




**Integrated Professional
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Cost Accounting and Financial Management

Part 1: Cost Accounting



Board of Studies
The Institute of Chartered Accountants of India
(Set up by an Act of Parliament)

PAPER 3

COST ACCOUNTING AND FINANCIAL MANAGEMENT

Part – 1 : Cost Accounting



**BOARD OF STUDIES
THE INSTITUTE OF CHARTERED ACCOUNTANTS OF INDIA**

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THE INSTITUTE OF CHARTERED ACCOUNTANTS OF INDIA

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PREFACE

The recent surge in globalisation and the massive cross border flow of capital has increased the significance of Cost Accounting and Financial Management for management and control purposes. The study of these two important subjects opens new opportunities for Chartered Accountancy students. It provides them with an opportunity to draw upon previous experiences and education to apply various business concepts and analytical tools to complex problems and issues in organizational settings.

This study material provides the basic concepts, theories and techniques relating to Cost Accounting and Financial Management and aims to develop the students' ability in understanding the different concepts and their application in the real life situations.

The study material is divided into two parts. Part I relates to Cost Accounting and Part II deals with Financial Management. The Cost Accounting portion has ten chapters having an in depth analysis of concepts relating to Material, Labour, Overheads and other important costing techniques. Standard Costing, Marginal Costing and Budgeting have been included in the syllabus at an introductory level. The syllabus has been designed in such a way that it helps students understand the traditional concepts, their applications, advantages and disadvantages. Contemporary changes in the subject shall be dealt with in the Final stage .

The portion on Financial Management is divided into seven chapters. Chapter 1 describes the scope, objectives and importance of financial management and its relationship with other disciplines. Time value of money is discussed in Chapter 2. Chapter 3 explains various tools and techniques of financial management namely Ratio Analysis and Cash Flow Analysis and their application in practical situations. Chapters 4, 6 and 7 deal with the theories, concepts and assumptions underlying financial decisions, namely, Financing, Investment and Working Capital Management. Chapter 5 describes the various Sources of Finance available to business enterprises to cater their different types of requirements.

The entire study material has been written in a simple language. A number of self-examination questions are given at the end of each chapter for practice by students. There are also a number of illustrations in each chapter to help students to have a better grasp of the subjects.

The concerned faculties members of Board of Studies Dr. S.Z.H. Zaidi, Dr. N.N. Sengupta, CA Ashish Gupta, CA Vikas Kumar, Ms. Anu have put their best efforts in making this study material lucid and students friendly.

SYLLABUS

PAPER – 3 : COST ACCOUNTING AND FINANCIAL MANAGEMENT

(One paper — Three hours – 100 Marks)

Level of Knowledge: Working knowledge

PART – I : COST ACCOUNTING (50 MARKS)

Objectives:

- (a) To understand the basic concepts and processes used to determine product costs,
- (b) To be able to interpret cost accounting statements,
- (c) To be able to analyse and evaluate information for cost ascertainment, planning, control and decision making, and
- (d) To be able to solve simple cases.

Contents

1. Introduction to Cost Accounting

- (a) Objectives and scope of Cost Accounting
- (b) Cost centres and Cost units
- (c) Cost classification for stock valuation, Profit measurement, Decision making and control
- (d) Coding systems
- (e) Elements of Cost
- (f) Cost behaviour pattern, Separating the components of semi-variable costs
- (g) Installation of a Costing system
- (h) Relationship of Cost Accounting, Financial Accounting, Management Accounting and Financial Management.

2. Cost Ascertainment

(a) Material Cost

- (i) Procurement procedures— Store procedures and documentation in respect of receipts and issue of stock, Stock verification
- (ii) Inventory control —Techniques of fixing of minimum, maximum and reorder

levels, Economic Order Quantity, ABC classification; Stocktaking and perpetual inventory

- (iii) Inventory accounting
- (iv) Consumption — Identification with products of cost centres, Basis for consumption entries in financial accounts, Monitoring consumption.

(b) Employee Cost

- (i) Attendance and payroll procedures, Overview of statutory requirements, Overtime, Idle time and Incentives
- (ii) Labour turnover
- (iii) Utilisation of labour, Direct and indirect labour, Charging of labour cost, Identifying labour hours with work orders or batches or capital jobs
- (iv) Efficiency rating procedures
- (v) Remuneration systems and incentive schemes.

(c) Direct Expenses

Sub-contracting — Control on material movements, Identification with the main product or service.

(d) Overheads

- (i) Functional analysis — Factory, Administration, Selling, Distribution, Research and Development
Behavioural analysis — Fixed, Variable, Semi variable and Step cost
- (ii) Factory Overheads — Primary distribution and secondary distribution, Criteria for choosing suitable basis for allotment, Capacity cost adjustments, Fixed absorption rates for absorbing overheads to products or services
- (iii) Administration overheads — Method of allocation to cost centres or products
- (iv) Selling and distribution overheads — Analysis and absorption of the expenses in products/customers, impact of marketing strategies, Cost effectiveness of various methods of sales promotion.

3. Cost Book-keeping

Cost Ledgers—Non-integrated accounts, Integrated accounts, Reconciliation of cost and financial accounts.

4. Costing Systems

(a) Job Costing

Job cost cards and databases, Collecting direct costs of each job, Attributing overhead costs to jobs, Applications of job costing.

(b) Batch Costing

(c) Contract Costing

Progress payments, Retention money, Escalation clause, Contract accounts, Accounting for material, Accounting for plant used in a contract, Contract profit and Balance sheet entries.

(d) Process Costing

Double entry book keeping, Process loss, Abnormal gains and losses, Equivalent units, Inter-process profit, Joint products and by products.

(e) Operating Costing System

5. Introduction to Marginal Costing

Marginal costing compared with absorption costing, Contribution, Breakeven analysis and profit volume graph.

6. Introduction to Standard Costing

Various types of standards, Setting of standards, Basic concepts of material and Labour standards and variance analysis.

7. Budget and Budgetary Control

The budget manual, preparation and monitoring procedures, budget variances, flexible budget, preparation of functional budget for operating and non operating functions, cash budget, master budget, principal budget factors.

PART – II : FINANCIAL MANAGEMENT (50 MARKS)

Objectives:

- (a) To develop ability to analyse and interpret various tools of financial analysis and planning,
- (b) To gain knowledge of management and financing of working capital,
- (c) To understand concepts relating to financing and investment decisions, and
- (d) To be able to solve simple cases.

Contents

1. Scope and Objectives of Financial Management

- (a) Meaning, Importance and Objectives
- (b) Conflicts in profit versus value maximisation principle
- (c) Role of Chief Financial Officer.

2. Time Value of Money

Compounding and Discounting techniques— Concepts of Annuity and Perpetuity.

3. Financial Analysis and Planning

- (a) Ratio Analysis for performance evaluation and financial health
- (b) Application of Ratio Analysis in decision making
- (c) Analysis of Cash Flow Statement.

4. Financing Decisions

- (a) Cost of Capital — Weighted average cost of capital and Marginal cost of capital
- (b) Capital Structure decisions — Capital structure patterns, Designing optimum capital structure, Constraints, Various capital structure theories
- (c) Business Risk and Financial Risk — Operating and financial leverage, Trading on Equity.

5. Types of Financing

- (a) Different sources of finance
- (b) Project financing — Intermediate and long term financing
- (c) Negotiating term loans with banks and financial institutions and appraisal thereof
- (d) Introduction to lease financing
- (e) Venture capital finance.

6. Investment Decisions

- (a) Purpose, Objective, Process
- (b) Understanding different types of projects
- (c) Techniques of Decision making: Non-discounted and Discounted Cash flow Approaches — Payback Period method, Accounting Rate of Return, Net Present Value, Internal Rate of Return, Modified Internal Rate of Return, Discounted Payback Period and Profitability Index
- (d) Ranking of competing projects, Ranking of projects with unequal lives.

7. Management of Working Capital

- (a) Working capital policies
- (b) Funds flow analysis
- (c) Inventory management
- (d) Receivables management
- (e) Payables management
- (f) Management of cash and marketable securities
- (g) Financing of working capital.

CONTENTS

COST ACCOUNTING

CHAPTER 1 – BASIC CONCEPTS

1.1	Evolution of Cost Accounting	1.1
1.2	Cost Accounting and Inventory Valuation	1.2
1.3	Objectives of Cost Accounting	1.3
1.4	Importance of Cost Accounting to Business Concern.....	1.5
1.5	Various Reports provided by Cost Accounting Department	1.6
1.6	Advantages of a Cost Accounting system	1.7
1.7	Essential Factors for Installing a Cost Accounting System	1.8
1.8	Relationship between Cost Accounting, Financial Accounting Management Accounting and Financial Management	1.9
1.9	Cost concepts and Terms	1.12
1.10	Elements of cost.....	1.16
1.11	Classification of costs	1.17
1.12	Coding systems.....	1.25
1.13	Types of Costing	1.26
1.14	Methods of Costing.....	1.27
1.15	Direct expenses	1.28
1.16	Self Examination Questions	1.30

CHAPTER 2 – MATERIAL

2.1	Introduction	2.1
2.2	Material control	2.2
2.3	Material procurement procedure.....	2.4
2.4	Material Issue Procedure	2.10
2.5	Material storage	2.14
2.6	Store Record.....	2.16

2.7	Inventory control.....	2.19
2.8	Valuation of material receipts.....	2.45
2.9	Valuation of material issues.....	2.48
2.10	Valuation of returns and shortages.....	2.65
2.11	Selection of Pricing Method.....	2.65
2.12	Treatment of Normal and Abnormal loss of material.....	2.66
2.13	Accounting and control of waste, scrap, spoilage & defective.....	2.66
2.14	Consumption of material.....	2.72
2.15	Miscellaneous illustration.....	2.74
2.16	Self examination questions.....	2.82

CHAPTER 3 – LABOUR

3.1	Introduction.....	3.1
3.2	Labour cost control.....	3.1
3.3	Attendance & payroll procedures.....	3.3
3.4	Idle time.....	3.11
3.5	Overtime.....	3.13
3.6	Labour turnover.....	3.18
3.7	Incentive system.....	3.25
3.8	Labour utilisation.....	3.28
3.9	System of wage payment and incentive.....	3.31
3.10	Absorption of wages.....	3.67
3.11	Efficiency rating procedures.....	3.74
3.12	Miscellaneous Illustration.....	3.76
3.13	Self Examination Questions.....	3.76

CHAPTER 4 – OVERHEADS

4.1	Introduction.....	4.1
4.2	Classification of Overheads.....	4.2

4.3	Accounting and control of Manufacturing Overheads.....	4.8
4.4	Steps for the Distribution of overheads.....	4.10
4.5	Methods of absorbing Overheads to Various Products or Jobs.....	4.35
4.6	Treatment of under-absorbed and over-absorbed overheads	4.46
4.7	Accounting and control of Administrative Overhead.....	4.59
4.8	Accounting and control of Selling & Distribution Overhead.....	4.64
4.9	Concepts related to Capacity	4.68
4.10	Treatment of certain items in Costing	4.69
4.11	Self Examination Questions	4.73

CHAPTER 5 – NON INTEGRATED ACCOUNTS

5.1	Introduction.....	5.1
5.2	Non Integrated Accounting System	5.1
5.3	Integrated Accounting System.....	5.34
5.4	Reconciliation of Cost and Financial Accounts	5.49
5.5	Self Examination Questions	5.61

CHAPTER 6 – METHOD OF COSTING(I)

6.1	Introduction.....	6.1
6.2	Job Costing.....	6.2
6.3	Contract Costing	6.9
6.4	Batch Costing.....	6.37
6.5	Operating Costing	6.39
6.6	Miscellaneous Illustration.....	6.47
6.7	Multiple Costing.....	6.54
6.8	Self Examination Questions	6. 54

CHAPTER 7 – METHOD OF COSTING (II)

7.1	Meaning of Process Costing.....	7.1
7.2	Operation Costing	7.2

7.3	Treatment of Process losses	7.4
7.4	Costing of Equivalent production units	7.7
7.5	Inter Process Profits	7.13
7.6	Joint products and by products	7.16
7.7	Miscellaneous Illustration	7.32
7.8	Self Examination Questions	7.39

CHAPTER 8 – STANDARD COSTING

8.1	Introduction	8.1
8.2	Definition of standard cost	8.3
8.3	Setting up of standard cost	8.3
8.4	Types of standards	8.8
8.5	Need for standard cost	8.9
8.6	Process of standard costing	8.10
8.7	Types of variances	8.11
8.8	Preparation of Operating Statement Under Standard Costing	8.18
8.9	Standard Costing at Global Communication Ltd.	8.19
8.10	Accounting procedure for standard cost	8.23
8.11	Disposition of Variances	8.25
8.12	Advantages and Criticism of Standard Costing	8.26
8.13	Miscellaneous Illustration	8.29
8.14	Self examination questions	8.44

CHAPTER 9 – MARGINAL COSTING

9.1	Introduction	9.1
9.2	Theory of Marginal Costing	9.2
9.3	Definitions	9.2
9.4	Ascertainment of Marginal cost	9.5
9.5	Separating fixed and Variable Costing	9.6

9.6	Distinction between Marginal and Absorption Costing.....	9.8
9.7	Advantages and Limitation of Marginal Costing	9.11
9.8	Marginal Cost Equation.....	9.13
9.9	Cost Volume Profit Analysis	9.13
9.10	Miscellaneous Illustration.....	9.20
9.11	Self Examination Questions	9.40

CHAPTER 10 – BUDGETS AND BUDGETARY CONTROL

10.1	Introduction.....	10.1
10.2	Objectives of budgeting	10.2
10.3	Budgetary control	10.3
10.4	Different types of budgets	10.7
10.5	Preparation of budgets	10.9
10.6	Miscellaneous Illustration.....	10.41
10.7	Self Examination Questions	10.53

GLOSSARY

CHAPTER 1

BASIC CONCEPTS

Learning Objectives

When you have finished studying this chapter, you should be able to

- ◆ Understand the objective and importance of Cost Accounting.
- ◆ Understand the cost accounting terminology.
- ◆ Differentiate between cost accounting and financial accounting
- ◆ Understand the relationship between Cost Accounting, Financial Accounting, Management Accounting and Financial Management.
- ◆ Understand the concept of codes and the process of codification.
- ◆ Understand the various types and methods of cost accounting.

1.1 EVOLUTION OF COST ACCOUNTING

Prior to the industrial revolution, businesses were small and characterised by simple market exchanges between individuals and organisations. In those times there was a need of accurate book keeping though not that much of cost accounting. However, by the seventeenth century in France, the Royal Wallpaper Manufactory had a Cost Accounting System. Some iron masters and potters in eighteenth century in England too began to produce Cost Accounting information before the Industrial Revolution.

Subsequently, with the advent of the industrial revolution, large sized process industries performing single activities (e.g. textiles, railways etc) came into being. During this period, there was a lack of market for intermediary products because of which cost information gained importance as a tool for measuring efficiency of different processes. The period, 1880 AD – 1925 AD saw the development of complex product designs and the emergence of multi activity diversified corporations like Du Pont, General Motors etc. It was during this period that scientific management was developed which led accountants to convert physical standards into cost standards, the latter being used for variance analysis and control.

During World War I and II the social importance of cost accounting grew with the growth of each country's defence expenditure. In the absence of competitive markets for most of the material required to fight war, the Governments in several countries placed cost-plus contracts



under which the price to be paid was the cost of production plus an agreed rate of profit. The reliance on cost information by the parties to defence contracts continued after World War II as well. Even today, most of the government contracts are decided on a cost plus basis.

1.2 COST ACCOUNTING AND INVENTORY VALUATION

The spurt in the industrial growth, as mentioned above, also resulted in the increased importance of financial accounting and audit (1900 AD onwards). One of the fundamental issues to be resolved by the accountants during this period was the measurement of the value of inventory while preparing financial statements. The valuation had a deep impact over the projected profitability of a company, which in turn affected the willingness of various stakeholders to inject large amount of capital in the business. The valuation also directly affected the taxes which the company was obliged to pay to the government since higher profits meant higher taxes and vice versa.

It was in this context that the need of establishing rules for inventory valuation was felt. It was then decided that inventory should be valued at 'cost' or 'market value' whichever is lower. The term 'cost', being restricted to the money expended in manufacturing the product till the time the product was sold. Hence, expenditure incurred in research and development, distribution, marketing or customer support functions was to be excluded while computing 'costs' for inventory valuation. The computation of the cost incidence on different types of inventory with different degrees of completion necessitated the need of accounting for 'costs' in order to arrive at the correct values.

As you would have understood by now, 'cost accounting' was initiated for manufacturing organizations and as a field of practice was limited within the factory premises. However, with the increase in its scope, cost accounting today is equally important to both manufacturing and service organizations and also does not restrict itself to inventory valuation alone. It is used in (1) various decision making scenarios e.g. whether to produce for captive consumption or buy from outside suppliers, (2) supply of information to the government (cost audit), (3) planning and control of expenses (variance analysis), (4) tracking expenses through a product's life cycle (life cycle costing), (5) fixation of selling prices (cost plus and other approaches) etc. The use of information technology has helped companies keep/maintain different cost systems for different purposes.

Today, Cost Accounting is popularly known as 'Cost and Management Accounting'.

Before you begin your study of Cost Accounting, you must be clear in your mind that you are going to study a subject, which is immensely useful in all economic activities. It is a natural instinct with all of us to measure the pros and cons of everything. A prudent housewife who goes for shopping considers the quality and price of each product before she buys it. In short, each economic activity, if rationally viewed, has two aspects - firstly, the costs involved in it



and secondly, the benefits obtained out of it. This analysis is technically known as cost-benefit analysis. It is very important in industrial and commercial activities. Cost Accounting involves a study of those concepts, tools, and techniques, which help us in ascertaining and analysing costs.

1.2.1 Definition of Costing, Cost Accounting and Cost Accountancy:

Costing is defined as “the technique and process of ascertaining costs”.

Cost Accounting is defined as "the process of accounting for cost which begins with the recording of income and expenditure or the bases on which they are calculated and ends with the preparation of periodical statements and reports for ascertaining and controlling costs."

Cost Accountancy has been defined as “the application of costing and cost accounting principles, methods and techniques to the science, art and practice of cost control and the ascertainment of profitability. It includes the presentation of information derived there from for the purpose of managerial decision making.”

1.3 OBJECTIVES OF COST ACCOUNTING

The main objectives of Cost Accounting are as follows :

- (i) Ascertainment of cost.
- (ii) Determination of selling price.
- (iii) Cost control and cost reduction.
- (iv) Ascertaining the profit of each activity.
- (v) Assisting management in decision-making.

1.3.1 Ascertainment of Cost: There are two methods of ascertaining costs, viz., Post Costing and Continuous Costing.

Post Costing means, analysis of actual information as recorded in financial books. It is accurate and is useful in the case of “Cost plus Contracts” where price is to be determined finally on the basis of actual cost.

Continuous Costing, aims at collecting information about cost as and when the activity takes place so that as soon as a job is completed the cost of completion would be known. This involves careful estimates being prepared of overheads. In order to be of any use, costing must be a continuous process.

Cost ascertained by the above two methods may be compared with the standard costs which are the target figures already compiled on the basis of experience and experiments.



1.3.2 Determination of selling price: Though the selling price of a product is influenced by market conditions, which are beyond the control of any business, it is still possible to determine the selling price within the market constraints. For this purpose, it is necessary to rely upon cost data supplied by Cost Accountants.

1.3.3 Cost control and cost reduction: To exercise cost control, broadly speaking the following steps should be observed:

- (i) Determine clearly the objective, i.e., pre-determine the desired results;
- (ii) Measure the actual performance;
- (iii) Investigate into the causes of failure to perform according to plan; and
- (iv) Institute corrective action.

The target cost and/or targets of performance should be laid down in respect of each department or operation and these targets should be related to individuals who, by their action, control the actual and bring them into line with the targets. Actual cost of performance should be measured in the same manner in which the targets are set up, *i.e.* if the targets are set up operation-wise, then the actual costs should also be collected operation-wise and not cost centre or department-wise as this would make comparison difficult.

Cost Reduction, may be defined "as the achievement of real and permanent reduction in the unit cost of goods manufactured or services rendered without impairing their suitability for the use intended or diminution in the quality of the product."

Cost reduction should not be confused with Cost control. Cost saving could be a temporary affair and may be at the cost of quality. Cost reduction implies the retention of the essential characteristics and quality of the product and thus it must be confined to permanent and genuine savings in the cost of manufacture, administration, distribution and selling, brought about by elimination of wasteful and inessential elements from the design of the product and from the techniques carried out in connection therewith. In other words, the essential characteristics and quality of the products are retained through improved methods and techniques and thereby a permanent reduction in unit cost is achieved. The definition of cost reduction does not, however, include reduction in expenditure arising from reduction in taxation or similar Government action or the effect of price agreements.

The three-fold assumptions involved in the definition of cost reduction may be summarised as under :

- (a) There is a saving in unit cost.
- (b) Such saving is of permanent nature.
- (c) The utility and quality of the goods and services remain unaffected, if not improved.



1.3.4 Ascertaining the profit of each activity : The profit of any activity can be ascertained by matching cost with the revenue of that activity. The purpose under this step is to determine costing profit or loss of any activity on an objective basis.

1.3.5 Assisting management in decision making : Decision making is defined as a process of selecting a course of action out of two or more alternative courses. For making a choice between different courses of action, it is necessary to make a comparison of the outcomes, which may be arrived under different alternatives. Such a comparison has only been made possible with the help of Cost Accounting information.

1.4 IMPORTANCE OF COST ACCOUNTING TO BUSINESS CONCERNS

Management of business concerns expects from Cost Accounting a detailed cost information in respect of its operations to equip their executives with relevant information required for planning, scheduling, controlling and decision making. To be more specific, management expects from cost accounting - information and reports to help them in the discharge of the following functions :

(a) *Control of material cost :* Cost of material usually constitute a substantial portion of the total cost of a product. Therefore, it is necessary to control it as far as possible. Such a control may be exercised by (i) Ensuring un-interrupted supply of material and spares for production. (ii) By avoiding excessive locking up of funds/capital in stocks of materials and stores. (iii) Also by the use of techniques like value analysis, standardisation etc. to control material cost.

(b) *Control of labour cost :* It can be controlled if workers complete their work within the standard time limit. Reduction of labour turnover and idle time too help us, to control labour cost.

(c) *Control of overheads :* Overheads consists of indirect expenses which are incurred in the factory, office and sales department ; they are part of production and sales cost. Such expenses may be controlled by keeping a strict check over them.

(d) *Measuring efficiency :* For measuring efficiency, Cost Accounting department should provide information about standards and actual performance of the concerned activity.

(e) *Budgeting :* Now-a-days detailed estimates in terms of quantities and amounts are drawn up before the start of each activity. This is done to ensure that a practicable course of action can be chalked out and the actual performance corresponds with the estimated or budgeted performance. The preparation of the budget is the function of Costing Department.

(f) *Price determination:* Cost accounts should provide information, which enables the management to fix remunerative selling prices for various items of products and services in different circumstances.



Cost Accounting

(g) *Curtailment of loss during the off-season:* Cost Accounting can also provide information, which may enable reduction of overhead, by utilising idle capacity during the off-season or by lengthening the season.

(h) *Expansion:* Cost Accounts may provide estimates of production of various levels on the basis of which the management may be able to formulate its approach to expansion.

(i) *Arriving at decisions:* Most of the decisions in a business undertaking involve correct statements of the likely effect on profits. Cost Accounts are of vital help in this respect. In fact, without proper cost accounting, decision would be like taking a jump in the dark, such as when production of a product is stopped.

1.5 VARIOUS REPORTS PROVIDED BY COST ACCOUNTING DEPARTMENT

Following reports may be provided by a Cost Accounting Department for the use of its executives:

(a) Cost sheets setting out the total cost, analysed into various elements, giving comparative figures for the previous period and for other plants under the same management.

(b) Consumption of material statements, showing total quantity of materials issued for production, materials actually embodied in production and wastage.

(c) Labour utilisation statements providing details about the total number of hours paid for, standard hours for the output, idle time (and amount involved) and causes thereof.

(d) Overheads incurred compared with budgets; overheads actually charged to production and the difference between the amount actually incurred and the amount so charged.

(e) Sales effected compared with budgets, showing the difference between the two because of quality being different from those taken into account while budgeting.

(f) Reconciliation of actual profit earned with estimated or budgeted profit.

(g) The total cost of abnormally spoiled work in the factory and abnormal losses in the store.

(h) The total cost of inventory carried, analysed into raw materials in chief stores and other stores. The number of months for which stocks would be sufficient (on the basis of average consumption being worked out).

(i) Labour turnover, and the cost of recruitment and training of new employees.

(j) Expenses incurred on Research and Development as compared with the budgeted amount.

Reports about particular departments and operations (like transport or power generation) may also be compiled and submitted to the departmental manager concerned.



1.6 ADVANTAGES OF A COST ACCOUNTING SYSTEM

Important advantages of a Cost Accounting System may be listed as below :

1. A good Cost Accounting System helps in identifying unprofitable activities, losses or inefficiencies in any form.
2. The application of cost reduction techniques, operations research techniques and value analysis technique, helps in achieving the objective of economy in concern's operations. Continuous efforts are being made by the business organisation for finding new and improved methods for reducing costs.
3. Cost Accounting is useful for identifying the exact causes for decrease or increase in the profit/loss of the business. It also helps in identifying unprofitable products or product lines so that these may be eliminated or alternative measures may be taken.
4. It provides information and data to the management to serve as guides in making decisions involving financial considerations. Guidance may also be given by the Cost Accountant on a host of problems such as, whether to purchase or manufacture a given component, whether to accept orders below cost, which machine to purchase when a number of choices are available.
5. Cost Accounting is quite useful for price fixation. It serves as a guide to test the adequacy of selling prices. The price determined may be useful for preparing estimates or filling tenders.
6. The use of cost accounting technique viz., variance analysis, points out the deviations from the pre-determined level and thus demands suitable action to eliminate such deviations in future.
7. Cost comparison helps in cost control. Such a comparison may be made from period to period by using the figures in respect of the same unit of firms or of several units in an industry by employing uniform costing and inter-firm comparison methods. Comparison may be made in respect of costs of jobs, processes or cost centres.
8. A system of costing provides figures for the use of Government, Wage Tribunals and other bodies for dealing with a variety of problems. Some such problems include price fixation, price control, tariff protection, wage level fixation, etc.
9. The cost of idle capacity can be easily worked out, when a concern is not working to full capacity.
10. The use of Marginal Costing technique, may help the executives in taking short term decisions. This technique of costing is highly useful during the period of trade depression, as the orders may have to be accepted during this period at a price less than the total cost.



11. The marginal cost has linear relationship with production volume and hence in formulating and solving “Linear Programming Problems”, marginal cost is useful.

1.7 ESSENTIAL FACTORS FOR INSTALLING A COST ACCOUNTING SYSTEM

As in the case of every other form of activity, it should be considered whether it would be profitable to have a cost accounting system. The benefits from such a system must exceed the amount to be spent on it. This would depend upon many factors including the nature of the business and the quality of the management. Management, which is prone to making decisions on the basis of pre-conceived notions without taking into account the information and data placed before it, cannot derive much benefit from a costing system. On the other hand management, which is in the habit of studying information thoroughly before making decisions, would require cost accounting system. Before setting up a system of cost accounting the under mentioned factors should be studied:

- (i) The objective of costing system, for example whether it is being introduced for fixing prices or for insisting a system of cost control.
- (ii) The areas of operation of business wherein the managements' action will be most beneficial. For instance, in a concern, which is anxious to expand its operations, increase in production would require maximum attention. On the other hand for a concern, which is not able, to sell the whole of its production the selling effort would require greater attention. The system of costing in each case should be designed to highlight, in significant areas, factors considered important for improving the efficiency of operations in that area.
- (iii) The general organisation of the business, with a view of finding out the manner in which the system of cost control could be introduced without altering or extending the organisation appreciably.
- (iv) The technical aspects of the concern and the attitude and behaviour that will be successful in winning sympathetic assistance or support of the supervisory staff and workmen.
- (v) The manner in which different variable expenses would be affected with expansion or cessation of different operations.
- (vi) The manner in which Cost and Financial accounts could be inter-locked into a single integral accounting system and in which results of separate sets of accounts, cost and financial, could be reconciled by means of control accounts.
- (vii) The maximum amount of information that would be sufficient and how the same should be secured without too much clerical labour, especially the possibility of collection of data on a separate printed form designed for each process; also the possibility of instruction



as regards filling up of the forms in writing to ensure that these would be faithfully carried out.

- (viii) How the accuracy of the data collected can be verified? Who should be made responsible for making such verification in regard to each operation and the form of certificate that he should give to indicate the verification that he has carried out ?
- (ix) The manner in which the benefits of introducing Cost Accounting could be explained to various persons in the concern, specially those in charge of production department and awareness created for the necessity of promptitude, frequency and regularity in collection of costing data.

1.7.1 Essentials of a good Cost Accounting System: The essential features, which a good Cost Accounting System should possess, are as follows:

- (i) Cost Accounting System should be tailor-made, practical, simple and capable of meeting the requirements of a business concern.
- (ii) The data to be used by the Cost Accounting System should be accurate; otherwise it may distort the output of the system.
- (iii) Necessary cooperation and participation of executives from various departments of the concern is essential for developing a good system of Cost Accounting.
- (iv) The Cost of installing and operating the system should justify the results.
- (v) The system of costing should not sacrifice the utility by introducing meticulous and unnecessary details.
- (vi) A carefully phased programme should be prepared by using network analysis for the introduction of the system.
- (vii) Management should have a faith in the Costing System and should also provide a helping hand for its development and success.

1.8 RELATIONSHIP BETWEEN COST ACCOUNTING, FINANCIAL ACCOUNTING, MANAGEMENT ACCOUNTING AND FINANCIAL MANAGEMENT

Cost Accounting is a branch of accounting, which has been developed because of the limitations of Financial Accounting from the point of view of management control and internal reporting. Financial accounting performs admirably, the function of portraying a true and fair overall picture of the results or activities carried on by an enterprise during a period and its financial position at the end of the year. Also, on the basis of financial accounting, effective control can be exercised on the property and assets of the enterprise to ensure that they are not misused or misappropriated. To that extent financial accounting helps to assess the overall progress of a concern, its strength and weaknesses by providing the figures relating to



several previous years. Data provided by Cost and Financial Accounting is further used for the management of all processes associated with the efficient acquisition and deployment of short, medium and long term financial resources. Such a process of management is known as Financial Management. The objective of Financial Management is to maximise the wealth of shareholders by taking effective Investment, Financing and Dividend decisions. Investment decisions relate to the effective deployment of scarce resources in terms of funds while the Financing decisions are concerned with acquiring optimum finance for attaining financial objectives. The last and very important 'Dividend decision' relates to the determination of the amount and frequency of cash which can be paid out of profits to shareholders. On the other hand, Management Accounting refers to managerial processes and technologies that are focused on adding value to organisations by attaining the effective use of resources, in dynamic and competitive contexts. Hence, Management Accounting is a distinctive form of resource management which facilitates management's 'decision making' by producing information for managers within an organisation.

1.8.1 Limitations of Financial Accounting: There are, however, serious limitations of financial accounting from the point of view of management. These stem from the fact that management must have information properly analysed and continuously flowing to it. Management cannot be satisfied with a broad picture, and that too available at the end of a period. The limitations of financial accounts together with procedures that overcome the limitations are given below :

Limitations

Procedures that overcome limitations

A. Forecasting and Planning

Management requires information so that it can make effective plans for the coming year and the period after that. In other words, information about the future is required. Financial Accounts do not provide this information.

The technique of budgeting has been evolved. Starting with the assessment of the limiting factors that may be operating, careful estimates can be prepared of all the activities that will be undertaken and these, then can be translated in terms of money. (An analysis of cost into fixed and variable is most useful in this respect). These "estimates", properly coordinated, become budgets and plans of action.

B. Decision making

Management requires information daily for making decision of any type. Financial Accounts normally are not able to provide information for this purpose. Information is

It is the complete analysis of cost incurred that can help management in making the type of decisions mentioned. The analysis



required to answer the under mentioned questions amongst others :

- | | |
|---|---|
| (i) What should be the product under normal circumstances and under special circumstances ? | (i) The total cost of each job, product, process etc. as to be ascertained; and |
| (ii) Should a part be produced in the factory itself or bought from the market ? | (ii) The cost must be further analysed as fixed and variable. |
| (iii) Should the production of a product be given up ? | (iii) In other words, management should have information to see what the effect on the revenues and cost (both) will be, if a proposed course of action is taken. This is the marginal costing technique and most problems can be handled with the aid of this technique. |
-
- (iv) What should be the priority accorded to a product ?
- (v) Should investment be made in a new project ?
- (vi) How much should be produced to earn a certain profit, given the selling price?

C. Control and assessment

Management requires information to assess the performance of various persons and departments and to see that costs do not exceed a reasonable limit for a given quantum of work of the requisite quality. Financial accounts cannot provide information for this purpose. Apart from the generality of the above, management requires to know :

- (i) the profitability of each product ; and
- (ii) the extent of unnecessary material, labour, facilities etc.

The techniques of budgeting and standard costing enable management to perform this function which is one of most important one. In this case also the main activity is analysis and comparison. If standard costing is not adopted, simple comparison of figures over the periods for each element of cost in terms of quantity if possible is of great help.

Profitability of each waste product can be easily established by comparing its selling price with the contribution it makes *i.e.*, the difference between the selling price and its variable cost.



It will be seen from the above that the chief limitation of financial accounting is lack of analysis of information and absence of measuring rods. Cost accounting with the aid of budgeting, standard costing and marginal costing has filled the need in this respect.

1.9 COST CONCEPTS AND TERMS

1.9.1 Cost

- (a) The amount of expenditure (actual or notional) incurred on or attributable to a specified article, product or activity. (here the word cost is used as a noun)
- (b) To ascertain the cost of a given thing. (here the word cost is used as a verb)

NOTE : The word 'Cost' can rarely stand on its own and should be qualified as to its limitation (e.g., historical, variable etc.) and related to a particular thing or 'object of thought' e.g., a given quantity or unit of goods made or services performed.

1.9.2 Cost object – Anything for which a separate measurement of cost is desired. Examples of cost objects include a product, a service, a project, a customer, a brand category, an activity, a department, a programme.

1.9.3 Direct costs – Costs that are related to the cost object and can be traced in an economically feasible way.

1.9.4 Indirect costs – Costs that are related to the cost object but cannot be traced to it in an economically feasible way.

1.9.5 Pre-determined - A cost which is computed in advance before production or operations start, on the basis of specification of all the factors affecting cost, is known as a pre-determined cost.

1.9.6 Standard Cost - A pre-determined cost, which is calculated from managements 'expected standard of efficient operation' and the relevant necessary expenditure. It may be used as a basis for price fixing and for cost control through variance analysis.

1.9.7 Marginal Cost - The amount at any given volume of output by which aggregate costs are changed if the volume of output is increased or decreased by one unit.

Note : In this context a unit may be a single article, an order, a stage of production, a process of a department. It relates to change in output in the particular circumstances under consideration within the capacity of the concerned organisation.

1.9.8 Cost of Sales - The cost which is attributable to the sales made.

Note: It is not uncommon to use this in a restricted sense as the production cost of goods sold.



1.9.9 Total Cost - The sum of all costs attributable to the cost object under consideration.

1.9.10 Cost Centre - It is defined as a location, person or an item of equipment (or group of these) for which cost may be ascertained and used for the purpose of Cost Control. Cost Centres are of two types, viz., Personal and Impersonal.

A *Personal cost centre* consists of a person or group of persons and an *Impersonal cost centre* consists of a location or an item of equipment (or group of these).

In a manufacturing concern there are two main types of Cost Centres as indicated below :

- (i) *Production Cost Centre* : It is a cost centre where raw material is handled for conversion into finished product. Here both direct and indirect expenses are incurred. Machine shops, welding shops and assembly shops are examples of production Cost Centres.
- (ii) *Service Cost Centre* : It is a cost centre which serves as an ancillary unit to a production cost centre. Power house, gas production shop, material service centres, plant maintenance centres are examples of service cost centres.

1.9.11 Cost unit - It is a unit of product, service or time (or combination of these) in relation to which costs may be ascertained or expressed. We may for instance determine the cost per tonne of steel, per tonne kilometre of a transport service or cost per machine hour. Sometime, a single order or a contract constitutes a cost unit. A batch which consists of a group of identical items and maintains its identity through one or more stages of production may also be considered as a cost unit.

Cost units are usually the units of physical measurement like number, weight, area, volume, length, time and value. A few typical examples of cost units are given below :

<i>Industry or Product</i>	<i>Cost Unit Basis</i>
Automobile	–Number
Cement	–Tonne/per bag etc.
Chemicals	–Litre, gallon, kilogram, tonne etc.
Power	–Kilo-watt hour
Steel	–Tonne
Transport	–Passenger kilometre

1.9.12 Responsibility Centre - It is defined as an activity centre of a business organisation entrusted with a special task. Under modern budgeting and control, financial executives tend to develop responsibility centres for the purpose of control. Responsibility centres can broadly



be classified into three categories. They are :

- (a) Cost Centres ;
- (b) Profit Centres ; and
- (c) Investment Centres ;

1.9.13 Profit Centres - Centres which have the responsibility of generating and maximising profits are called Profit Centres.

1.9.14 Investment Centres - Those centres which are concerned with earning an adequate return on investment are called Investment Centres.

1.9.15 Cost allocation - It is defined as the assignment of the indirect costs to the chosen cost object.

1.9.16 Cost absorption - It is defined as the process of absorbing all indirect costs allocated to or apportioned over a particular cost centre or production department by the units produced. Hence, while allocating, the relevant cost objects would be the concerned cost centre or the concerned department, while, the process of absorption would consider the units produced as the relevant cost object. For example, the overhead costs of a lathe centre may be absorbed by using a rate per lathe hour. Cost absorption can take place only after cost allocation. In other words, the overhead costs are either allocated or apportioned over different cost centres and afterwards they are absorbed on equitable basis by the output of the same cost centres.

1.9.17 Estimated cost - Kohler defines estimated cost as "the expected cost of manufacture, or acquisition, often in terms of a unit of product computed on the basis of information available in advance of actual production or purchase". Estimated cost are prospective costs since they refer to prediction of costs.

1.9.18 Differential cost - (Incremental and decremental costs). It represents the change (increase or decrease) in total cost (variable as well as fixed) due to change in activity level, technology, process or method of production, etc. For example if any change is proposed in the existing level or in the existing method of production, the increase or decrease in total cost or in specific elements of cost as a result of this decision will be known as incremental cost or decremental cost.

1.9.19 Imputed costs - These costs are notional costs which do not involve any cash outlay. Interest on capital, the payment for which is not actually made, is an example of imputed cost. These costs are similar to opportunity costs.

1.9.20 Capitalised costs - These are costs which are initially recorded as assets and subsequently treated as expenses.

1.9.21 Product costs - These are the costs which are associated with the purchase and sale of goods (in the case of merchandise inventory). In the production scenario, such costs are



associated with the acquisition and conversion of materials and all other manufacturing inputs into finished product for sale. Hence, under marginal costing, variable manufacturing costs and under absorption costing, total manufacturing costs (variable and fixed) constitute inventoriable or product costs. Under the Indian GAAP, product costs will be those costs which are allowed to be a part of the value of inventory as per Accounting Standard 2, issued by the Council of the Institute of Chartered Accountants of India.

1.9.22 Opportunity cost - This cost refers to the value of sacrifice made or benefit of opportunity foregone in accepting an alternative course of action. For example, a firm financing its expansion plan by withdrawing money from its bank deposits. In such a case the loss of interest on the bank deposit is the opportunity cost for carrying out the expansion plan.

1.9.23 Out-of-pocket cost - It is that portion of total cost, which involves cash outflow. This cost concept is a short-run concept and is used in decisions relating to fixation of selling price in recession, make or buy, etc. Out-of-pocket costs can be avoided or saved if a particular proposal under consideration is not accepted.

1.9.24 Shut down costs - Those costs, which continue to be, incurred even when a plant is temporarily shutdown, e.g. rent, rates, depreciation, etc. These costs cannot be eliminated with the closure of the plant. In other words, all fixed costs, which cannot be avoided during the temporary closure of a plant, will be known as shut down costs.

1.9.25 Sunk costs - Historical costs incurred in the past are known as sunk costs. They play no role in decision making in the current period. For example, in the case of a decision relating to the replacement of a machine, the written down value of the existing machine is a sunk cost and therefore, not considered.

1.9.26 Absolute cost - These costs refer to the cost of any product, process or unit in its totality. When costs are presented in a statement form, various cost components may be shown in absolute amount or as a percentage of total cost or as per unit cost or all together. Here the costs depicted in absolute amount may be called absolute costs and are base costs on which further analysis and decisions are based.

1.9.27 Discretionary costs – Such costs are not tied to a clear cause and effect relationship between inputs and outputs. They usually arise from periodic decisions regarding the maximum outlay to be incurred. Examples include advertising, public relations, executive training etc.

1.9.28 Period costs - These are the costs, which are not assigned to the products but are charged as expenses against the revenue of the period in which they are incurred. All non-manufacturing costs such as general and administrative expenses, selling and distribution expenses are recognised as period costs.



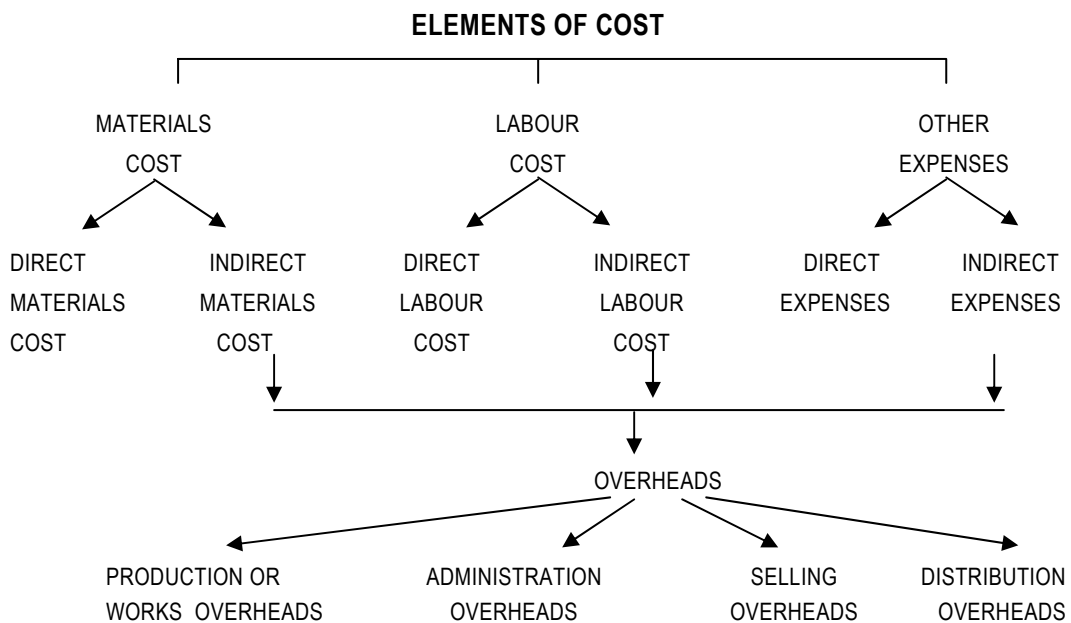
1.9.29 Engineered costs - These are costs that result specifically from a clear cause and effect relationship between inputs and outputs. The relationship is usually personally observable. Examples of inputs are direct material costs, direct labour costs etc. Examples of output are cars, computers etc.

1.9.30 Explicit Costs - These costs are also known as out of pocket costs and refer to costs involving immediate payment of cash. Salaries, wages, postage and telegram, printing and stationery, interest on loan etc. are some examples of explicit costs involving immediate cash payment.

1.9.31 Implicit Costs - These costs do not involve any immediate cash payment. They are not recorded in the books of account. They are also known as economic costs.

1.10 ELEMENTS OF COST

A diagram as given below shows the elements of cost described as under :



1.10.1 Direct materials : Materials which are present in the finished product(cost object) or can be economically identified in the product are called direct materials. For example, cloth in dress making; materials purchased for a specific job etc.

Note: However in some cases a material may be direct but it is treated as indirect, because it is used in small quantities and it is not economically feasible to identify that quantity.



1.10.2 Direct labour : Labour which can be economically identified or attributed wholly to a cost object is called direct labour. For example, labour engaged on the actual production of the product or in carrying out the necessary operations for converting the raw materials into finished product.

1.10.3 Direct expenses : It includes all expenses other than direct material or direct labour which are specially incurred for a particular cost object and can be identified in an economically feasible way.

1.10.4 Indirect materials : Materials which do not normally form part of the finished product (cost object) are known as indirect materials. These are —

- ❖ Stores used for maintaining machines and buildings (lubricants, cotton waste, bricks etc.)
- ❖ Stores used by service departments like power house, boiler house, canteen etc.

1.10.5 Indirect labour : Labour costs which cannot be allocated but can be apportioned to or absorbed by cost units or cost centres is known as indirect labour. Examples of indirect labour includes - charge hands and supervisors; maintenance workers; etc.

1.10.6 Indirect expenses : Expenses other than direct expenses are known as indirect expenses. Factory rent and rates, insurance of plant and machinery, power, light, heating, repairing, telephone etc., are some examples of indirect expenses.

1.10.7 Overheads : It is the aggregate of indirect material costs, indirect labour costs and indirect expenses. The main groups into which overheads may be subdivided are the following :

- | | |
|-----------------------------------|-------------------------------|
| (i) Production or Works overheads | (ii) Administration overheads |
| (iii) Selling overheads | (iv) Distribution overheads |

1.11 CLASSIFICATION OF COSTS

It means the grouping of costs according to their common characteristics. The important ways of classification of costs are :

- | | |
|----------------------------|--------------------|
| (1) By nature or element | (2) By functions |
| (3) As direct and indirect | (4) By variability |
| (5) By controllability | (6) By normality |

1.11.1 By Nature of Element - Under this classification the costs are divided into three categories *i.e.*, materials cost, labour cost and expenses. This type of classification is useful to determine the total cost.

1.11.2 By Functions - Under this classification, costs are divided according to the function for which they have been incurred. Some of the examples are :

Production cost - The cost of sequence of operations which begins with supplying materials,



Cost Accounting

labour and services and ends with primary packing of the product.

Selling cost - The cost seeking to create and stimulate demand (sometimes termed 'marketing') and of securing orders.

Distribution cost - The cost of the sequence of operations which begins with making the packed product available for despatch and ends with making the reconditioned returned empty package, if any available for re-use.

Note - It also includes expenditure incurred in transporting articles to central or local storage. Distribution costs include expenditure incurred in moving articles to and from prospective customers as in case of goods on sale or return basis. In the gas, electricity and water industry distribution means pipes, mains and services which may be regarded as the equivalent of packing and transportation.

Administrative cost - The cost of formulating the policy, directing the organisation and controlling the operations of an undertaking which is not related directly to a production, selling and distribution, research or development activity or function.

Research cost - The cost of researching for new or improved products, new applications of materials, or improved methods.

Development cost - The cost of the process which begins with the implementation of the decision to produce a new or improved product or to employ a new or improved method and ends with commencement of formal production of that product or by that method.

Pre-production cost - The part of development cost incurred in making a trial production run preliminary to formal product.

Note - This term is sometimes used to cover all activities prior to production including research and development, but in such cases the usage should be made clear in the context.

Conversion cost - The sum of direct wages, direct expenses and overhead cost of converting raw materials to the finished stage or converting a material from one stage of production to the next.

Note - In some circumstances this phrase is used to include any excess material cost or loss of material incurred at the particular stage of production.

Product costs – Please refer to 1.9.21

Purposes for computing product costs :

The three different purposes for computing product costs are as follows :

- (i) *Preparation of financial statements:* Here focus is on inventoriable costs for complying with Accounting Standard –2 , issued by the Council of ICAI.

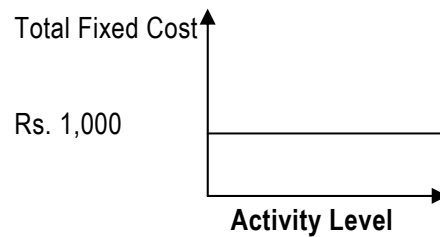


- (ii) *Product pricing*: It is an important purpose for which product costs are used. For this purpose, the cost of the other areas of the value chain should be included to make the product available to the customer.
- (iii) *Contracting with government agencies*: Normally such contracts are on a cost plus basis. For this purpose government agencies may not allow the contractors to recover research and development and marketing costs under cost plus contracts.

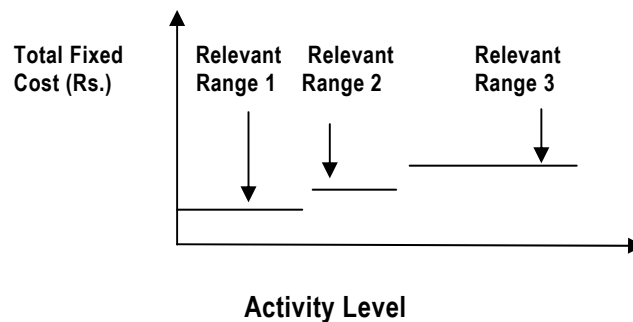
1.11.3 As Direct and Indirect – Please refer to 1.9.3 and 1.9.4

1.11.4 By Variability - According to this classification costs are classified into three groups viz., fixed, variable and semi-variable.

- (a) *Fixed costs* - These are the costs which are incurred for a period, and which, within certain output and turnover limits, tend to be unaffected by fluctuations in the levels of activity (output or turnover). They do not tend to increase or decrease with the changes in output. For example, rent, insurance of factory building etc., remain the same for different levels of production. A fixed cost can be depicted graphically as follows,



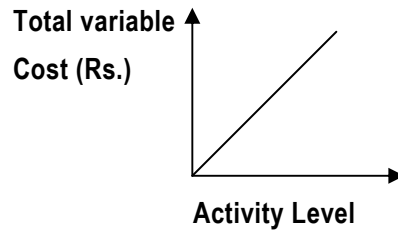
The graph shows that the cost is constant (Rs.1,000) for all activity levels. However, it should be noted that this is only true for a relevant range of activity. Fixed costs tend to change beyond the relevant range. Such cost behaviour pattern is described as a stepped fixed cost:



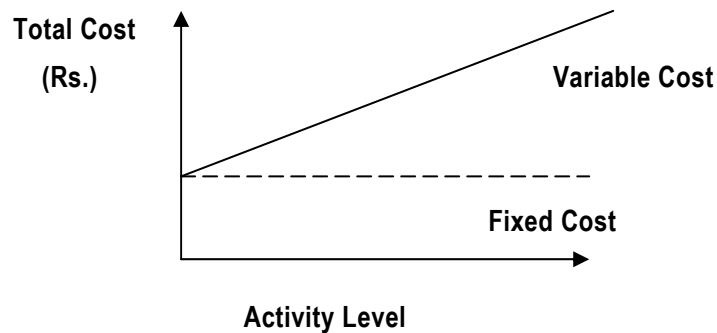


Cost Accounting

- (b) *Variable costs* - These costs tend to vary with the volume of activity. Any increase in the activity results in an increase in the variable cost and vice-versa. For example, cost of direct labour, etc. Variable costs are depicted graphically as follows,



- (c) *Semi-variable costs* - These costs contain both fixed and variable components and are thus partly affected by fluctuations in the level of activity. Examples of semi variable costs are telephone bills, gas and electricity etc. Such costs are depicted graphically as follows:



Methods of segregating Semi-variable costs into fixed and variable costs - The segregation of semi-variable costs into fixed and variable costs can be carried out by using the following methods:

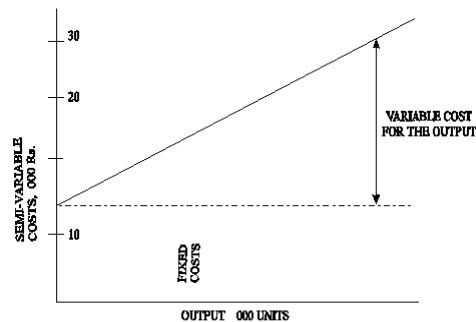
- (a) Graphical method
- (b) High points and low points method
- (c) Analytical method
- (d) Comparison by period or level of activity method
- (e) Least squares method

(a) *Graphical method*: Under this method, a large number of observations regarding the total costs at different levels of output are plotted on a graph with the output on the X-axis and the total cost on the Y-axis. Then, by judgment, a line of "best-fit", which passes through all or most of the points is drawn. The point at which this line cuts the Y-axis indicates the total fixed



Basic Concept

cost component in the total cost. If a line is drawn at this point parallel to the X-axis, this indicates the fixed cost. The variable cost, at any level of output, is derived by deducting this fixed cost element from the total cost. The following graph illustrates this:



(b) *High points and low points method:* - Under this method in the following illustration the difference between the total cost at highest and lowest volume is divided by the difference between the sales value at the highest and lowest volume. The quotient thus obtained gives us the rate of variable cost in relation to sales value. The fixed cost is the remainder. See the following illustration.

Illustration :

	Sales value	Total cost
	Rs.	Rs.
At the Highest volume	1,40,000	72,000
At the Lowest volume	<u>80,000</u>	<u>60,000</u>
	<u>60,000</u>	<u>12,000</u>

Thus, Variable Cost (Rs. 12,000/Rs. 60,000) = 1/5 or 20% of sales value

= Rs. 28,000 (at highest volume)

Fixed Cost : Rs. 72,000 – Rs. 28,000 *i.e.*, (20% of Rs. 1,40,000) = Rs. 44,000.

Alternatively : Rs. 60,000 – Rs. 16,000 (20% of Rs. 80,000) = Rs. 44,000.

(c) *Analytical method:* Under this method an experienced cost accountant tries to judge empirically what proportion of the semi-variable cost would be variable and what would be fixed. The degree of variability is ascertained for each item of semi-variable expenses. For example, some semi-variable expenses may vary to the extent of 20% while others may vary to the extent of 80%. Although it is very difficult to estimate the extent of variability of an expense, the method is easy to apply. (Go through the following illustration for clarity).



Cost Accounting

Illustration

Suppose, last month the total semi-variable expenses amounted to Rs. 3,000. If the degree of variability is assumed to be 70%, then variable cost = 70% of Rs. 3,000 = Rs. 2,100. Fixed cost = Rs. 3,000 – Rs. 2,100 = Rs. 900.

Now in the future months, the fixed cost will remain constant, but the variable cost will vary according to the change in production volume. Thus, if in the next month production increases by 50%, the total semi-variable expenses will be:

Fixed cost of Rs. 900, *plus* variable cost *viz.*, Rs. 3,150 *i.e.*, (Rs. 2,100(V.C.) *plus* 50% increase of V.C. *i.e.*, Rs. 1,050) *i.e.*, Rs. 4,050.

(d) *Comparison by period or level of activity method* - Under this method, the variable overhead may be determined by comparing two levels of output with the amount of expenses at those levels. Since the fixed element does not change, the variable element may be ascertained with the help of the following formula.

$$\frac{\text{Change in the amount of expense}}{\text{Change in the quantity of output}}$$

Suppose the following information is available:

	<i>Production Units</i>	<i>Semi-variable expenses</i>
		Rs.
January	100	260
February	<u>140</u>	<u>300</u>
Difference	<u>40</u>	<u>40</u>

The variable cost :

$$\frac{\text{Change in Semi- variable expenses}}{\text{Change in production volume}} = \frac{\text{Rs. 40}}{40 \text{ units}} = \text{Re. 1/unit}$$

Thus, in January, the variable cost will be 100 × Re. 1 = Rs. 100 and the fixed cost element will be (Rs. 260 – Rs. 100) or Rs. 160. In February, the variable cost will be 140 × Re. 1 = Rs. 140 whereas the fixed cost element will remain the same, *i.e.*, Rs. 160.

(e) *Least squared method* : This is the best method to segregate semi-variable costs into its fixed and variable components. This is a statistical method and is based on finding out a line of best fit for a number of observations. The method uses the linear equation $y = mx + c$, where m represents the variable element of cost per unit, ' c ' represents the total fixed cost, ' y ' represents the total cost, ' x ' represents the volume of output. The total cost is thus split into its



Basic Concept

fixed and variable elements by solving this equation. By using this method, the expenditure against an item is determined at various levels of output and values of x and y are fitted in the above formula to find out the values of m and c . The following illustration may be helpful to understand this method.

	Level of activity	
Capacity %	60%	80%
Volume (Labour hours) x	150	200
Semi-variable expenses (maintenance of plant) y	Rs. 1,200	Rs. 1,275

Substituting the values of x and y in the equation, $y = mx + c$, at both the levels of activity, we get

$$1,200 = 150m + c$$

$$1,275 = 200m + c$$

On solving the above equation, we get

(c) (Fixed cost) = Rs. 975 and m (Variable cost) = Rs. 1.50 per labour hour.

Advantages of Classification of Costs into Fixed and Variable: The primary objective of segregating semi-variable expenses into fixed and variable is to ascertain marginal costs. Besides this, it has the following advantages also.

(a) *Controlling expenses:* The classification of expenses into fixed and variable components helps in controlling expenses. Fixed costs are generally policy costs, which cannot be easily reduced. They are incurred irrespective of the output and hence are more or less non controllable. Variable expenses vary with the volume of activity and the responsibility for incurring such an expenditure is determined in relation to the output. The management can control these costs by giving proper allowances in accordance with the output achieved.

(b) *Preparation of budget estimates:* The segregation of overheads into fixed and variable part helps in the preparation of flexible budget. It enables a firm to estimate costs at different levels of activity and make comparison with the actual expenses incurred.

Suppose in October, 2006 the output of a factory was 1,000 units and the expenses were:

	Rs.
Fixed	5,000
Variable	4,000
Semi-variable (40% fixed)	<u>6,000</u>
	<u>15,000</u>



Cost Accounting

In November, 2006 the output was likely to increase to 1,200 units. In that case the budget or estimate of expenses will be :

	Rs.
<i>Fixed</i>	5,000
<i>Variable</i>	4,800
$\left(\frac{\text{Rs.4,000} \times 1,200 \text{ units}}{1,000 \text{ units}} \right)$	
<i>Semi-variable</i>	
Fixed, 40% of Rs. 6,000	2,400
Variable: $\left[\frac{\text{Rs.3,600} \times 1,200 \text{ units}}{1,000 \text{ units}} \right]$	4,320
	<u>16,520</u>

It would be a mistake to think that with the output going up from 1,000 units to 1,200 units the expenses would increase proportionately to Rs. 18,000.

(c) *Decision making*: The segregation of semi variable cost between fixed and variable overhead also helps the management to take many important decisions. For example, decisions regarding the price to be charged during depression or recession or for export market. Likewise, decisions on make or buy, shut down or continue, etc., are also taken after separating fixed costs from variable costs. In fact, when any change is contemplated, say, increase or decrease in production, change in the process of manufacture or distribution, it is necessary to know the total effect on cost (or revenue) and that would be impossible without a correct segregation of fixed and variable costs. The technique of marginal costing, cost volume profit relationship and break-even analysis are all based on such segregation.

1.11.5 By Controllability - Costs here may be classified into controllable and uncontrollable costs.

(a) *Controllable costs* - These are the costs which can be influenced by the action of a specified member of an undertaking. A business organisation is usually divided into a number of responsibility centres and an executive heads each such centre. Controllable costs incurred in a particular responsibility centre can be influenced by the action of the executive heading that responsibility centre. Direct costs comprising direct labour, direct material, direct expenses and some of the overheads are generally controllable by the shop level management.



(b) *Uncontrollable costs* - Costs which cannot be influenced by the action of a specified member of an undertaking are known as uncontrollable costs. For example, expenditure incurred by, say, the Tool Room is controllable by the foreman in charge of that section but the share of the tool-room expenditure which is apportioned to a machine shop is not to be controlled by the machine shop foreman.

The distinction between controllable and uncontrollable costs is not very sharp and is sometimes left to individual judgement. In fact no cost is uncontrollable; it is only in relation to a particular individual that we may specify a particular cost to be either controllable or uncontrollable.

1.11.6 By Normality - According to this basis cost may be categorised as follows:

- (a) *Normal cost* - It is the cost which is normally incurred at a given level of output under the conditions in which that level of output is normally attained.
- (b) *Abnormal cost* - It is the cost which is not normally incurred at a given level of output in the conditions in which that level of output is normally attained. It is charged to Costing Profit and loss Account.

1.12 CODING SYSTEMS

Codes

The Chartered Institute of Management Accountants has defined a code as “ a system of symbols designed to be applied to a classified set of items to give a brief account reference , facilitating entry collation and analysis”

Hence cost classification forms the basis of any cost coding. It helps us understand the characteristic of any cost through a short symbolised form.

Composite Codes

Let us consider the following example

A company has devised a system of codification in which the first three digits indicate the nature of the expenditure and the last three digits the cost centre or cost unit to be charged e.g. if the first digit is 1, the system implies that it refers to raw material and if the number is 2 it represents a labour cost. The second and third numbers relating to 1 i.e., raw material, provide details of the type e.g., whether the raw material is an electronic component (number 4), mechanical component (number 1) consumables(number 2) or packing (number 3) and the name respectively. Hence the description of a cost with a code 146.729 shall be understood as follows:

- ◆ Since the first number is 1 the cost refers to raw material cost



Cost Accounting

- ◆ The second number being 4 indicates that the raw material is an electronic component.
- ◆ The third number 6 refers to the description which according to the company's codification refers to Diodes.

The last three numbers provide details of the cost centre e.g. the first number provides details of the location of the plant, the second number gives detail of the department (machining or assembly or something else) and the third number indicates whether the cost is direct or indirect.

Advantages of a coding system

The following are some of the advantages of a well-designed coding system :

- (a) Since the code is, most of the times, briefer than a description, it saves time when systems are worked upon manually and in case the system is computerised it reduces the data storage capacity. The illustration above demonstrates this advantage very clearly.
- (b) A code helps in reducing ambiguity. In case two professionals understand the same item differently a code will help them objectively.
- (c) Unlike detailed descriptions, a code facilitates data processing in computerised systems.

The requirements for an efficient coding system

- (a) Every number used in the code should be unique and certain, i.e. it should be easily identified from the structure of the code.
- (b) Elasticity and comprehensiveness is an absolute must for a well designed coding system. It should be possible to identify a code for every item and the coding system should be capable of expanding to accommodate new items.
- (c) The code should be brief and meaningful.
- (d) The maintenance of the coding system should be centrally controlled. It should not be possible for individuals to independently add new codes to the existing coding system.
- (e) Codification systems should be of the same length. This makes errors easier to spot and it assists computerised data processing.

1.13 TYPES OF COSTING

For ascertaining cost, following types of costing are usually used.

1.13.1 Uniform Costing: When a number of firms in an industry agree among themselves to follow the same system of costing in detail, adopting common terminology for various items and processes they are said to follow a system of uniform costing. In such a case, a



comparison of the performance of each of the firms can be made with that of another, or with the average performance in the industry. Under such a system it is also possible to determine the cost of production of goods which is true for the industry as a whole. It is found useful when tax-relief or protection is sought from the Government.

1.13.2 Marginal Costing: It is defined as the ascertainment of marginal cost by differentiating between fixed and variable costs. It is used to ascertain effect of changes in volume or type of output on profit.

1.13.3 Standard Costing and variance analysis: It is the name given to the technique whereby standard costs are pre-determined and subsequently compared with the recorded actual costs. It is thus a technique of cost ascertainment and cost control. This technique may be used in conjunction with any method of costing. However, it is especially suitable where the manufacturing method involves production of standardised goods of repetitive nature.

1.13.4 Historical Costing: It is the ascertainment of costs after they have been incurred. This type of costing has limited utility.

1.13.5 Direct Costing: It is the practice of charging all direct costs to operations, processes or products leaving all indirect costs to be written off against profits in which they arise.

1.13.6 Absorption Costing: It is the practice of charging all costs, both variable and fixed to operations, processes or products. This differs from marginal costing where fixed costs are excluded.

1.14 METHODS OF COSTING

Different industries follow different methods of costing because of the differences in the nature of their work. The various methods of costing are as follows:

1.14.1 Job Costing: In this case the cost of each job is ascertained separately. It is suitable in all cases where work is undertaken on receiving a customer's order like a printing press, motor workshop, etc. In case a factory produces a certain quantity of a part at a time, say 5,000 rims of bicycle, the cost can be ascertained like that of a job. The name then given is Batch Costing.

1.14.2 Batch Costing: It is the extension of job costing. A batch may represent a number of small orders passed through the factory in batch. Each batch here is treated as a unit of cost and thus separately costed. Here cost per unit is determined by dividing the cost of the batch by the number of units produced in the batch.

1.14.3 Contract Costing : Here the cost of each contract is ascertained separately. It is suitable for firms engaged in the construction of bridges, roads, buildings etc.



1.14.4 Single or Output Costing : Here the cost of a product is ascertained, the product being the only one produced like bricks, coals, etc.

1.14.5 Process Costing : Here the cost of completing each stage of work is ascertained, like cost of making pulp and cost of making paper from pulp. In mechanical operations, the cost of each operation may be ascertained separately ; the name given is operation costing.

1.14.6 Operating Costing : It is used in the case of concerns rendering services like transport, supply of water, retail trade etc.

1.14.7 Multiple Costing : It is a combination of two or more methods of costing outlined above. Suppose a firm manufactures bicycles including its components; the parts will be costed by the system of job or batch costing but the cost of assembling the bicycle will be computed by the Single or output costing method. The whole system of costing is known as multiple costing.

1.15. DIRECT EXPENSES

1.15.1. Meaning of Direct Expenses : Direct Expenses are also termed as 'Chargeable expenses'. These are the expenses which can be allocated directly to a cost object. Direct expenses are defined as 'costs other than material and wages which are incurred for a specific product or saleable services'.

Examples of direct expenses are :

- (i) Hire charges of special machinery or plant for a particular production order or job.
- (ii) Payment of royalties.
- (iii) Cost of special moulds, designs and patterns.
- (iv) Experimental costs before undertaking the job concerned.
- (v) Travelling and conveyance expenses incurred in connection with a particular job.
- (vi) Sub-contracting expenses or outside work costs if jobs are sent out for special processing.

1.15.2 Characteristics of Direct Expenses :

- (i) Direct expenses are those expenses, which are other than the direct materials and direct labour.
- (ii) These expenses are either allocated or charged completely to cost centres or work orders.
- (iii) These expenses are included in prime cost of a product.



The nature of direct expenses demands a strict control over such expenses. This feature of controlling direct expenses in business houses compels their management to treat some of the direct expenses as indirect expense. Sometime a direct expense is assumed as indirect due to the convenience. Sometimes a concern may treat an expense as direct whereas another may treat the same expense as indirect. Further the amount of these expenses in proportion to the total cost also influences the decision to treat them as direct expense or as an indirect expense.

1.15.3 Sub-contracting : It is a common business practice followed by business concerns, under which operations requiring special processing are sub-contracted. Examples of such operations are painting, cutting, stitching etc. This is done due to following reasons :

- (i) The operations, which are given to outside sub-contractors, are those operations, which require the use of special skill, or special equipment, which is not available with the concern.
- (ii) If the management of a concern intends to engage available labour hours and machine hours for operations, which require special skill or special facility available with the concern, the operations, which require a lower level of skill or general-purpose machine, are given to outsider.
- (iii) If there is temporary increase in demand of product of a concern, some of the operations are given to outsiders to bridge the imbalance between the production capacities available with various work-centres. The payments made to sub-contractors or outsiders are charged as direct expenses of the specific jobs/work orders.

1.15.4. Documentation: The basic document which is used for the charging of direct expenses to products or batches or work order is the invoice received from suppliers of such service. The payment to supplier of service is made on the basis of invoice & expenses are booked in financial accounts.

For example, hiring charges of a machine is charged to the product for which it is hired on the basis of invoice received from supplier of machinery.

1.15.5. Identification of direct expenses with main product or service: For the identification of direct expense with main product or service it is required that the code number of product or service should be inscribed on invoice received from supplier of services.

For example, if a machine is hired to complete a particular product, then the hiring charging of a machine is direct expense of the particular product. For charging hiring charges of machine to a particular product it is required that the invoice received from supplier of machine should be coded with the product code for ensuring that the hiring charges of machine is charged to the particular product. Alternatively, if cash is paid, then the cash book analysis will show the product code which is to be charged with the cost of hiring machinery.



1.16 Self Examination Questions

Multiple Choice Questions

- (a) The main purpose of cost accounting is to :
- (i) maximise profits;
 - (ii) help in inventory valuation;
 - (iii) provide information to management for decision making;
 - (iv) aid in the fixation of selling price.
- (b) One of the most important tools in cost planning is :
- (i) direct cost;
 - (ii) budget;
 - (iii) cost sheet;
 - (iv) marginal costing.
- (c) Increase in total variable cost is due to :
- (i) increase in fixed cost;
 - (ii) increase in sales;
 - (iii) increase in production.
- (d) An example of fixed cost is :
- (i) direct material cost;
 - (ii) works manager's salary;
 - (iii) depreciation of machinery;
 - (iv) chargeable expenses.
- (e) Cost of goods produced includes :
- (i) production cost and finished goods inventory;
 - (ii) production cost and work-in-progress;
 - (iii) production cost, work-in-progress and finished goods inventory.
- (f) Conversion cost is equal to the total of :
- (i) material cost and direct wages;
 - (ii) material cost and indirect wages;
 - (iii) direct wages and factory overhead;
 - (iv) material cost and factory overhead.
- (g) Costs which are ascertained after they have been incurred are known as
- (i) imputed costs;



- (ii) sunk costs;
 - (iii) historical costs;
 - (iv) opportunity costs.
- (h) Prime costs plus variable overhead is known as :
- (i) production cost;
 - (ii) marginal costs;
 - (iii) total cost;
 - (iv) cost of sales.
- (i) Indirect costs are known as:
- (i) Variable costs;
 - (ii) Fixed costs;
 - (iii) Overheads;
 - (iv) None of the above.
- (j) Accounting standard 2 recommends the valuation of inventory on:
- (i) Absorption costing;
 - (ii) Marginal costing;
 - (iii) Activity based costing;
 - (iv) None of the above.
- (k) If Rs 10 is spend on producing 10 units and Rs 15 for producing 15, then the fixed cost per unit is:
- (i) Rs 0;
 - (ii) Rs 1;
 - (iii) Rs 2;
 - (iv) None of the above.
- (l) The variable cost per unit is:
- (i) Variable in nature;
 - (ii) Fixed in nature;
 - (iii) Semivariable in nature;
 - (iv) None of the above.
- (m) The total cost for producing 10 items is Rs 15 and that for producing 15 items is Rs 20. What is the fixed cost?
- (i) Rs 10;
 - (ii) Rs 15;



Cost Accounting

- (iii) Rs 5;
(iv) None of the above.
- (n) A company presently does not utilise its available capacity. In case of full capacity utilisation, the cost per unit shall
- (i) Increase;
(ii) Decrease;
(iii) Remain constant;
(iv) None of the above.
- (o) The following extract is taken from the distribution cost budget of DC Ltd.
- | | | |
|--------------------------|-----------|------------|
| Volume delivered (units) | 8,000 | 14,000 |
| Distribution cost | Rs. 7,200 | Rs. 10,500 |
- The budgeted cost allowance for distribution cost for a delivery volume of 12,000 units is
- (i) Rs. 6,600
(ii) Rs. 9,000
(iii) Rs. 9,400
(iv) Rs. 10,800

Answers to Multiple Choice Questions

- (a) iii; (b) ii; (c) iii; (d) ii; (e) ii; (f) iii; (g) iii; (h) ii; (i) iii; (j) i; (k) i; (l) ii; (m) iii; (n) ii;
(o) iii

Short Answer Type Questions

1. What is Cost Accounting? Explain its important objectives.
2. Write short note on:
 - (i) Conversion cost.
 - (ii) Sunk cost.
 - (iii) Differential cost.
 - (iv) Opportunity cost.
 - (v) Out of pocket cost.
3. Distinguish between:
 - (i) Cost centre and cost unit.
 - (ii) Cost control and cost reduction.
 - (iii) Period cost and product cost.
 - (iv) Controllable and non-controllable costs.
 - (v) Estimated cost and standard cost.



- (vi) Variable cost and direct cost.
4. Write brief answers to the following :
- (a) While introducing a cost accounting system, to what should most attention be paid- production or sales ?
 - (b) Are direct expenses more important than indirect expenses ?
 - (c) Is prompt reporting better than accurate reporting ?
 - (d) If the selling price for a product is not within the control of the firm, why should it have a system of cost accounting ?
5. Below is given a list of industries and also the methods of costing and cost unit. Give the correct number of methods of costing and unit of cost against each industry.
- | <i>Industry</i> | <i>Methods of Costing</i> | <i>Unit of Cost</i> |
|---|---------------------------|----------------------------|
| (i) Nursing Home | (a) Process | 1. Each job |
| (ii) Road Transport | (b) Job | 2. Bed per week or per day |
| (iii) Steel (owning iron ore mines) | (c) Multiple | 3. Per tonne |
| | (d) Single | 4. Each contract |
| (iv) Coal | (e) Operating | 5. Each unit |
| (v) Bicycle | (f) Contract | 6. Per tonne-kilo-metre |
| (vi) Bridge construction | | |
| (vii) Interior decoration | | |
| (viii) Advertising | | |
| (ix) Furniture | | |
| (x) Sugar company having own sugarcane fields | | |
6. A company manufacturing garments. The following costs are incurred by the company. You are required to group the costs which are listed below into following classifications:
- (a) direct materials
 - (b) direct labour
 - (c) direct expenses
 - (d) indirect production overhead
 - (e) research and development cost
 - (f) selling & distribution cost
 - (g) administration costs
 - (h) finance costs.
 - (i) Lubricant for sewing machines



Cost Accounting

- (ii) Floppy disk for general office computer
- (iii) Maintenance contract for office photocopying machine
- (iv) Road licence for delivery vehicle
- (v) Market research prior to new product launch
- (vi) Cost of painting advertising slogans in delivery vans
- (vii) Trade magazine
- (viii) Upkeep of delivery vehicles
- (ix) Wages of operative in cutting department
- (x) Interest on bank overdraft

Answers to Short Answer Type Questions.

5. (i) e, 2 (ii) e, 6 (iii) a, 3 (iv) d, 3 (v) c, 5 (vi) f, 4 (vii) b, 1 (viii) b, 1 (ix) c, 5 (x) a, 3.
6. (a) nil (b) ix (c) nil (d) i (e) v (f) iv, vi, viii (g) ii, iii (h) x.

Long Answer Type Questions

1. State and explain the differences between Financial Accounting, Cost Accounting and Management Accounting.
2. What do you understand by direct expenses? What are their characteristics?
3. Discuss the factors which a Cost Accountant should consider before installing a costing system in a manufacturing concern.
4. Discuss the various methods known to you which may be utilised for segregating a semi variable cost into its fixed and variable component.
5. How is Cost Accounting important to business concerns? Discuss.

CHAPTER 2

MATERIAL

Learning Objectives

When you have finished studying this chapter, you should be able to

- ◆ Understand the need and importance of material control.
- ◆ Describe the procedures involved in procuring, storing and issuing material.
- ◆ Differentiate amongst the various methods of valuing material.
- ◆ Understand the meaning and the accounting treatment for normal and abnormal loss of material.
- ◆ Understand the meaning and the accounting treatment of waste, scrap, spoilage and defectives.

2.1 INTRODUCTION

We have acquired a basic knowledge about the concepts, objectives, advantages, methods and elements of cost. We shall now study each element of cost separately. The first element of cost is "Direct Material Cost".

Materials constitute a very significant proportion of total cost of finished product in most of the manufacturing industries. A proper recording and control over the material costs is essential because of the following :

- (a) The exact quality of specification of materials required should be determined according to the required quality of the finished product. If too superior quality of material is purchased, it would mean higher cost due to high prices; if the quality of materials purchased is too low, the product will be of inferior quality.
- (b) The price paid should be the minimum possible otherwise the higher cost of the finished products would make the product uncompetitive in the market.
- (c) There should be no interruption in the production process for want of materials and stores, including small inexpensive items like lubricating oil for a machine. Sometime their out of stock situation may lead to stoppage of machines.



- (d) There should be no over stocking of materials because that would result in loss of interest charges, higher godown charges, deterioration in quality and losses due to obsolescence (either due to manufacture of certain articles being given up or the material previously required for the production not being required any longer due to a change in methods of production).
- (e) Wastage and losses while the materials are in store should be avoided as far as possible; and
- (f) Wastage during the process of manufacture should be the minimum possible.

It may also be added that information about availability of materials and stores should be continuously available so that production may be planned properly and the required materials purchased in time.

2.2 MATERIAL CONTROL

The publication of the Institute of Cost and Management Accountants on Budgetary Control defines it as “the function of ensuring that sufficient goods are retained in stock to meet all requirements without carrying unnecessarily large stocks”. When the functions of indexing buying, receiving, inspection, storing and paying of the goods are separated it is essential that these should be properly co-ordinated so as to achieve the advantages of specialisation.

2.2.1 Objectives of system of material control : The objectives of a system of material control are the following :

- (i) Ensuring that no activity, particularly production, suffers from interruption for want of materials and stores-it should be noted that this requires constant availability of every item that may be needed howsoever small its cost may be. Lubricating oil may cost much less than the main raw material but, from the point of view of uninterrupted production, both have equal importance.
- (ii) Seeing to it that all the materials and stores are acquired at the lowest possible price considering the quality that is required and considering other relevant factors like reliability in respect of delivery, etc.
- (iii) Minimisation of the total cost involved, both for acquiring stocks (apart from the price paid to the supplier) and for holding them.
- (iv) Avoidance of unnecessary losses and wastages that may arise from deterioration in quality due to defective or long storage or from obsolescence. It may be noted that losses and wastages in the process of manufacture, concern the production department.



- (v) Maintenance of proper records to ensure that reliable information is available for all items of materials and stores that not only helps in detecting losses and pilferages but also facilitates proper production planning.

The fulfilment of the objectives mentioned above will require that standard lists of all the materials and stores required for the firm's work be drawn up with the weekly consumption figures. Also the lead time for each item has to be determined which will then enable the firm to ascertain the minimum quantity for each items. It is also necessary to fix maximum quantity so that capital is not locked up unnecessarily and the risk of obsolescence is minimised. Costs are minimised through the use of ABC analysis (which means classification of the various items on the basis of investment involved into three categories, viz., A, B and C.)

2.2.2 Requirements of material control - Material control requirements are as follows:—

1. Proper co-ordination of all departments involved viz., finance, purchasing, receiving, inspection, storage, accounting and payment.
2. Determining purchase procedure to see that purchases are made, after making suitable enquiries, at the most favourable terms to the firm.
3. Use of standard forms for placing the order, noting receipt of goods, authorising issue of the materials etc.
4. Preparation of budgets concerning materials, supplies and equipment to ensure economy in purchasing and use of materials.
5. Operation of a system of internal check so that all transactions involving materials, supplies and equipment purchases are properly approved and automatically checked.
6. Storage of all materials and supplies in a well designated location with proper safeguards.
7. Operation of a system of perpetual inventory together with continuous stock checking so that it is possible to determine at any time the amount and value of each kind of material in stock.
8. Operation of a system of stores control and issue so that there will be delivery of materials upon requisition to departments in the right amount at the time they are needed.
9. Development of system of controlling accounts and subsidiary records which exhibit summary and detailed material costs at the stage of material receipt and consumption.



10. Regular reports of materials purchased, issue from stock, inventory balances, obsolete stock, goods returned to vendors, and spoiled or defective units.

2.3 MATERIALS PROCUREMENT PROCEDURE

If a concern can afford it, there should be a separate purchase department for all purchases to be made on behalf of all other departments. Purchasing should be centralised *i.e.* all purchases should be done by the purchasing department except for small purchases which may be done by the user's department. What is needed is that there should be staff wholly devoted to purchasing. Such a staff is bound to become expert in the various matters to be attended to, for examples— units of materials to be purchased and licences to be obtained, transport, sources of supply, probable price etc. The concerned officers in this department keep themselves in constant touch with the markets either by reading various trade magazines or by direct association, to have the latest information.

If a concern has a number of factories requiring the same material and stores, there will be advantage in centralising purchases since important economies in prices and even transport may be obtained by placing large orders at a time. In such a case inspection at a source may also be possible. Of course, there will be a little delay in supply because of clerical processes and sometimes, there may be a misunderstanding resulting in supply of wrong articles.

However, there is no advantage in centralised purchasing if different materials, and stores are required by different plants.

Materials purchase department in a business house is confronted with the following issues:

- (i) What to purchase ?
- (ii) When to purchase ?
- (iii) How much to purchase ?
- (iv) From where to purchase.
- (v) At what price to purchase.

To overcome the above listed issues, the purchase department follows the procedure involving following steps :

1. Receiving purchase requisitions.
2. Exploring the sources of materials supply and selecting suitable material suppliers.



3. Preparation and execution of purchase orders.
4. Receipt and inspection of materials.
5. Checking and passing of bills for payment.

2.3.1 Receiving purchase requisitions - Since the materials and stores purchased will be used by the production departments, there should be constant co-ordination between the purchase and production departments.

A purchase requisition is a form used for making a formal request to the purchasing department to purchase materials. This form is usually filled up by the store keeper for regular materials and by the departmental head for special materials (not stocked as regular items). The requisition form is duly signed by either works manager or plant superintendent, in addition to the one originating it.

At the beginning a complete list of materials and stores required should be drawn up, the list should have weekly consumption figures. It should be gone through periodically so that necessary deletion and addition may be made. If there is any change in the rate of consumption per week (say, due to extra shift being worked), the purchase department should be informed about the new figures. Once an item has been included in the standard list, it becomes the duty of the purchase department to arrange for fresh supplies before existing stocks are exhausted. But if the production department requires some new material, it should make out an indent well in time and send it to the purchase department for necessary action.

Control over buying - For control over buying of regular stores materials it is necessary to determine their maximum, minimum, reorder level and economic order quantities. The use of economic order quantities and various levels constitutes an adequate safeguard against improper indenting of regular materials. In respect of special materials, required for a special order or purpose, it is desirable that the technical department concerned should prepare materials specifications list specifying the quantity, size and order specifications of materials to be drawn from the store and those to be specially procured.

In all cases, the starting point in the process for purchasing is the issue of a proper purchase requisition (form is given below). (Students may note that the forms suggested in this booklet as well as in the text books are illustrative in nature. The actual form may differ under different circumstances). It may originate either in the stores department in connection with regular stock of materials or in the production planning or in other technical departments concerned in respect of special materials. Its purpose is to request and authorise the purchase department to order to procure the materials specified in



Cost Accounting

stated quantities. It should be made out in triplicate. The original copy is sent to the purchasing department, the duplicate is kept by the storekeeper or the department which initiates the requisition and the triplicate is sent to the authorising executive.

Purchase Requisition (Regular/Special)

(Use a separate form for each item)

No..... Department.....
Date.....
Purchase..... Date by which material required.....

Description of Materials required	Quantity required	Exact specification
--------------------------------------	----------------------	---------------------

.....
Indentor

For use in purchase department

Firm	1.	2.	3.	Order No. & Date.....
Quotations			With.....
Price (including charges)			Price.....
Date of Delivery			Date of dly.....
Remarks	Purchase Manager			



A specimen form of purchase requisition for reordering regular stock items.

Purchase Requisition

No.					Date
S.No.	Name of article	Present stock	Minimum stock	Maximum stock	Remarks

Remarks
 Purchase manager Stores Ledger Clerk

2.3.2 Exploring the sources of materials supply and selecting suitable material suppliers:

A source for the supply of each material may be selected after the receipt of the purchase requisition. Purchase department in each business house usually maintains a list of suppliers for each group of materials, required by their concern. Atleast three quotations are invited from such suppliers. On the receipt of these quotations a comparative statement is prepared. For selecting material suppliers the factors which the purchase department keeps in its mind are—price; quantity; quality offered; time of delivery; mode of transportation; terms of payment; reputation of supplier; etc. In addition to the above listed factors purchase manager obtains the necessary information from the statement of quotations; past records, buyer guides etc. for finally selecting material suppliers.

2.3.3 Preparation and execution of purchase orders :

Having decided on the best quotation that should be accepted, the purchase manager or concerned officer proceeds to issue the formal purchase order. It is a written request to the supplier to supply certain specified materials at specified rates and within a specified period.

Copies of purchase order are sent to :

- (i) The supplier;
- (ii) Store or the order indenting department;
- (iii) Receiving department; and
- (iv) Accounting department.

A copy of the purchase order, alongwith relevant purchase requisitions, is held in the file



Cost Accounting

of the department to facilitate the follow-up, of the delivery and also for approving the invoice for payment.

2.3.4 Receipt and inspection of materials: Under every system of stores organisation, a distinction is made between the function of receiving and storing, so that each acts as a check on the other.

The receiving department or section is responsible for taking charge of the incoming materials, checking and verifying their quantities, inspecting them as regards their grade, quality or other technical specifications and if found acceptable, passing them on to the stores (or other departments for which these might have been purchased). In large organisation, a special inspection wing is often attached to the receiving department and, where it is not so, technical appraisal of the incoming supplies is carried out by the general inspecting staff. In case the quality is not the same as ordered, the goods are not accepted. If everything is in order and the supply is considered suitable for acceptance, the Receiving department prepares a Receiving Report or Material Inward Note or Goods Received Note. It is prepared in quadruplicate, the copies being distributed as under :

- (i) First copy is sent to the Purchase Department for verifying supplier's bill for payment.
- (ii) Second copy is sent to the store or the department that indents the material.
- (iii) Third copy is sent to the stores ledger clerk in the Cost Department.
- (iv) Fourth and the last copy is retained for use by the receiving department.

A good plan would be that the receiving clerk sends all the three copies (meant for others) along with the materials to the store or the department that placed the order. The materials are then physically inspected and the particulars thereof as recorded in the Receiving Report are verified. If the quantity and quality are in order, the delivery of the same is accepted and copies of the report are signed; two copies of the report are forwarded to the Purchase Department and the third is kept on the file as documentary evidence of the quantities of stores received for storage or use, as the case may be. The Purchase Department in turn, enters the purchase price and forwards one copy to the Accounts Department and the second to the Cost Department. A specimen form of the receiving report is given below:



Material

Goods Received Note

Received from.....

No.

Order No.

Date.....

Quantity	Code	Description	Amount			Remarks
			Amount due to supplier Rs.	Charges Rs.	Total Rs.	

Inspector.....

Store Keeper.....

Receiver.....

Store Ledger Clerk.....

Material outward return note - Sometimes materials have to be returned to suppliers after these have been received in the factory. Such returns may occur before or after the preparation of the receiving report. If the return takes place before the preparation of the receiving report, such material obviously would not be included in the report and hence not debited in the stores books and ledgers. In that case, no adjustment in the account books would be necessary. But if the material is returned after its entry in the receiving report, a suitable document must be drawn up in support of the credit entry so as to exclude from the Stores of Material Account the value of the materials returned back. This document usually takes the form of a Material outward return note.

The Material outward return note is drawn up by the Stores or the Despatch Department. Five copies of it are usually prepared; two for the supplier (one of which is to be sent back by the supplier after he has signed the same), one for Store, one for Cost (stores) Ledger and one copy to be retained in the Material outward return book. (Please draw up the form yourself and then see the text book).

2.3.5 Checking and passing of bills for payment : The invoice received from the supplier is sent to the stores accounting section to check authenticity and mathematical accuracy. The quantity and price are also checked with reference to goods received note and the purchase order respectively. The stores accounting section after checking its accuracy finally certifies and passes the invoice for payment. In this way the payment is made to supplier.



2.4 MATERIAL ISSUE PROCEDURE

Issue of material must not be made except under properly authorised requisition slip; usually it is the foreman of a department who has the authority to draw materials from the store. Issue of material must be made on the basis of first in first out, that is, out of the earliest lot on hand. If care is not exercised in this regard, quality of earliest lot of material may deteriorate for having been kept for a long period.

Material requisition note : It is the voucher of the authority as regards issue of materials for use in the factory or in any of its departments. Where a 'Materials List' has been prepared, either the whole of the materials would be withdrawn on its basis or separate materials requisitions would be prepared by the person or department and the material drawn upto the limit specified in the list. The Requisition Notes are made out in triplicate. The copies are distributed in the following manner :

- One copy for the Store-keeper.
- One copy for Cost department.
- One copy for the Department requiring it.

If no material list has been prepared, it is desirable that the task of the preparation of Material Requisition Notes be left to the Planning Department. If there is no Planning Department, (or although in existence, is unable to undertake this task), the Requisition Notes should be prepared by the person or department that requires the materials. Usually, a foreman's authority is enough but, in the case of costly materials, it would be desirable to have such requisitions duly approved by some higher authority, like the Superintendent or Works Manager before these are presented to Stores.

A specimen form of the Material Requisition is shown below:

Material Requisition Note

Work Order No.	No.															
Department	Date															
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"><i>Item No.</i></th> <th style="width: 40%;"><i>Particulars</i></th> <th style="width: 15%;"><i>Qty.</i></th> <th style="width: 15%;"><i>Rate</i></th> <th style="width: 15%;"><i>Amount</i></th> </tr> <tr> <td></td> <td></td> <td></td> <td style="text-align: center;"><i>Rs.</i></td> <td style="text-align: center;"><i>Rs.</i></td> </tr> </thead> <tbody> <tr> <td style="border-top: 1px solid black;">Store-keeper</td> <td style="border-top: 1px solid black;">Workman receiving the material</td> <td style="border-top: 1px solid black;"></td> <td style="border-top: 1px solid black;">Foreman</td> <td style="border-top: 1px solid black;">S.L. Clerk</td> </tr> </tbody> </table>		<i>Item No.</i>	<i>Particulars</i>	<i>Qty.</i>	<i>Rate</i>	<i>Amount</i>				<i>Rs.</i>	<i>Rs.</i>	Store-keeper	Workman receiving the material		Foreman	S.L. Clerk
<i>Item No.</i>	<i>Particulars</i>	<i>Qty.</i>	<i>Rate</i>	<i>Amount</i>												
			<i>Rs.</i>	<i>Rs.</i>												
Store-keeper	Workman receiving the material		Foreman	S.L. Clerk												

Bill of material : It is also known as Material Specification List or simply Material List. It is a schedule of standard quantities of materials required for any job or other unit of



production. A comprehensive Materials List should rigidly lay down the exact description and specifications of all materials required for a job or other unit of production and also required quantities so that if there is any deviation from the standard list, it can easily be detected. The materials List is prepared by the Engineering or Planning Department in a standard form. The number of copies prepared vary according to the requirement of each business, but four is the minimum number. A copy of it is usually sent to each of the following department :

- (i) Stores department.
- (ii) Cost Accounts Department.
- (iii) Production Control department.
- (iv) Engineering or Planning department.

The advantages of using "bill of material", by the above departments may be summed up as follows:—

Stores Department :

- 1. A bill of material serves as an important basis of preparing material purchase requisitions by stores department.
- 2. It acts as an authorisation for issuing total material requirement.
- 3. The clerical activity is reduced as the stores clerk issues the entire/part of the material requirement to the users if the details of material asked are present in the bill of materials.

Cost Accounts Department :

- 1. Bill of material, is used by Cost Accounts department for preparing an estimate/budget of material cost for the job/process/operation, it is meant.
- 2. It may be used as a device for controlling the excess cost of material used. This is done after determining material variances and ascertaining the reasons for their occurrence.

Production Control Department :

- 1. Bill of material, may be used by this department for controlling usage of materials.
- 2. Its usage saves time which otherwise would have been wasted for preparing separate requisitions of material.

Engineering or Planning department : As stated earlier this department prepares the materials list in a standard form. A copy of list is sent to stores, cost accounts and



Cost Accounting

production control department.

Proforma of Bill of Materials

Job No.	No.
Department authorised	Date

Sl. No.	Code No. or	Description	Qty.	Date of issue & Qty. issued	Rate Rs.	Amount Rs.
				Date Qty.		

Authorised by	Received by
Store Keeper's signature	Checked by
	Cost clerk

Transfer of material: The surplus material arising on a job or other units of production may sometime be unsuitable for transfer to Stores because of its bulk, heavy weight, brittleness or some such reason. It may, however, be possible to find some alternative use for such materials by transferring it to some other job instead of returning it to the Store Room.

It must be stressed that generally transfer of material from one job to another is irregular, if not improper, in so far it is not conducive to correct allocation and control of material cost of jobs or other units of production. It is only in the circumstances envisaged above that such direct transfer should be made, at the time of material transfer a material transfer note should be made in duplicate, the disposition of the copies of this note being as follows :

- One copy for the Cost Department, and
- One copy for the department making the transfer.

No copy is required for the Store as no entry in the stores records would be called for. The Cost Department would use its copy for the purpose of making the necessary entries in the cost ledger accounts for the jobs affected.

The form of the Material Transfer Note is shown below:



Material

Material Transfer Note

From Job No.

No.

To Job No.

Date

Item No.	Particulars	Rate Rs.	Amount Rs.
----------	-------------	-------------	---------------

Transferred by

Received by

Job Ledger Clerk

Return of material: Sometimes, it is not possible before hand to make any precise estimate of the material requirements or units of production. Besides, at times due to some technical or other difficulty, it is not practicable to measure exactly the quantity of material required by a department. In either case, material may have to be issued from stores in bulk, often in excess of the actual quantity required. Where such a condition exists, it is of the utmost importance from the point of view of materials control that any surplus material left over on the completion of a job should be promptly hand over to the storekeeper for safe and proper custody.

Unless this is done, the surplus material may be misappropriated or misapplied to some purpose, other than that for which it was intended. The material cost of the job against which the excess material was originally drawn in that case, would be overstated unless the job is given credit for the surplus arising thereon.

The surplus material, when it is returned to the storeroom, should be accompanied by a document known either as a Shop Credit Note or alternatively as a Stores Debit Note. This document should be made out, by the department returning the surplus material and it should be in triplicate to be used as follows:

One copy for the Store Room;

One copy for the Cost Department; and

One copy (book copy) for the department returning the surplus material.



Cost Accounting

The form of Shop Credit Note is given below:

Shop Credit Note

Job No.	No.			
Department	Date			
Item No.	Particulars	Qty.	Rate	Amount
Store-keeper	S.L. Clerk			Foreman of the Returning Department

2.5 MATERIAL STORAGE

Proper storing of materials is of primary importance. It is not enough only to purchase material of the required quality. If the purchased material subsequently deteriorates in quality because of bad storage, the loss is even more than what might arise from purchase of bad quality materials. Apart from preservation of quality, the store-keeper also must ensure safe custody of the material. It should be the function of store-keeper that the right quantity of materials always should be available in stock.

2.5.1 Duties of store keeper : These can be briefly set out as follows :

1. To exercise general control over all activities in Stores Department
2. To ensure safe keeping both as to quality and quantity of materials.
3. To maintain proper records.
4. To initiate purchase requisitions for the replacement of stock of all regular stores items whenever the stock level of any item of store approaches the minimum limit fixed in respect thereof.
5. To initiate action for stoppage of further purchasing when the stock level approaches the maximum limit.
6. To check and receive purchased materials forwarded by the receiving department and to arrange for the storage in appropriate places.
7. To reserve a particular material for a specific job when so required.
8. To issue materials only in required quantities against authorised requisition notes/material lists.



9. To check the book balances, with the actual physical stock at frequent intervals by way of internal control over wrong issues, pilferage, etc.

2.5.2 Minimising the cost of purchasing and store-keeping: There are two types of costs which are involved in making a purchase and keeping the goods in the store. For placing each order, a certain amount of labour is required and, therefore, it will involve a certain sum of money as cost. It should be noted that the cost of making a purchase not only includes the cost incurred by the purchasing department but it also includes the cost of receiving and inspecting the goods. These costs will naturally increase if the number of order is large; there can be saving if the number of orders is reduced. The other type of cost is concerned with keeping the goods in stock, it comprises the money invested, the loss which is likely to take place if the goods are kept, the expenses incurred on looking after the items etc. Larger the stock, higher will be this type of cost. In order to reduce this cost, it is necessary to bring down level of the stock. It may be noted that the number of orders can be cut down only, if the quantity of each order is increased, but if that is done, the average quantity on hand will increase and, therefore, interest and the cost of store keeping will be higher. It is necessary, therefore to have balance between those two costs and to keep total of the two at the minimum level. With this objective in view, the economic order quantity is worked out. But different items for stock have to be treated differently. The name given to such classification is the 'ABC' Analysis, or the Selective Inventory Control.

2.5.3 Different classes of stores: Broadly speaking, there are three classes of stores *viz.*, central or main stores, sub-stores and departmental stores. The central stores are the most common of all and in practice, factories generally have only a central store under the control of one store keeper. Such a store is centrally situated and is easily accessible to all departments. If receipts and issues of different items of stores are not large, and the various departments are close to each other, one central store for all purposes is sufficient.

In big organisations, particularly in the case of collieries, tea gardens, etc., where the work spots are distributed over a large area, sub-stores are created. A sub-store is in fact a branch of the central store. It is generally created to facilitate easy accessibility to the various work spots or consumption centres. Only the essential items, as well as those required urgently, are kept in them. The issues to sub-stores are not treated as consumption but only as a transfer, from one store (central) to another sub-store. The control in the matter of ordering or receiving rests with the central stores and the sub-stores do not generally receive any item directly.



Cost Accounting

Departmental stores are created normally to minimise the time spent on drawing from stores. For example, a week's supply may be drawn at one time and kept in a departmental store at a place marked for the purpose. Such stores, however, are essential where one or more production departments work in multiple shifts and the central store works for only one shift; also for the storage of work in progress and semi-finished components where these are large in number or in bulk. Unlike a sub store in the departmental store, the control rests with the department in charge. The materials are generally issued in bulk to the departmental store and it is the responsibility of the department-in-charge to keep proper accounts as regards issues and stock. If the bulk of materials is required for only one department, it is usually stored near the department under the charge of the super intendent concerned.

2.5.4 Stores location : The location of store should be carefully planned. It should be near to the material receiving department so that transportation charges are minimum. At the same time, it should be easily accessible to all other departments of the factory, railway siding, roads etc. Planned location of the stores department avoids delay in the movement of materials to the departments in which they are needed.

2.5.5 Stores layout : The store should be adequately provided with the necessary racks, drawers and other suitable receptacles for storing materials. Each place (for example, a drawer or a corner) where materials are kept is called a bin. Each bin should be serially numbered and for every item a bin should be allowed. All receipts of the item of the same type should be kept in the bin allotted, for convenience of access. The number of the bin should be entered in the Store Ledger concerned accounts.

2.6 STORE RECORD

The record of stores may be maintained in three forms:

- (a) Bin Cards
- (b) Stock Control Cards,
- (c) Stores Ledger.

The first two forms of accounts are records of quantities received, issued and those in balance, but the third one is an account of their cost also. Usually, the account is kept in both the forms, the quantitative in the store and quantitative-cum-financial in the Cost Department.

Bin Cards and Stock Control Cards : These are essentially similar, being only quantitative records of stores. The latter contains further information as regards stock on order. Bin



cards are kept attached to the bins or receptacles or quite near thereto so that these also assist in the identification of stock. The Stock Control Cards, on the other hand, are kept in cabinets or trays or loose binders.

Advantages of Bin Cards :

- (i) There would be less chances of mistakes being made as entries will be made at the same time as goods are received or issued by the person actually handling the materials.
- (ii) Control over stock can be more effective, in as much as comparison of the actual quantity in hand at any time with the book balance is possible.
- (iii) Identification of the different items of materials is facilitated by reference to the Bin Card the bin or storage receptacle.

Disadvantages of Bin Cards :

- (i) Store records are dispersed over a wide area.
- (ii) The cards are liable to be smeared with dirt and grease because of proximity to material and also because of handling materials.
- (iii) People handling materials are not ordinarily suitable for the clerical work involved in writing Bin Cards.

Advantages of Stock Control Cards :

- (i) Records are kept in a more compact manner so that reference to them is facilitated.
- (ii) Records can be kept in a neat and clean way by men solely engaged in clerical work so that a division of labour between record keeping and actual material handling is possible.
- (iii) As the records are at one place, it is possible to get an overall idea of the stock position without the necessity of going round the stores.

Disadvantages of Stock Control Cards :

- (i) On the spot comparison of the physical stock of an item with its book balance is not facilitated.
- (ii) Physical identification of materials in stock may not be as easy as in the case of bin cards, as the Stock Control Cards are housed in cabinets or trays.

The specimen forms of these cards may be studied from any text book.

Stores Ledger: A Modern Stores Ledger is a collection of cards or loose leaves specially ruled for maintaining a record of both quantity and cost of stores received, issued and those in stock. It being a subsidiary ledger to the main cost ledger, it is maintained by the Cost Accounts Department. It is posted from Goods Received Notes and Materials



Cost Accounting

requisition. The advantages of writing up Stores Ledger mechanically are:

- (1) It enables distribution of work among a number of clerks due to which receipts and issues are posted quickly and regularly.
- (2) It enables stock records to be centralised in case of an organisation having a number of depots.
- (3) The accuracy of posting can be mechanically tested more conveniently.
- (4) The records are clearer and neater. Also the recurring cost of maintaining them is much less than those kept manually.
- (5) If up-to-date records are available, the management will be able to exercise greater control over quantities held in stock from time to time which may result in a great deal of saving in both the amount of investment in stock and their cost.

Now-a-days, mostly a duplicate record of issues and receipt of materials is kept one on Bin Cards in the Store and the second in the Stores Ledger in the stores. The form of ruling the Store Ledger and Bin Cards should be studied from the text book.

2.6.1 Treatment of shortages in stock taking : At the time of stock taking generally discrepancies are found between physical stock shown in the bin card and stores ledger. These discrepancies are in the form of shortages or losses. The causes for these discrepancies may be classified as unavoidable or avoidable.

Losses arising from unavoidable causes should be taken care of by setting up a standard percentage of loss based on the study of the past data. The issue prices may be inflated to cover the standard loss percentage. Alternatively, issues may be made at the purchase price but the cost of the loss or shortage may be treated as overheads.

Actual losses should be compared with the standard and excess losses should be analysed to see whether they are due to normal or abnormal reasons. If they are attributable to normal causes, an additional charge to overheads should be made on the basis of the value of materials consumed. If they arise from abnormal causes, they should be charged to the Costing Profit and Loss account.

Avoidable losses are generally treated as abnormal losses. These losses should be debited to the Costing Profit and Loss Account.

Losses or surpluses arising from errors in documentation, posting etc., should be corrected through adjustment entries.



2.7 INVENTORY CONTROL

The main objective of inventory control is to achieve maximum efficiency in production and sales with the minimum investment in inventory.

Inventory comprises of stocks of materials, components, work-in-progress, and finished products and stores and spares. The techniques commonly applied for inventory control are as follows:

Techniques of Inventory control :

- (i) Setting of various stock levels.
- (ii) ABC analysis.
- (iii) Two bin system.
- (iv) Establishment of system of budgets.
- (v) Use of perpetual inventory records and continuous stock verification.
- (vi) Determination of economic order quantity.
- (vii) Review of slow and non-moving items.
- (viii) Use of control ratios.

2.7.1 Setting of various stock levels:

Minimum level - It indicates the lowest figure of inventory balance, which must be maintained in hand at all times, so that there is no stoppage of production due to non-availability of inventory.

The main consideration for the fixation of minimum level of inventory are as follows:

1. Information about maximum consumption and maximum delivery period in respect of each item to determine its re-order level.
2. Average rate of consumption for each inventory item.
3. Average delivery period for each item. This period can be calculated by averaging the maximum and minimum period.

The formula used for its calculation is as follows:

Minimum level of inventory = Re-order level – (Average rate of consumption × average time of inventory delivery)



Maximum level :

It indicates the maximum figure of inventory quantity held in stock at any time.

The important considerations which should govern the fixation of maximum level for various inventory items are as follows :

1. The fixation of maximum level of an inventory item requires information about its-re-order level. The re-order level itself depends upon its maximum rate of consumption and maximum delivery period. It in fact is the product of maximum consumption of inventory item and its maximum delivery period.
2. Knowledge about minimum consumption and minimum delivery period for each inventory item should also be known.
3. The determination of maximum level also requires the figure of economic order quantity.
4. Availability of funds, storage space, nature of items and their price per unit are also important for the fixation of maximum level.
5. In the case of imported materials due to their irregular supply, the maximum level should be high.

The formula used for its calculation is as follows :

$$\text{Maximum level of inventory} = \text{Re-order-level} + \text{Re-order quantity} - (\text{Minimum consumption} \times \text{Minimum re-order period})$$

Re-order level - This level lies between minimum and the maximum levels in such a way that before the material ordered is received into the stores, there is sufficient quantity on hand to cover both normal and abnormal consumption situations. In other words, it is the level at which fresh order should be placed for replenishment of stock.

The formula used for its calculation is as follows :

$$\text{Re-order level} = \text{Maximum re-order period} \times \text{Maximum Usage (or)} = \text{Minimum level} + (\text{Average rate of consumption} \times \text{Average time to obtain fresh supplies}).$$

Average Inventory Level - This level of stock may be determined by using the following equal formula :

$$\text{Average inventory level} = \text{Minimum level} + 1/2 \text{ Re-order quantity}$$

(or)

$$= \frac{\text{Maximum level} + \text{Minimum level}}{2}$$



Danger level - It is the level at which normal issues of the raw material inventory are stopped and emergency issues are only made.

Danger level = Average consumption × Lead time for emergency purchases

Illustration - Two components, A and B are used as follows :

Normal usage	50 per week each
Maximum usage	75 per week each
Minimum usage	25 per week each
Re-order quantity	A : 300; B : 500
Re-order period	A : 4 to 6 weeks B : 2 to 4 weeks

Calculate for each component (a) Re-ordering level, (b) Minimum level, (c) Maximum level, (d) Average stock level.

Solution :

(a) Re-ordering level :

Minimum usage per week × Maximum delivery period.

Re-ordering level for component A = 75 units × 6 weeks = 450 units

Re-ordering level for component B = 75 units × 4 weeks = 300 units

(b) Minimum level :

Re-order level – (Normal usage × Average period)

Minimum level for component A = 450 units – 50 units × 5 weeks = 200 units

Minimum level for component B = 300 units – 50 units × 3 weeks = 150 units

(c) Maximum level :

ROL + ROQ – (Min. usage × Minimum period)

Maximum level for component A = (450 units + 300 units) – (25 units × 4 weeks) = 650 units

Maximum level for component B = (300 units + 500 units) – (25 units × 2 weeks) = 750 units

(d) Average stock level :

$\frac{1}{2}$ (Minimum + Maximum) stock level



Cost Accounting

Average stock level for component A = $\frac{1}{2}$ (200 units + 650 units) = 425 units.

Average stock level for component B = $\frac{1}{2}$ (150 units + 750 units) = 450 units.

Illustration

A Company uses three raw materials A, B and C for a particular product for which the following data apply:

Raw Material	Usage per unit of Product (Kgs.)	Re-order quantity (Kgs.)	Price per Kg.	Delivery period (in weeks)			Re-order level (Kgs)	Minimum level (Kgs.)
				Minimum	Average	Maximum	Rs.	
A	10	10,000	0.10	1	2	3	8,000	
B	4	5,000	0.30	3	4	5	4,750	
C	6	10,000	0.15	2	3	4		2,000

Weekly production varies from 175 to 225 units, averaging 200 units of the said product. What would be the following quantities :

- Minimum stock of A ?
- Maximum stock of B ?
- Re-order level of C ?
- Average stock level of A ?

Solution

(i) Minimum stock of A

Re-order level – (Average rate of consumption \times Average time required to obtain fresh delivery)

$$= 8,000 - (200 \times 10 \times 2) = 4,000 \text{ kgs.}$$

(ii) Maximum stock of B

Re-order level – (Minimum consumption \times Minimum re-order period) + Re-order quantity

$$= 4,750 - (175 \times 4 \times 3) + 5,000$$

$$= 9,750 - 2,100 = 7,650 \text{ kgs.}$$



(iii) Re-order level of C

$$\begin{aligned} & \text{Maximum re-order period} \times \text{Maximum usage} \\ & = 4 \times 225 \times 6 = 5,400 \text{ kgs.} \end{aligned}$$

OR

Re-order level of C

$$\begin{aligned} & = \text{Minimum stock of C} + [\text{Average rate of consumption} \times \text{Average time required to obtain} \\ & \quad \text{fresh delivery}] \\ & = 2,000 + [(200 \times 6) \times 3] \text{ kgs.} \\ & = 5,600 \text{ kgs.} \end{aligned}$$

(iv) Average stock level of A

$$\begin{aligned} & = \text{Minimum stock level of A} + \frac{1}{2} \text{ Re-order quantity of A} \\ & = 4,000 + \frac{1}{2} \times 10,000 = 4,000 + 5,000 = 9,000 \text{ kgs.} \end{aligned}$$

OR

Average Stock level of A

$$\frac{\text{Minimum stock level of A} + \text{Maximum stock level of A}}{2} \quad (\text{Refer to working note})$$

$$\frac{4,000 + 16,250}{2} = 10,125 \text{ kgs.}$$

Working note

$$\begin{aligned} \text{Maximum stock of A} & = \text{ROL} + \text{ROQ} - (\text{Minimum consumption} \times \text{Minimum re-order period}) \\ & = 8,000 + 10,000 - [(175 \times 10) \times 1] \\ & = 16,250 \text{ kgs.} \end{aligned}$$

2.7.2 ABC Analysis: It is a system of inventory control. It exercises discriminating control over different items of stores classified on the basis of the investment involved. Usually the items are divided into three categories according to their importance, namely, their value and frequency of replenishment during a period.

- (i) 'A' Category of items consists of only a small percentage *i.e.*, about 10% of the total items handled by the stores but require heavy investment about 70% of inventory value, because of their high prices or heavy requirement or both.



Cost Accounting

- (ii) 'B' Category of items are relatively less important; they may be 20% of the total items of material handled by stores. The percentage of investment required is about 20% of the total investment in inventories.
- (iii) 'C' Category of items do not require much investment; it may be about 10% of total inventory value but they are nearly 70% of the total items handled by store.

'A' category of items can be controlled effectively by using a regular system which ensures neither over-stocking nor shortage of materials for production. Such a system plans its total material requirements by making budgets. The stocks of materials are controlled by fixing certain levels like maximum level, minimum level and re-order level. A reduction in inventory management costs is achieved by determining economic order quantities after taking into account ordering cost and carrying cost. To avoid shortage and to minimize heavy investment in inventories, the techniques of value analysis, variety reduction, standardisation etc., may be used.

In the case of 'B' category of items, as the sum involved is moderate, the same degree of control as applied in 'A' category of items is not warranted. The orders for the items, belonging to this category may be placed after reviewing their situation periodically.

For 'C' category of items, there is no need of exercising constant control. Orders for items in this group may be placed either after six months or once in a year, after ascertaining consumption requirements. In this case the objective is to economise on ordering and handling costs.

Illustration

A factory uses 4,000 varieties of inventory. In terms of inventory holding and inventory usage, the following information is compiled:

<i>No. of varieties of inventory</i>	<i>%</i>	<i>% value of inventory holding (average)</i>	<i>% of inventory usage (in end-product)</i>
3,875	96.875	20	5
110	2.750	30	10
15	0.375	50	85
4,000	100.000	100	100

Classify the items of inventory as per ABC analysis with reasons.



Solution

Classification of the items of inventory as per ABC analysis

1. 15 number of varieties of inventory items should be classified as 'A' category items because of the following reasons :
 - (i) Constitute 0.375% of total number of varieties of inventory handled by stores of factory, which is minimum as per given classification in the table.
 - (ii) 50% of total use value of inventory holding (average) which is maximum according to the given table.
 - (iii) Highest in consumption about 85% of inventory usage (in end-product).
2. 110 number of varieties of inventory items should be classified as 'B' category items because of the following reasons :
 - (i) Constitute 2.750% of total number of varieties of inventory items handled by stores of factory.
 - (ii) Requires moderate investment of about 30% of total use value of inventory holding (average).
 - (iii) Moderate in consumption about 10% of inventory usage (in end-product).
3. 3,875 number of varieties of inventory items should be classified as 'C' category items because of the following reasons:
 - (i) Constitute 96.875% of total varieties of inventory items handled by stores of factory.
 - (ii) Requires about 20% of total use value of inventory holding (average).
 - (iii) Minimum inventory consumption *i.e.* about 5% of inventory usage (in end-product).

Advantages of ABC analysis : The advantages of ABC analysis are the following :

- (i) It ensures that, without there being any danger of interruption of production for want of materials or stores, minimum investment will be made in inventories of stocks of materials or stocks to be carried.
- (ii) The cost of placing orders, receiving goods and maintaining stocks is minimised specially if the system is coupled with the determination of proper economic order quantities.
- (iii) Management time is saved since attention need be paid only to some of the items rather than all the items as would be the case if the ABC system was not in operation.



Cost Accounting

(iv) With the introduction of the ABC system, much of the work connected with purchases can be systematized on a routine basis to be handled by subordinate staff.

2.7.3 Two bin system: Under this system each bin is divided into two parts - one, smaller part, should stock the quantity equal to the minimum stock or even the re-ordering level, and the other to keep the remaining quantity. Issues are made out of the larger part; but as soon as it becomes necessary to use quantity out of the smaller part of the bin, fresh order is placed. "Two Bin System" is supplemental to the record of respective quantities on the bin card and the stores ledger card.

2.7.4 Establishment of system of budgets: To control investment in the inventories, it is necessary to know in advance about the inventories requirement during a specific period usually a year. The exact quantity of various type of inventories and the time when they would be required can be known by studying carefully production plans and production schedules. Based on this, inventories requirement budget can be prepared. Such a budget will discourage the unnecessary investment in inventories.

2.7.5 Use of perpetual inventory records and continuous stock verification – Perpetual inventory represents a system of records maintained by the stores department. It in fact comprises: (i) Bin Cards, and (ii) Stores Ledger.

Bin Card maintains a quantitative record of receipts, issues and closing balances of each item of stores. Separate bin cards are maintained for each item. Each card is filled up with the physical movement of goods *i.e.* on its receipt and issue.

Like bin cards, the Store Ledger is maintained to record all receipt and issue transactions in respect of materials. It is filled up with the help of goods received note and material issue requisitions.

A perpetual inventory is usually checked by a programme of continuous stock taking. Continuous stock taking means the physical checking of those records (which are maintained under perpetual inventory) with actual stock. Perpetual inventory is essential for material control. It incidentally helps continuous stock taking. The success of perpetual inventory depends upon the following:

- (a) The Stores Ledger—(showing quantities and amount of each item).
- (b) Stock Control cards (or Bin Cards).
- (c) Reconciling the quantity balances shown by (a) & (b) above.
- (d) Checking the physical balances of a number of items every day systematically and by rotation.



- (e) Explaining promptly the causes of discrepancies, if any, between physical balances and book figures.
- (f) Making corrective entries where called for after step (e) and
- (g) Removing the causes of the discrepancies referred to in step (e)

Advantages – The main advantages of perpetual inventory are as follows :

- (1) Physical stocks can be counted and book balances adjusted as and when desired without waiting for the entire stock-taking to be done.
- (2) Quick compilation of Profit and Loss Account (for interim period) due to prompt availability of stock figures.
- (3) Discrepancies are easily located and thus corrective action can be promptly taken to avoid their recurrence.
- (4) A systematic review of the perpetual inventory reveals the existence of surplus, dormant, obsolete and slow-moving materials, so that remedial measures may be taken in time.
- (5) Fixation of the various stock levels and checking of actual balances in hand with these levels assist the Store keeper in maintaining stocks within limits and in initiating purchase requisitions for correct quantity at the proper time.

Continuous stock verification – The checking of physical inventory is an essential feature of every sound system of material control. Such a checking may be periodical or continuous. Annual stock-taking, however, has certain inherent shortcomings which tend to detract from the usefulness of such physical verification. For instance, since all the items have to be covered in a given number of days, either the production department has to be shut down during those days to enable thorough checking of stock or else the verification must be of limited character. Moreover, in the case of periodical checking there is the problem of finding an adequately trained contingent. It is likely to be drawn from different departments where stock-taking is not the normal work and they are apt to discharge such temporary duties somewhat perfunctorily. The element of surprise, that is essential for effective control is wholly absent in the system. Then if there are stock discrepancies, they remain undetected until the end of the period. It means that the figures of stock during the period continue to be supplied incorrectly. Often, the discrepancies are not corrected.

The system of continuous stock-taking consists of counting and verifying the number of items daily throughout the year so that during the year all items of stores are covered three or four times. The stock verifiers are independent of the stores, and the stores staff have no foreknowledge as to the particular items that would be checked on any particular



Cost Accounting

day. But it must be seen that each item is checked a number of times in a year.

Advantages – The advantages of continuous stock-taking are :

1. Closure of normal functioning is not necessary.
2. Whole time specialised staff can be engaged for the purpose since the work is spread throughout the year. In smaller concerns, duties may be assigned to various officers of middle rank by rotation to the checking, say, of 20 items. This would be easy because the store ledger card and the bin card will bear the bin number. The officers concerned need only walk up to the particular bin number, count, weigh or measure the article lying there and enter the quantity on the form provided for the purpose. The rest of the work (comparison with book figures) can be done by the stores ledger clerk.
3. Stock discrepancies are likely to be brought to the notice and corrected much earlier than under the annual stock-taking system.
4. The system generally has a sobering influence on the stores staff because of the element of surprise present therein.
5. The movement of stores items can be watched more closely by the stores auditor so that chances of obsolescence buying are reduced.
6. Final Accounts can be ready quickly. Interim accounts are possible quite conveniently.

2.7.6 Economic Order Quantity (EOQ): Purchase department in manufacturing concerns is usually faced with the problem of deciding the 'quantity of various items' which they should purchase. If purchases of material are made in bulk then inventory carrying cost will be high. On the other hand if order size is small each time, then the ordering cost will be high. In order to minimise ordering and carrying costs it is necessary to determine the order quantity which minimises these two costs. The size of the order for which both ordering and carrying cost are minimum is known as economic order quantity.

Assumptions underlying E.O.Q.: The calculation of economic order of material to be purchased is subject to the following assumptions:

- (i) Ordering cost per order and carrying cost per unit per annum are known and they are fixed.
- (ii) Anticipated usage of material in units is known.
- (iii) Cost per unit of the material is constant and is known as well.
- (iv) The quantity of material ordered is received immediately *i.e.* the lead time is zero.

The famous mathematician Wilson derived the formula which is used for determining the size of order for each of purchases at minimum ordering and carrying costs.



The formula given by Wilson for calculating economic order quantity is as follows :

$$EOQ = \sqrt{\frac{2AS}{C}}$$

where, A = Annual usage units

S = Ordering cost per order

C = Annual carrying cost of one unit, i.e., carrying cost percentage × cost of one unit.

Illustration

Calculate the Economic Order Quantity from the following information. Also state the number of orders to be placed in a year.

Consumption of materials per annum	:	10,000 kg.
Order placing cost per order	:	Rs. 50
Cost per kg. of raw materials	:	Rs. 2
Storage costs	:	8% on average inventory

Solution

$$EOQ = \sqrt{\frac{2A \times S}{C}}$$

A = Units consumed during year

S = Ordering cost per order

C = Inventory carrying cost per unit per annum.

$$EOQ = \sqrt{\frac{2 \times 10,000 \times 50}{\frac{2 \times 8}{100}}} = \sqrt{\frac{2 \times 10,000 \times 50 \times 25}{4}}$$

$$= 2,500 \text{ kg.}$$



Cost Accounting

$$\text{No. of orders to be placed in a year} = \frac{\text{Total consumption of materials per annum}}{\text{EOQ}}$$

$$= \frac{10,000 \text{ kg.}}{2,500 \text{ kg.}} = 4 \text{ Orders per year}$$

Illustration

X Ltd. is committed to supply 24,000 bearings per annum to Y Ltd. on steady basis. It is estimated that it costs 10 paise as inventory holding cost per bearing per month and that the set-up cost per run of bearing manufacture is Rs. 324.

- What would be the optimum run size for bearing manufacture ?
- Assuming that the company has a policy of manufacturing 6,000 bearings per run, how much extra costs the company would be incurring as compared to the optimum run suggested in (a) above ?
- What is the minimum inventory holding cost ?

Solution

$$(a) \text{ Optimum production run size (Q)} = \sqrt{\frac{2UP}{I}}$$

where,

U = No. of units to be produced within one year.

P = Set-up cost per production run

I = Carrying cost per unit per annum.

$$= \sqrt{\frac{2UP}{I}} = \sqrt{\frac{2 \times 24,000 \times \text{Rs.}324}{0.10 \times 12}}$$

$$= 3,600 \text{ bearings.}$$

- Total Cost (of maintaining the inventories) when production run size (Q) are 3,600 and 6,000 bearings respectively

Total cost = Total set-up cost + Total carrying cost.



Material

(Total set-up cost) $Q = 3,600 = (\text{No. of production runs ordered}) \times (\text{Set-up cost per production run})$

$$\begin{aligned} &= \frac{24,000}{3,600} \times \text{Rs. } 324 \\ &= \text{Rs. } 2,160 \end{aligned} \quad \dots(1)$$

$$\begin{aligned} (\text{Total set-up cost}) \quad Q = 6,000 &= \frac{24,000}{6,000} \times \text{Rs. } 324 \\ &= 1,296 \end{aligned} \quad \dots(2)$$

$$\begin{aligned} (\text{Total carrying cost}) \quad Q = 3,600 &= 1/2 \quad Q \times I \\ &= 1/2 \times 3,600 \times 0.10P \times \text{Rs. } 12 \\ &= \text{Rs. } 2,160 \end{aligned} \quad \dots(3)$$

$$\begin{aligned} (\text{Total carrying cost}) \quad Q = 6,000 &= 1/2 \times 6,000 \times 0.10P \times \text{Rs. } 12 \\ &= \text{Rs. } 3,600 \end{aligned} \quad \dots(4)$$

$$\begin{aligned} (\text{Total Cost}) \quad Q = 3,600 &= \text{Rs. } 2,160 + \text{Rs. } 2,160 \\ [(1) + (3)] &= \text{Rs. } 4,320 \end{aligned} \quad \dots(5)$$

$$\begin{aligned} (\text{Total Cost}) \quad Q = 6,000 &= \text{Rs. } 1,296 + \text{Rs. } 3,600 \\ [(2) + (4)] &= \text{Rs. } 4,896 \end{aligned} \quad \dots(6)$$

$$\begin{aligned} \text{Extra cost incurred} &= \text{Rs. } 4,896 - \text{Rs. } 4,320 \\ [(6) - (5)] &= \text{Rs. } 576 \end{aligned}$$

- (c) Minimum inventory holding cost = $1/2 \quad Q \times I$
(when $Q = 3,600$ bearings) = $1/2 \times 3,600$ bearings $\times 0.10P \times \text{Rs. } 12$
= Rs. 2,160

Illustration

Shriram enterprise manufactures a special product "ZED". The following particulars were collected for the year 2006:

- (a) Monthly demand of ZED – 1,000 units
- (b) Cost of placing an order Rs. 100.



Cost Accounting

- (c) Annual carrying cost per unit Rs. 15.
- (d) Normal usage 50 units per week.
- (e) Minimum usage 25 units per week.
- (f) Maximum usage 75 units per week.
- (g) Re-order period 4 to 6 weeks.

Compute from the above

- (1) Re-order quantity
- (2) Re-order level
- (3) Minimum level
- (4) Maximum level
- (5) Average stock level.

Solution

$$\begin{aligned} 1. \quad \text{Re-order quantity of units used} &= \sqrt{\frac{2AS}{C}} = \sqrt{\frac{2 \times 2,600 \times \text{Rs.}100}{\text{Rs.}15}} \\ &= 186 \text{ units (approximately)} \end{aligned}$$

(Refer to note)

- | | | |
|-------------------|---|--|
| where, A | = | Annual demand of input units |
| S | = | Cost of placing an order |
| C | = | Annual carrying cost per unit |
| 2. Re-order level | = | Maximum re-order period × maximum usage |
| | = | 6 weeks × 75 units = 450 units |
| 3. Minimum Level | = | Re-order level – (normal usage × average re-order period). |
| | = | 450 units – 50 units × 5 weeks. |
| | = | 450 units – 250 units = 200 units. |
| 4. Maximum Level | = | Re-order level + Re-order quantity – Minimum usage × Minimum order period. |
| | = | 450 units + 186 units – 25 units × 4 weeks |
| | = | 536 units |



5. **Average Stock Level** = $\frac{1}{2}$ (Minimum stock level + Maximum stock level)
= $\frac{1}{2}$ (200 units + 536 units)
= 368 units.

Note: A = Annual demand of input units for 12,000 units of 'ZED'
= 52 weeks \times Normal usage of input units per week
= 52 weeks \times 50 units of input per week
= 2,600 units.

Illustration

- (a) EXE Limited has received an offer of quantity discounts on its order of materials as under:

<i>Price per tonne</i>	<i>Tonnes</i>
<i>Rs.</i>	<i>Nos.</i>
1,200	Less than 500
1,180	500 and less than 1,000
1,160	1,000 and less than 2,000
1,140	2,000 and less than 3,000
1,120	3,000 and above.

The annual requirement for the material is 5,000 tonnes. The ordering cost per order is Rs. 1,200 and the stock holding cost is estimated at 20% of material cost per annum. You are required to compute the most economical purchase level.

- (b) What will be your answer to the above question if there are no discounts offered and the price per tonne is Rs. 1,500 ?



Cost Accounting

Solution (a)

Total annual requirement (S)	Ordersize (Units) (q)	No. of orders S/q	Cost of inventory S×Per unit cost (Rs.)	Ordering cost S/q×Rs.1200 (Rs.)	Carrying cost p.u.p.a 1/2×q×20% of cost p.u. (Rs.)	Total Cost (4+5+6) (Rs.)
1	2	3	4	5	6	7
500 units	400	12.5	60,00,000 (5,000×Rs.1200)	15,000	48,000 (200 × Rs. 240)	60,63,000
	500	10	59,00,000 (5,000×Rs.1180)	12,000	59,000 (250 × Rs. 236)	59,71,000
	1000	5	58,00,000 (5,000×Rs.1160)	6,000	1,16,000 (500 × Rs. 232)	59,22,000
	2000	2.5	57,00,000 (5,000×Rs.1140)	3,000	2,28,000 (1,000×Rs.228)	59,31,000
	3000	1666	56,00,000 (5,000×Rs.1120)	2,000	3,36,000 (1,500×Rs.224)	59,38,000

The above table shows that the total cost of 5,000 units including ordering and carrying cost is minimum (Rs. 59,22,000) when the order size is 1,000 units. Hence the most economical purchase level is 1,000 units.

$$(b) \text{ EOQ} = \sqrt{\frac{2SC_o}{iC_1}}$$

where S is the annual inventory requirement,
 C_o is the ordering cost per order and
 iC_1 is the carrying cost per unit per annum.

$$= \sqrt{\frac{2 \times 2,500 \text{ units} \times \text{Rs.} 1,200}{20\% \times \text{Rs.} 1,500}}$$



Illustration

From the details given below, calculate:

- (i) Re-ordering level
- (ii) Maximum level
- (iii) Minimum level
- (iv) Danger level.

Re-ordering quantity is to be calculated on the basis of following information:

Cost of placing a purchase order is Rs. 20

Number of units to be purchased during the year is 5,000

Purchase price per unit inclusive of transportation cost is Rs. 50

Annual cost of storage per units is Rs. 5.

Details of lead time : Average 10 days, Maximum 15 days, Minimum 6 days.

For emergency purchases 4 days.

Rate of consumption : Average : 15 units per day,

Maximum : 20 units per day.

Solution

Basic Data :

Co (Ordering cost per order)	=	Rs. 20
S (Number of units to be purchased annually)	=	5,000 units
C ₁ (Purchase price per unit inclusive of transportation cost)	=	Rs. 50.
iC ₁ (Annual cost of storage per unit)	=	Rs. 5

Computations :

- (i) **Re-ordering level** = Maximum usage per period × Maximum re-order period
(ROL) = 20 units per day × 15 days = 300 units
- (ii) **Maximum level** = ROL + ROQ – [Min. rate of consumption × Min. re-order period] (Refer to working notes 1 and 2)



Cost Accounting

- = 300 units + 200 units – [10 units per day × 6 days]
= 440 units
- (iii) **Minimum level** = ROL – Average rate of consumption × Average re-order-period
= 300 units – (15 units per day × 10 days)
= 150 units
- (iv) **Danger level** = Average consumption × Lead time for emergency purchases
= 15 units per day × 4 days = 60 units

Working Notes :

$$1. \quad ROQ = \sqrt{\frac{2SC_0}{iC_1}} = \sqrt{\frac{2 \times 5,000 \text{ units} \times \text{Rs. } 1,200}{20\% \times \text{Rs. } 1,500}} = 200 \text{ units}$$

$$2. \quad \text{Av. rate of consumption} = \frac{\text{Minimum rate of consumption} + \text{Maximum rate of consumption}}{2}$$

$$15 \text{ units per day} = \frac{X \text{ units/day} + 20 \text{ units per day}}{2}$$

$$\text{or } X = 10 \text{ units per day.}$$

Illustration

About 50 items are required every day for a machine. A fixed cost of Rs. 50 per order is incurred for placing an order. The Inventory carrying cost per item amounts to Rs. 0.02 per day. The lead period is 32 days. Compute :

- (i) Economic order quantity.
(ii) Re-order level.

Solution

$$\text{Annual consumption (S)} = 50 \text{ items} \times 365 \text{ days} = 18,250 \text{ items}$$



Fixed cost per order (Co) or Ordering cost = Rs. 50

Inventory carrying cost per item per annum (iC₁) = Rs. 0.02 × 365 = Rs. 7.30

$$(i) \text{ Economic order quantity} = \sqrt{\frac{2SC_0}{iC_1}} = \sqrt{\frac{2 \times 18,250 \text{ units} \times \text{Rs.} 50}{\text{Rs.} 7.30}} = 500 \text{ units}$$

$$(ii) \text{ Re-order level} = \text{Maximum usage per day} \times \text{Maximum lead time} \\ = 50 \text{ items per day} \times 32 \text{ days} \\ = 1,600 \text{ items}$$

Illustration

M/s. Tubes Ltd. are the manufacturers of picture tubes for T.V. The following are the details of their operation during 2006:

Average monthly market demand	2,000 Tubes
Ordering cost	Rs. 100 per order
Inventory carrying cost	20% per annum
Cost of tubes	Rs. 500 per tube
Normal usage	100 tubes per week
Minimum usage	50 tubes per week
Maximum usage	200 tubes per week
Lead time to supply	6 – 8 weeks

Compute from the above:

- (1) Economic order quantity. If the supplier is willing to supply quarterly 1,500 units at a discount of 5%, is it worth accepting?
- (2) Maximum level of stock.
- (3) Minimum level of stock.
- (4) Re-order level

Solution

$$S = \text{Annual usage of tubes} = \text{Normal usage per week} \times 52 \text{ weeks} \\ = 100 \text{ tubes} \times 52 \text{ weeks} = 5,200 \text{ tubes.}$$



Cost Accounting

C_0 = Ordering cost per order = Rs. 100/- per order

C_1 = Cost per tube = Rs. 500/-

iC_1 = Inventory carrying cost per unit per annum
= 20% × Rs. 500 = Rs. 100/- per unit, per annum

(1) Economic order quantity

$$\text{E.O.Q} = \sqrt{\frac{2SC_0}{iC_1}} = \sqrt{\frac{2 \times 5,200 \text{ units} \times \text{Rs. } 1,00}{\text{Rs. } 1,00}} = 102 \text{ tubes (approx.)}$$

If the supplier is willing to supply 1500 units at a discount of 5% is it worth accepting?

Total cost (when order size is 1,500 units) = Cost of 5,200 units + Ordering cost + Carrying cost

$$\begin{aligned} &= 5,200 \text{ units} \times \text{Rs. } 475 + \frac{5,200 \text{ units}}{1,500 \text{ units}} \times \text{Rs. } 100 + 1,500 \text{ units} \times 20\% \times \text{Rs. } 475 \\ &= \text{Rs. } 24,70,000 + \text{Rs. } 346.67 + \text{Rs. } 71,250 \\ &= \text{Rs. } 25,41,596.67 \end{aligned}$$

Total cost (when order size is 102 units)

$$\begin{aligned} &= 5,200 \text{ units} \times \text{Rs. } 500 + \frac{5,200 \text{ units}}{102 \text{ units}} \times \text{Rs. } 100 + 102 \text{ units} \times 20\% \times \text{Rs. } 500 \\ &= \text{Rs. } 26,00,000 + \text{Rs. } 5,098.03 + \text{Rs. } 5,100 \\ &= \text{Rs. } 26,10,198.03 \end{aligned}$$

Since, the total cost under quarterly supply of 1,500 units with 5% discount is lower than that when order size is 102 units, therefore the offer should be accepted. While accepting this offer consideration of capital blocked on order size of 1,500 units per quarter has been ignored.

(2) Maximum level of stock

= Re-order level + Re-order quantity – Min. usage × Min. re-order period



Material

$$= 1,600 \text{ units} + 102 \text{ units} - 50 \text{ units} \times 6 \text{ weeks} \\ = 1,402 \text{ units.}$$

(3) Minimum level of stock

$$= \text{Re-order level} - \text{Normal usage} \times \text{Average reorder period} \\ = 1,600 \text{ units} - 100 \text{ units} \times 7 \text{ weeks} = 900 \text{ units.}$$

(4) Reorder level

$$= \text{Maximum consumption} \times \text{Maximum re-order period} \\ = 200 \text{ units} \times 8 \text{ weeks} = 1,600 \text{ units.}$$

Illustration

The complete Gardener is deciding on the economic order quantity for two brands of lawn fertilizer: Super Grow and Nature's Own. The following information is collected:

	Fertilizer	
	Super Grow	Nature's Own
Annual Demand	2,000 Bags	1,280 Bags
Relevant ordering cost per purchase order	Rs. 1,200	Rs. 1,400
Annual relevant carrying cost per bag	Rs. 480	Rs. 560

Required :

- (i) Compute EOQ for Super Grow and Nature's Own.
- (ii) For the EOQ, what is the sum of the total annual relevant ordering costs and total annual relevant carrying costs for Super Grow and Nature's Own ?
- (iii) For the EOQ Compute the number of deliveries per year for Super Grow and Nature's Own.

Solution

$$(i) \quad \text{EOQ} = \sqrt{\frac{2SC_0}{iC_1}}$$

* Here S = Annual demand of fertilizer bags.

C_1 = Cost per bag.



Cost Accounting

C_0 = Relevant ordering cost per purchase order

iC_1 = Annual relevant carrying cost per bag

EOQ for Super Grow Fertilizer

EOQ for Nature's Own Fertilizer

$$\sqrt{\frac{2 \times 2,000 \text{ bags} \times \text{Rs. } 1,200}{\text{Rs. } 480}} = 100 \text{ bags}$$

$$\sqrt{\frac{2 \times 1,280 \text{ bags} \times \text{Rs. } 1,400}{\text{Rs. } 560}} = 80 \text{ bags}$$

(ii) Total annual relevant costs for Super Grow Fertilizer

= Total annual relevant ordering costs + Total annual relevant carrying costs

$$= \frac{S}{\text{EOQ}} \times C_0 + \frac{1}{2} \text{EOQ} \times iC_1$$

$$= \frac{2000 \text{ bags}}{100 \text{ bags}} \times \text{Rs. } 1,200 + \frac{1}{2} \times 100 \text{ bags} \times \text{Rs. } 480$$

$$= \text{Rs. } 24,000 + \text{Rs. } 24,000 = \text{Rs. } 48,000$$

Total annual relevant costs for Nature's Own Fertilizer

$$= \frac{1,280 \text{ bags}}{80 \text{ bags}} \times \text{Rs. } 1,400 + \frac{1}{2} \times 80 \text{ bags} \times \text{Rs. } 560$$

$$= \text{Rs. } 22,400 + \text{Rs. } 22,400 = \text{Rs. } 44,800$$

(iii) Number of deliveries for Super Grow Fertilizer per year.

$$\frac{S}{\text{EOQ}} = (\text{annual demand of fertiliser bags}) = \frac{2000 \text{ bags}}{100 \text{ bags}} = 20 \text{ orders}$$

Number of deliveries for Nature's Own fertilizers per year.

$$= \frac{1,280 \text{ bags}}{80 \text{ bags}} = 16 \text{ orders}$$



Illustration

G. Ltd. produces a product which has a monthly demand of 4,000 units. The product requires a component X which is purchased at Rs. 20. For every finished product, one unit of component is required. The ordering cost is Rs. 120 per order and the holding cost is 10% p.a.

You are required to calculate:

- (i) Economic order quantity.
- (ii) If the minimum lot size to be supplied is 4,000 units, what is the extra cost, the company has to incur ?
- (iii) What is the minimum carrying cost, the company has to incur ?

Solution

(a) (i) Economic order quantity :

S (Annual requirement or Component 'X')	= 4,000 units per month × 12 months
	= 48,000 units
C ₁ (Purchase cost p.u.)	= Rs. 20
C ₀ (Ordering cost per order)	= Rs. 120
i (Holding cost)	= 10% per annum

$$\text{E.O.Q.} = \frac{S}{\text{EOQ}} = \sqrt{\frac{2 \times 48,000 \text{ units} \times \text{Rs. } 120}{10\% \times \text{Rs. } 20}} = 2,400 \text{ units}$$

(ii) Extra cost incurred by the company

$$\begin{aligned} \text{Total cost} &= \text{Total ordering cost} + \text{Total carrying cost} \\ &\text{(when order size is 4,000 units)} \\ &= \frac{S}{Q} \times C_0 + q (iC_1) \end{aligned}$$

$$= \frac{48,000 \text{ units}}{4,000 \text{ units}} \times \text{Rs. } 120 + \frac{1}{2} \times 4,000 \text{ units} \times 10\% \times \text{Rs. } 20$$



Cost Accounting

$$= \text{Rs. } 1,440 + \text{Rs. } 4,000 = \text{Rs. } 5,440 \quad \dots(a)$$

$$\text{Total cost} = \frac{48,000 \text{ units}}{2,400 \text{ units}} \times \text{Rs. } 120 + \frac{1}{2} \times 2,400 \text{ units} \times 10\% \times \text{Rs. } 20$$

(when order size is 2,400 units)

$$= \text{Rs. } 2,400 + \text{Rs. } 2,400 = \text{Rs. } 4,800 \quad \dots(b)$$

$$\text{Extra cost : (a) - (b)} = \text{Rs. } 5,440 - \text{Rs. } 4,800 = \text{Rs. } 640$$

(incurred by the company)

(iii) Minimum carrying cost :

Carrying cost depends upon the size of the order. It will be minimum on the least order size. (In this part of the question the two order sizes are 2,400 units and 4,000 units. Here 2,400 units is the least of the two order sizes. At this order size carrying cost will be minimum.)

The minimum carrying cost in this case can be computed as under :

$$\text{Minimum carrying cost} = \frac{1}{2} \times 2,400 \text{ units} \times 10\% \times \text{Rs. } 20 = \text{Rs. } 2,400.$$

Illustration

A Ltd. is committed to supply 24,000 bearings per annum to B Ltd. on a steady basis. It is estimated that it costs 10 paise as inventory holding cost per bearing per month and that the set-up cost per run of bearing manufacture is Rs. 324.

- (i) What should be the optimum run size for bearing manufacture ?
- (ii) What would be the interval between two consecutive optimum runs ?
- (iii) Find out the minimum inventory cost per annum.

Solution

(i) Optimum run size for bearing manufacture

$$= \sqrt{\frac{2 \times \text{Annual supply of bearings} \times \text{Set - up cost per production run}}{\text{Annual holding cost per bearing}}}$$



$$= \sqrt{\frac{2 \times 24,000 \text{ bearings} \times \text{Rs. } 324}{12 \text{ months} \times 0.10P}} = 3,600 \text{ bearings}$$

(ii) Interval between two consecutive optimum runs

$$\begin{aligned} &= \frac{12 \text{ months}}{\text{Number of production runs per annum}} = \frac{12 \text{ months}}{\left(\frac{\text{Annual production}}{\text{Optimum run size}} \right)} \\ &= \frac{12 \text{ months}}{\left(\frac{24,000 \text{ bearings}}{3,600 \text{ bearings}} \right)} = \frac{12 \text{ months}}{6.66} = 1.8 \text{ months or } 55 \text{ days approximately} \end{aligned}$$

(iii) Minimum inventory cost per annum

= Total production run cost + Total carrying cost per annum

$$= \frac{24,000 \text{ bearings}}{3,600 \text{ bearings}} \times \text{Rs. } 324 + \frac{1}{2} \times 3,600 \text{ bearings} \times 0.10 P \times 12 \text{ months}$$

$$= \text{Rs. } 2,160 + \text{Rs. } 2,160 = \text{Rs. } 4,320$$

2.7.7 Review of slow and non-moving items : Sometimes, due to high value of slow moving and non-moving raw materials, it appears that the concern has blocked huge sum of money unnecessarily in raw materials. To overcome this problem, it is necessary to dispose-off as early as possible, the non-moving items or make arrangements for their exchange with the inventories required by the concern. Besides this no new requisition should be made for the purchase of slow moving items, till the existing stock is exhausted. Computation of inventory turnover ratio may help in identifying slow moving items.

2.7.8 Use of control ratios : (i) *Input output ratio* : Inventory control can also be exercised by the use of input output ratio analysis. Input-output ratio is the ratio of the quantity of input of material to production and the standard material content of the actual output.

This type of ratio analysis enables comparison of actual consumption and standard consumption, thus indicating whether the usage of material is favourable or adverse.



Cost Accounting

(ii) *Inventory turnover ratio* : Computation of inventory turnover ratios for different items of material and comparison of the turnover rates, provides a useful guidance for measuring inventory performance. High inventory turnover ratio indicates that the material in the question is a fast moving one. A low turnover ratio indicates over-investment and locking up of the working capital in inventories. Inventory turnover ratio may be calculated by using the following formulae:-

$$\text{Inventory turnover ratio} = \frac{\text{Cost of materials consumed during the period}}{\text{Cost of average stock held during the period}}$$

$$\text{Average stock} = \frac{1}{2} (\text{opening stock} + \text{closing stock})$$

By comparing the number of days in the case of two different materials, it is possible to know which is fast moving and which is slow moving. On this basis, attempt should be made to reduce the amount of capital locked up, and prevent over-stocking of the slow moving items.

Illustration

The following data are available in respect of material X for the year ended 31st March, 2006.

	Rs.
Opening stock	90,000
Purchases during the year	2,70,000
Closing stock	1,10,000

Calculate :

- (i) Inventory turnover ratio, and
- (ii) The number of days for which the average inventory is held.

Solution

Inventory turnover ratio

$$\text{(Refer to working note)} = \frac{\text{Cost of stock of raw material consumed}}{\text{Average stock of raw material}}$$



Material

$$\begin{aligned} &= \frac{\text{Rs.2,50,000}}{\text{Rs.1,00,000}} \\ &= 2.5 \end{aligned}$$

Average number of days for which

$$\begin{aligned} \text{the average inventory is held} &= \frac{365}{\text{Inventory turnover ratio}} = \frac{365 \text{ days}}{2.5} \\ &= 146 \end{aligned}$$

Working Note :

	Rs.
Opening stock of raw material	90,000
Add: Material purchases during the year	2,70,000
Less: Closing stock of raw material	<u>1,10,000</u>
Cost of stock of raw material consumed	<u>2,50,000</u>

2.8 VALUATION OF MATERIAL RECEIPTS

The invoice of material purchased from the market sometime contain items such as trade discount, quantity discount, freight, duty, insurance, cost of containers, sales tax, excise duty, cash discount etc. Under such a situation, the general principal is that all costs incurred upto the point of procuring and storing materials should constitute the cost of materials purchased. The amount of trade discount, quantity discount and excise duty (under MODVAT credit scheme) being credit items and are thus deducted from the invoice of material purchased. The transport charges (carriage and freight), sales tax, insurance, cost of containers, customs and excise duty (without MODVAT credit) should be included in the invoice cost of material. The cash discount is considered as financial gain, so it is kept outside the domain of material cost. In case the containers are returnable, their resale value should also be taken in the invoice price of material to correctly ascertain the cost of material purchased. The cost of material purchased so determined may be used for the entry of material in the Stores Ledger.

Illustration

An invoice in respect of a consignment of chemicals A and B provides the following



Cost Accounting

information:

	<i>Rs.</i>
Chemical A: 10,000 lbs. at Rs. 10 per lb.	1,00,000
Chemical B: 8,000 lbs. at Rs. 13 per lb.	1,04,000
Sales tax @ 10%	20,400
Railway freight	<u>3,840</u>
Total cost	<u>2,28,240</u>

A shortage of 500 lbs. in chemical A and 320 lbs. in chemical B is noticed due to normal breakages. You are required to determine the rate per lb. of each chemical, assuming a provision of 2% for further deterioration.

Solution

Statement showing computation of effective quantity of each chemical available for use

	<i>Chemical A</i>	<i>Chemical B</i>
	<i>lbs.</i>	<i>lbs.</i>
Quantity purchased	10,000	8,000
Less : Shortage due to normal breakages	<u>500</u>	<u>320</u>
	9,500	7,680
Less : Provision for deterioration 2%	<u>190</u>	<u>53.6</u>
Quantity available	<u>9,310</u>	<u>7,526.4</u>

Statement showing the computation of rate per lb. of each chemical

	<i>Chemical A</i>	<i>Chemical B</i>
	<i>Rs.</i>	<i>Rs.</i>
Purchase price	1,00,000	1,04,000
Add : Sales tax (10%)	10,000	10,400
Railway freight (in the ratio of quantity purchased <i>i.e.</i> , 5:4)	<u>2,133</u>	<u>1,707</u>
Total cost	<u>1,12,133</u>	<u>1,16,107</u>



Material

$$\text{Rate per lb. A : } \frac{\text{Rs. } 1,12,133}{9,310\text{lbs}} = \text{Rs. } 12.04$$

$$\text{Rate per lb. B : } \frac{\text{Rs. } 1,16,107}{7,526.34\text{lbs}} = \text{Rs. } 15.43$$

Illustration

At what price per unit would Part No. A 32 be entered in the Stores Ledger, if the following invoice was received from a supplier:

Invoice	Rs.
200 units Part No. A 32 @ Rs. 5	1,000.00
Less : 20% discount	<u>200.00</u>
	800.00
Add : Excise duty @ 15%	<u>120.00</u>
	920.00
Add : Packing charges (5 non-returnable boxes)	<u>50.00</u>
	<u>970.00</u>

Notes:

- (i) A 2 per cent discount will be given for payment in 30 days.
- (ii) Documents substantiating payment of excise duty is enclosed for claiming MODVAT credit.

Solution

200 units net cost after trade discount	Rs. 800
Add : Packing charges	Rs. 50
Total cost per 200 units	Rs. 850

$$\text{Cost per unit} = \frac{\text{Rs. } 850}{200} = \text{Rs. } 4.25$$



2.9 VALUATION OF MATERIAL ISSUES

Materials issued from stores should be priced at the value at which they are carried in stock. But the value attached to the stock of any item of material, at any particular point of time may be the result, not of one purchase rate or price but of different purchase rate or prices. In other words, the same material may have been acquired at different prices and its stock at any particular time may comprise materials of more than one lot so that there would be a problem of determining the appropriate rate at which price (rate) the materials will be issued.

Several methods of pricing material issues have been evolved in an attempt to satisfactorily answer the problem. These methods may be grouped and explained as follows :

2.9.1 Cost Price Methods:

- (a) Specific price method.
- (b) First-in First-out method.
- (c) Last-in-First-out method.
- (d) Base stock method.

2.9.2 Average Price Methods :

- (e) Simple average price method.
- (f) Weighted average price method.
- (g) Periodic simple average price method.
- (h) Periodic weighted average price method.
- (i) Moving simple average price method.
- (j) Moving weighted average price method.

2.9.3 Market Price Methods :

- (k) Replacement price method.
- (l) Realisable price method.

2.9.4 Notional Price Methods :

- (m) Standard price method.



- (n) Inflated price methods.
- (o) Re-use Price Method.

We may now briefly discuss all the above methods:

(a) Specific Price Method - This method is useful, specially when materials are purchased for a specific job or work order, and as such these materials are issued subsequently to that specific job or work order at the price at which they were purchased. To use this method, it is necessary to store each lot of material separately and maintain its separate account. The advantages and disadvantage of this method are :

Advantages :

1. The cost of materials issued for production purposes to specific jobs represent actual and correct costs.
2. This method is best suited for non-standard and specific products.

Disadvantage : This method is difficult to operate, specially when purchases and issues are numerous.

(b) First-in-First out Method (FIFO) - It is a method of pricing the issues of materials, in the order in which they are purchased. In other words, the materials are issued in the order in which they arrive in the store or the items longest in stock are issued first. Thus each issue of material only recovers the purchase price which does not reflect the current market price. This method is considered suitable in times of falling price because the material cost charged to production will be high while the replacement cost of materials will be low. But, in the case of rising prices, if this method is adopted, the charge to production will be low as compared to the replacement cost of materials. Consequently, it would be difficult to purchase the same volume of material (as in the current period) in future without having additional capital resources. The advantages and disadvantages of the method may be stated as follows :

Advantages :

1. It is simple to understand and easy to operate.
2. Material cost charged to production represents actual cost with which the cost of production should have been charged.
3. In the case of falling prices, the use of this method gives better results.
4. Closing stock of material will be represented very closely at current market price.



Cost Accounting

Disadvantages :

1. If the prices fluctuate frequently, this method may lead to clerical error.
2. Since each issue of material to production is related to a specific purchase price, the costs charged to the same job are likely to show a variation from period to period.
3. In the case of rising prices, the real profits of the concern being low, they may be inadequate to meet the concern's demand to purchase raw materials at the ruling price.

The application of FIFO method is illustrated below :

Material Received and Issued					
<i>Lot</i>	<i>Date</i>	<i>Quantity</i>	<i>Lot</i>	<i>Rate</i>	<i>Amount</i>
	<i>No.</i>		<i>Kg.</i>	<i>No.</i>	
1.	July 3	600		1.00	600.00
2.	July 13	800		1.20	960.00
3.	July 23	600		0.90	540.00
4.	August 5	400		1.10	440.00
5.	August 6	1200		0.80	960.00
	July 8		400 Kgs. out of (1)	1.00	400.00
	July 12		200 Kgs. out of (1)	1.00	200.00
	July 22		600 Kgs. out of (2)	1.20	720.00
	July 25		200 Kgs. out of (2)	1.20	240.00
			200 Kgs. out of (3)	0.90	180.00
	August 8		400 Kgs. out of (3)	0.90	360.00
			400 Kgs. out of (4)	1.10	440.00
			200 Kgs. out of (5)	0.80	160.00

The stock in hand after 8th August will be 1,000 Kgs. This will be out of lot number (5) and its value will be Rs. 800, *i.e.*, @ Re. 0.80 per Kg.

(c) Last-in-First out method (LIFO) - It is a method of pricing the issues of materials. This method is based on the assumption that the items of the last batch (lot) purchased are the first to be issued. Therefore, under this method the prices of the last batch (lot) is used for pricing the issues, until it is exhausted, and so on. If however, the quantity of issue is more than the quantity of the latest lot than earlier (lot) and its price will also be



taken into consideration. During inflationary period or period of rising prices, the use of LIFO would help to ensure that the cost of production determined on the above basis is approximately the current one. This method is also useful specially when there is a feeling that due to the use of FIFO or average methods, the profits shown and tax paid are too high.

The advantages and disadvantages of LIFO method are as follows :

Advantages :

1. The cost of materials issued will be either nearer to and or will reflect the current market price. Thus, the cost of goods produced will be related to the trend of the market price of materials. Such a trend in price of materials enables the matching of cost of production with current sales revenues.
2. The use of the method during the period of rising prices does not reflect undue high profit in the income statement as it was under the first-in-first-out or average method. In fact, the profit shown here is relatively lower because the cost of production takes into account the rising trend of material prices.
3. In the case of falling prices profit tends to rise due to lower material cost, yet the finished products appear to be more competitive and are at market price.
4. Over a period, the use of LIFO helps to iron out the fluctuations in profits.
5. In the period of inflation LIFO will tend to show the correct profit and thus avoid paying undue taxes to some extent.

Disadvantages :

1. Calculation under LIFO system becomes complicated and cumbersome when frequent purchases are made at highly fluctuating rates.
2. Costs of different similar batches of production carried on at the same time may differ a great deal.
3. In time of falling prices, there will be need for writing off stock value considerably to stick to the principle of stock valuation, *i.e.*, the cost or the market price whichever is lower.
4. This method of valuation of material is not acceptable to the income tax authorities.

(d) Base Stock Method - A minimum quantity of stock under this method is always held at a fixed price as reserve in the stock, to meet a state of emergency, if it arises. This minimum stock is known as base stock and is valued at a price at which the first lot of materials is received and remains unaffected by subsequent price fluctuations. Thus, this



Cost Accounting

is more a method of valuing inventory than a method of valuing issues because, with the base of stock valued at the original cost some other method of valuing issues should be adopted. The quantity in excess of the base stock may be valued either on the FIFO or LIFO basis. This method is not an independent method as it uses FIFO or LIFO. Its advantages and disadvantages therefore will depend upon the use of the other method viz., FIFO or LIFO.

Illustration :

'AT' Ltd. furnishes the following store transactions for September, 2006 :

1-9-06	Opening balance	25 units value Rs. 162.50
4-9-06	Issues Req. No. 85	8 units
6-9-06	Receipts from B & Co. GRN No. 26	50 units @ Rs. 5.75 per unit
7-9-06	Issues Req. No. 97	12 units
10-9-06	Return to B & Co.	10 units
12-9-06	Issues Req. No. 108	15 units
13-9-06	Issues Req. No. 110	20 units
15-9-06	Receipts from M & Co. GRN. No. 33	25 units @ Rs. 6.10 per unit
17-9-06	Issues Req. No. 12	10 units
19-9-06	Received replacement from B & Co. GRN No. 38	10 units
20-9-06	Returned from department, material of M & Co. MRR No. 4	5 units
22-9-06	Transfer from Job 182 to Job 187 in the dept. MTR 6	5 units
26-9-06	Issues Req. No. 146	10 units
29-9-06	Transfer from Dept. "A" to Dept. "B" MTR 10	5 units
30-9-06	Shortage in stock taking	2 units

Write up the priced stores ledger on FIFO method and discuss how would you treat the shortage in stock taking.



Material

Solution :

Stores Ledger of AT Ltd. for the month of September, 2006 (FIFO Method)

Date	GRN No. MRR No.	Qty. Units	RECEIPT			ISSUE			BALANCE		
			Rate Rs. P	Amount Rs. P	Requisition No.	Qty. Units	Rate Rs. P.	Amount Rs. P.	Qty. Units	Rate Rs. P.	Amount Rs. P.
1	2	3	4	5	6	7	8	9	10	11	12
1-9-06	—	—	—	—	—	—	—	—	25	6.50	162.50
4-9-06	—	—	—	—	85	8	6.50	52	17	6.50	110.50
6-9-06	26	50	5.75	287.50	—	—	—	—	17	6.50	398.00
7-9-06	—	—	—	—	97	12	6.50	78	50}	5.75}	320.00
10-9-06	—	—	—	—	Nil	10	5.75	57.50	5	6.50	262.00
12-9-06	—	—	—	—	108	5	6.50	—	30	5.75	172.50
13-9-06	—	—	—	—	110	10}	5.75}	90	10	5.75	57.50
15-9-06	33	25	6.10	152.50	—	—	—	—	10	5.75	210.00
17-9-06	—	—	—	—	121	10	5.75	57.50	25	6.10	152.50
19-9-06	38	10	5.75	57.50	—	—	—	—	25	6.10	210.00
20-9-06	4	5	5.75	28.75	—	—	—	—	5	5.75}	258.75
26-9-06	—	—	—	—	146	5	5.75	—	10}	7.75}	179.50
30-9-06	—	—	—	—	Shortage	2	6.10}	12.20	18	6.10}	167.30
									10}	5.75}	



Working Notes :

1. The material received as replacement from vendor is treated as fresh supply.
2. In the absence of information the price of the material received from within on 20-9-06 has been taken as the price of the earlier issue made on 17-9-06. In FIFO method physical flow of the material is irrelevant for pricing the issues.
3. The issue of material on 26-9-06 is made out of the material received from within.
4. The entries for transfer of material from one job and department to other on 22-9-06 and 29-9-06 are book entries for adjusting the cost of respective jobs and as such they have not been shown in the stores ledger account.
5. The material found short as a result of stock taking has been written off.

Illustration :

The following information is provided by SUNRISE INDUSTRIES for the fortnight of April, 2006 :

Material Exe :

Stock on 1-4-2006 100 units at Rs. 5 per unit.

Purchases

5-4-06	300	units	at Rs. 6
8-4-06	500	units	at Rs. 7
12-4-06	600	units	at Rs. 8

Issues

6-4-06	250	units
10-4-06	400	units
14-4-06	500	units

Required :

- (A) Calculate using FIFO and LIFO methods of pricing issues :
- (a) the value of materials consumed during the period
 - (b) the value of stock of materials on 15-4-06.
- (B) Explain why the figures in (a) and (b) in part A of this question are different under the two methods of pricing of material issues used. You need not draw up the Stores Ledgers.



Material

Solution

- (A) (a) Value of Material Exe consumed during the period
1-4-06 to 15-4-06 by using FIFO method.

<i>Date</i>	<i>Description Units</i>	<i>Qty.</i>	<i>Rate</i>	<i>Amount</i>
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
1-4-06	Opening balance	100	5	500
5-4-06	Purchased	300	6	1,800
6-4-06	Issued	100	5	1,400
		150	6	
8-4-06	Purchased	500	7	3,500
10-4-06	Issued	150	6	2,650
		250	7	
12-4-06	Purchased	600	8	4,800
14-4-06	Issued	250	7	3,750
		250	8	
15-4-06	Balance	350	8	2,800

Total value of material Exe consumed during the period under FIFO method comes to (Rs. 1,400 + Rs. 2,650 + Rs. 3,750) Rs. 7,800 and balance on 15-4-06 is of Rs. 2,800.

Value of Material Exe consumed during the period 1-4-06 to 15-4-06 by using LIFO method

<i>Date</i>	<i>Description</i>	<i>Qty.</i>	<i>Rate</i>	<i>Amount</i>
		<i>Units</i>	<i>Rs.</i>	<i>Rs.</i>
1-4-06	Opening balance	100	5	500
5-4-06	Purchased	300	6	1,800
6-4-06	Issued	250	6	1,500
8-4-06	Purchased	500	7	3,500
10-4-06	Issued	400	7	2,800
12-4-06	Purchased	600	8	4,800
14-4-06	Issued	500	8	4,000
15-4-06	Balance	350	—	2,300*



Cost Accounting

Total value of material Exe issued under LIFO method comes to (Rs. 1,500 + Rs. 2,800 + Rs. 4,000) Rs. 8,300.

*The balance 350 units on 15-4-06 of Rs. 2,300, relates to opening balance on 1-4-06 and purchases made on 5-4-06, 8-4-06 and 12-4-06. (100 units @ Rs. 5, 50 units @ Rs. 6, 100 units @ Rs. 7 and 100 units @ Rs. 8).

(b) As shown in (a) above, the value of stock of materials on 15-4-06:

Under FIFO method Rs. 2,800

Under LIFO method Rs. 2,300

(B) Total value of material Exe issued to production under FIFO and LIFO methods comes to Rs. 7,800 and Rs. 8,300 respectively. The value of closing stock of material Exe on 15-4-06 under FIFO and LIFO methods comes to Rs. 2,800 and Rs. 2,300 respectively.

The reasons for the difference of Rs. 500 (Rs. 8,300 – Rs. 7,800) as shown by the following table in the value of material Exe, issued to production under FIFO and LIFO are as follows :

Date	Quantity Issued (Units)	Value		Total Rs.	Value		Total Rs.
		FIFO Rs.	Total Rs.		LIFO Rs.	Total Rs.	
6-4-06	250	1,400			1,500		
10-4-06	400	2,650			2,800		
14-4-06	500	3,750	7,800	4,000		8,300	

1. On 6-4-06, 250 units were issued to production. Under FIFO their value comes to Rs. 1,400 (100 units × Rs. 5 + 150 units × Rs. 6) and under LIFO Rs. 1,500 (250 × Rs. 6). Hence, Rs. 100 was more charged to production under LIFO.
2. On 10-4-06, 400 units were issued to production. Under FIFO their value comes to Rs. 2,650 (150 × Rs. 6 + 250 × Rs. 7) and under LIFO Rs. 2,800 (400 × Rs. 7). Hence, Rs. 150 was more charged to production under LIFO.
3. On 14-4-06, 500 units were issued to production. Under FIFO their value comes to Rs. 3,750 (250 × Rs. 7 + 250 × Rs. 8) and under LIFO Rs. 4,000 (500 × Rs. 8). Hence, Rs. 250 was more charged to production under LIFO.

Thus the total excess amount charged to production under LIFO comes to Rs. 500.



Material

The reasons for the difference of Rs. 500 (Rs. 2,800 – Rs. 2,300) in the value of 350 units of Closing Stock of material Exe under FIFO and LIFO are as follows :

1. In the case of FIFO, all the 350 units of the closing stock belongs to the purchase of material made on 12-4-06, whereas under LIFO these units were from opening balance and purchases made on 5-4-06, 8-4-06 and 12-4-06.
2. Due to different purchase price paid by the concern on different days of purchase, the value of closing stock differed under FIFO and LIFO. Under FIFO 350 units of closing stock were valued @ Rs. 8 p.u. Whereas under LIFO first 100 units were valued @ Rs. 5 p.u., next 50 units @ Rs. 6 p.u., next 100 units @ Rs. 7 p.u. and last 100 units @ Rs. 8 p.u.

Thus under FIFO, the value of closing stock increased by Rs. 500.

Illustration

The following transactions in respect of material Y occurred during the six months ended 30th June, 2006:

Month	Purchase (units)	Price per unit	Issued units
		Rs.	
January	200	25	Nil
February	300	24	250
March	425	26	300
April	475	23	550
May	500	25	800
June	600	20	400

Required :

- (a) The Chief Accountant argues that the value of closing stock remains the same no matter which method of pricing of material issues is used. Do you agree? Why or why not? Detailed stores ledgers are not required.
- (b) When and why would you recommend the LIFO method of pricing material issues ?

Solution

(a) The Closing Stock at the end of six months period *i.e.*, on 30th June, 2006 will be 200 units, whereas up to the end of May 2006, total purchases coincide with the total



Cost Accounting

issues *i.e.*, 2,300 units. It means that at the end of May 2006, there was no closing stock. In the month of June 2006, 600 units were purchased out of which 400 units were issued. Since there was only one purchase and one issue in the month of June, 2006 and there was no opening stock on 1st June 2006, the Closing Stock of 200 units is to be valued at Rs. 20 per unit.

In view of this, the argument of the Chief Accountant appears to be correct. Where there is only one purchase and one issue in a month with no opening stock, the method of pricing of material issues becomes irrelevant. Therefore, in the given case one should agree with the argument of the Chief Accountant that the value of Closing Stock remains the same no matter which method of pricing the issue is used.

It may, however, be noted that the argument of Chief Accountant would not stand if one finds the value of the Closing Stock at the end of each month.

(b) LIFO method has an edge over FIFO or any other method of pricing material issues due to the following advantages :

- (i) The cost of the materials issued will be either nearer or will reflect the current market price. Thus, the cost of goods produced will be related to the trend of the market price of materials. Such a trend in price of materials enables the matching of cost of production with current sales revenues.
- (ii) The use of the method during the period of rising prices does not reflect undue high profit in the income statement, as it was under the first-in-first-out or average method. In fact, the profit shown here is relatively lower because the cost of production takes into account the rising trend of material prices.
- (iii) In the case of falling prices, profit tends to rise due to lower material cost, yet the finished products appear to be more competitive and are at market price.
- (iv) During the period of inflation, LIFO will tend to show the correct profit and thus, avoid paying undue taxes to some extent.

(e) **Simple Average Price Method** - Under this method, materials issued are valued at average price, which is calculated by dividing the total of all units rate by the number of unit rate. In other words :

$$\text{Material issue price} = \frac{\text{Total of unit prices of each purchase}}{\text{Total number of purchases}}$$

This method is useful under the following circumstances :

1. When the materials are received in uniform lots of similar quantity, otherwise, it will give wrong results.



2. When purchase prices do not fluctuate considerably.

Advantage : It is simple to understand and easy to operate.

Disadvantages :

1. Materials issue cost does not represent actual cost price. Since the materials are issued at a price obtained by averaging cost prices, a profit or loss may arise from such type of pricing.

2. In case the prices of material fluctuate considerably, this method will give incorrect results.

3. The prices of materials issues used are determined by averaging prices of purchases without giving consideration to the quantity. Such a price determination is unscientific.

(f) Weighted Average Price Method : This method gives due weights to quantities purchased and the purchase price, while, determining the issue price. The average issue price here is calculated by dividing the total cost of materials in the stock by total quantity of materials prior to each issue. The advantages and disadvantages of this method are :

Advantages :

1. It smoothens the price fluctuations if at all it is there due to material purchases.

2. Issue prices need not be calculated for each issue unless new lot of materials is received.

Disadvantage :

1. Material cost does not represent actual cost price and therefore, a profit or loss will arise out of such a pricing method.

(g) Periodic Simple Average Price Method : This method is similar to Simple Average Price Method except that the average price is calculated at the end of the concerned period. In other words, the price paid during the period for different lots of materials purchased are added up and the total is divided by the number of purchases made during the period. The rate so computed is then used to price all the issues made during the period, and also for valuing the closing inventory of the period.

Advantages :

1. It is simple to operate, as it avoids calculation of issue price after every receipt.

2. This method can usefully be employed in costing continuous processes where each individual order is absorbed into the general cost of producing large quantities of articles.

Disadvantages :

1. This method cannot be applied in jobbing industry where each individual job order is to be priced at each stage of its completion.



Cost Accounting

2. This method is unscientific as it does not take into consideration the quantities purchased at different prices.

3. This method also suffers from all those disadvantages of simple average cost method.

(h) Periodic Weighted Average Price Method : This method is like weighted average price method, except that the calculations of issue prices are made periodically (say, a month). The rate so arrived is used for the issues made during that period and also for valuing the inventory at the end of the period.

Advantage :

1. This method is superior to the periodic simple average price method as it takes into account the quantities also.

2. It overcomes or evens out the effect of fluctuations.

3. In addition to above, the method also possesses all the advantages of the simple weighted average price method.

Disadvantage : This method is not suitable for job costing because each job is to be priced at each stage of completion.

(i) Moving Simple Average Price Method : Under this method, the rate for material issues is determined by dividing the total of the periodic simple average prices of a given number of periods by the numbers of periods. For determining the moving simple average price, it is necessary to fix up first period to be taken for determining the average. Suppose a six monthly period is decided upon and moving, average rate for the month of June is to be calculated. Under such a situation, we have to make a list of the simple average prices from January to June, add them up, and divide the total by six. To calculate the moving average rate for July, we have to omit simple average rate pertaining to January and add the rate relating to July and divide the total by six.

Advantage : This method evens out price fluctuations over a longer period, thus stabilising the charges to work-in-progress. Thus the cost of production will be stable to a significant extent.

Disadvantage : A profit or loss arises by the use of moving simple average cost.

(j) Moving Weighted Average Price Method : Under this method, the issue, rate is calculated by dividing the total of the periodic weighted average price of a given number of periods by the number of periods.

(k) Replacement Price Method: Replacement price is defined as the price at which it is possible to purchase an item, identical to that which is being replaced or revalued. Under this method, materials issued are valued at the replacement cost of the items. This method pre-supposes the determination of the replacement cost of materials at the time of



each issue; viz., the cost at which identical materials could be currently purchased. The product cost under this method is at current market price, which is the main objective of the replacement price method.

This method is useful to determine true cost of production and to value material issues in periods of rising prices, because the cost of material considered in cost of production would be able to replace the materials at the increased price.

Advantage: Product cost reflects the current market prices and it can be compared with the selling price.

Disadvantage: The use of the method requires the determination of market price of material before each issue of material. Such a requirement creates problems.

(l) Realisable Price Method: Realisable price means a price at which the material to be issued can be sold in the market. This price may be more or may be less than the cost price at which it was originally purchased. Like replacement price method, the stores ledger would show profit or loss in this method too.

(m) Standard Price Method: Under this method, materials are priced at some predetermined rate or standard price irrespective of the actual purchase cost of the materials. Standard cost is usually fixed after taking into consideration the following factors:

- (i) Current prices,
- (ii) Anticipated market trends, and
- (iii) Discount available and transport charges etc.

Standard prices are fixed for each material and the requisitions are priced at the standard price. This method is useful for controlling material cost and determining the efficiency of purchase department. In the case of highly fluctuating prices of materials, it is difficult to fix their standard cost on long-term basis.

Advantages:

- (1) The use of the standard price method simplifies the task of valuing issues of materials.
- (2) It facilitates the control of material cost and the task of judging the efficiency of purchase department.
- (3) It reduces the clerical work.

Disadvantages:

- (1) The use of standard price does not reflect the market price and thus results in a profit or loss.
- (2) The fixation of standard price becomes difficult when prices fluctuate frequently.



Statement of receipts and issues by adopting First-in-First-Out Method

Date	Particulars	Receipts				Issues				Balance			
		Units		Value		Units		Value		Units		Value	
		No.	Rs.	Rs.	Rs.	No.	Rs.	Rs.	Rs.	No.	Rs.	Rs.	Rs.
Jan. 1	Purchase	100	1	100	—	—	—	—	100	1	100	—	—
Jan. 20	Purchase	100	2	200	—	—	—	—	100	1	100	—	—
Jan. 22	Issue to Job W 16	—	—	—	60	1	60	—	40	1	40	—	—
Jan. 23	Issue to Job W 17	—	—	—	40	1	40	—	100	2	200	—	—
					20	2	40	—	80	2	160		

Statement of receipts and issues by adopting Last-in-First-Out method

Date	Particulars	Receipts				Issues				Balance			
		Units		Value		Units		Value		Units		Value	
		No.	Rs.	Rs.	Rs.	No.	Rs.	Rs.	Rs.	No.	Rs.	Rs.	Rs.
Jan. 1	Purchase	100	1	100	—	—	—	—	100	1	100	—	—
Jan. 20	Purchase	100	2	200	—	—	—	—	100	1	100	—	—
Jan. 22	Issue to Job W 16	—	—	—	60	2	120	—	40	1	40	—	—
Jan. 23	Issue to Job W 17	—	—	—	40	2	80	—	80	1	80	—	—

Job W 17

20} 1} 20}

Statement of Receipt and Issues by adopting Weighted Average method

Date	Particulars	Receipts			Issues			Balance	
		Units	Rate	Value	Units	Rate	Value	Rate	Value
		No.	Rs.	Rs.	No.	Rs.	Rs.	Rs.	Rs.
Jan. 1	Purchase	100	1	100	—	—	100	1	100
Jan. 20	Purchase	100	2	200	—	—	200	1.50	300
Jan. 22	Issue to Job W 16	—	—	60	1.50	90	140	1.50	210
Jan. 23	Issue to Job W 17	—	—	60	1.50	90	80	1.50	120

Statement of Material Values allocated to Job W 16, Job 17 and Closing Stock, under aforesaid methods

	FIFO		LIFO		Weighted Average	
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Material for Job W 16	60	120	90	90		
Material for Job W 17	80	100	90	90		
Closing Stock	160	80	120	120		
	300	300	300	300		

Material





Cost Accounting

(n) **Inflated Price Method** - In case material suffers loss in weight due to natural or climatic factors, e.g., evaporation, the issue price of the material is inflated to cover up the losses.

(o) **Re-use Price Method** - When materials are rejected and returned to the stores or a processed material is put to some other use, then for the purpose it is meant, then such materials are priced at a rate quite different from the price paid for them originally. There is no final procedure for valuing use of material.

Illustration :

The following information is extracted from the Stores Ledger:

Material X	
Opening Stock	<i>Nil</i>
<i>Purchases :</i>	
Jan. 1	100 @ Re. 1 per unit
Jan. 20	100 @ Rs. 2 per unit
<i>Issues :</i>	
Jan. 22	60 for Job W 16
Jan. 23	60 for Job W 17

Complete the receipts and issues valuation by adopting the First-In-First-Out, Last-In-First-Out and the Weighted Average Method. Tabulate the values allocated to Job W 16, Job W 17 and the closing stock under the methods aforesaid and discuss from different points of view which method you would prefer.

Solution

From the point of view of cost of material charged to each job, it is minimum under FIFO and maximum under LIFO (Refer to Tables on previous pages). During the period of rising prices, the use of FIFO give rise to high profits and that of LIFO low profits. In the case of weighted average there is no significant adverse or favourable effect on the cost of material as well as on profits.

From the point of view of valuation of closing stock it is apparent from the above statement that it is maximum under FIFO, moderate under weighted average and minimum under LIFO.



It is clear from the Tables on previous page that the use of weighted average evens out the fluctuations in the prices. Under this method, the cost of materials issued to the jobs and the cost of material in hands reflects greater uniformity than under FIFO and LIFO. Thus from different points of view, weighted average method is preferred over LIFO and FIFO.

2.10 VALUATION OF RETURNS & SHORTAGES

2.10.1 Valuation of Materials Returned to the Vendor : Materials which do not meet quantity, dimensional and other specifications and are considered to be unfit for production are usually returned to the vendor. These materials can be returned to the vendor before they are sent to the stores. In case materials reach store and are noticed to be of sub-standard quality, then also they can be returned to vendor. The price of the materials to be returned to vendor should include its invoice price plus freight, receiving and handling charges etc. *Strictly speaking, the materials returned to vendor should be returned at the stores ledger price and not at invoice price.* But in practice invoice price is only considered, the gap between the invoice price and stores ledger price is charged as overhead.

In Stores ledger the defective or sub-standard materials are shown in the issue column at the rate shown in the ledger, and the difference between issue price and invoice cost is debited to an inventory adjustment account.

2.10.2 Valuation of Materials Returned to Stores: When materials requisitioned for a specific job or work-in progress are found to be in excess of the requirement or are unsuitable for the purpose, they are returned to the stores. There are two ways of treating such returns.

- (1) Such returns are entered in the receipt column at the price at which they were originally issued, and the materials are kept in suspense, to be issued at the same price against the next requisition.
- (2) Include the materials in stock as if they were fresh purchases at the original issue price.

2.10.3 Valuation of Shortages during Physical Verification: Materials found short during physical verification should be entered in the issue column and valued at the rate as per the method adopted, *i.e.*, FIFO or any other.

2.11 SELECTION OF PRICING METHOD

No hard and fast rule or procedure has been laid down to select a method of pricing



issues of material. However, the ultimate choice of a method of selection may be based on the following considerations.

- (a) The method of costing used and the policy of management.
- (b) The frequency of purchases and issues.
- (c) The extent of price fluctuations.
- (d) The extent of work involved in recording, issuing and pricing materials.
- (e) Whether cost of materials used should reflect current or historical conditions?

2.12 TREATMENT OF NORMAL AND ABNORMAL LOSS OF MATERIALS

Whichever method may be adopted for pricing materials, certain differences between the book balance and the value of physical stock are bound to occur. These differences, which may be a gain or loss, should be transferred to Inventory Adjustment Account pending investigation. If, upon investigation, they are regarded as normal, they should be transferred to Overhead Control Account; if abnormal, they should be written off to the Costing Profit and Loss Account.

In the case of normal losses, an alternative method is used to price per unit of material so as to cover the normal loss. It can be understood with the help of the example considered. Suppose 1,000 metres of gunny cloth are purchased at Rs. 2 per metre. It is expected that 1% would be the normal loss due to issues being made in small lots. The inflated price would be Rs. 2.02 p. *i.e.*, (Rs. 2,000 for 990 metres). The rate of Rs. 2.02 per metre of gunny cloth covers the cost a normal loss as well.

2.13 ACCOUNTING AND CONTROL OF WASTE, SCRAP, SPOILAGE AND DEFECTIVES

2.13.1 Waste - It represents the portion of basic raw materials lost in processing having no recoverable value. Waste may be visible - remnants of basic raw materials - or invisible; *e.g.*, disappearance of basic raw materials through evaporation, smoke etc. Shrinkage of material due to natural causes may also be a form of a material wastage.

Normal waste is absorbed in the cost of net output, whereas abnormal waste is transferred to the Costing Profit and Loss Account.

For effective control of waste, normal allowances for yield and waste should be made from past experience, technical factors and special features of the material process and product. Actual yield and waste should be compared with anticipated figures and appropriate actions should be taken where necessary. Responsibility should be fixed on



purchasing, storage, maintenance, production and inspection staff to maintain standards. A systematic procedure for feedback of achievement against laid down standards should be established.

2.13.2 Scrap - It has been defined as the incidental residue from certain types of manufacture, usually of small amount and low value, recoverable without further processing. Scrap may be treated in cost accounts in the following ways:-

- (i) Where the value of scrap is negligible, it may be excluded from costs. In other words, the cost of scrap is borne by good units and income scrap is treated as other income.
- (ii) The sales value of scrap net of selling and distribution cost, is deducted from overhead to reduce the overhead rate. A variation of this method is to deduct the net realisable value from material cost. This method is followed when scraps cannot be aggregated job or process-wise.
- (iii) When scrap is identifiable with a particular job or process and its value is significant, the scrap account should be charged with full cost. The credit is given to the job or process concerned. The profit or loss in the scrap account, on realisation, will be transferred to the Costing Profit and Loss Account.

Control of scrap really means the maximum effective utilisation of raw material. Scrap control does not, therefore, start in the production department; it starts from the stage of product designing. Thus the most suitable type of materials, the right type of equipment and personnel would help in getting maximum quantity of finished product from a given raw material.

A standard allowance for scrap should be fixed and actual scrap should be collected, recorded and reported indicating the cost centre responsible for it. A periodical scrap report would serve the purpose where two or more departments or cost centres are responsible for the scrap; the reports should be routed through the departments concerned.

2.13.3 Spoilage - It is the term used for materials which are badly damaged in manufacturing operations, and they cannot be rectified economically and hence taken out of process to be disposed of in some manner without further processing. Spoilage may be either normal or abnormal.

Normal spoilage (*i.e.*, which is inherent in the operation) costs are included in costs either charging the loss due to spoilage to the production order or by charging it to production overhead so that it is spread over all products. Any value realised from spoilage is credited to production order or production overhead account, as the case may be.



The cost of abnormal spoilage (*i.e.*, arising out of causes not inherent in manufacturing process) is charged to the Costing Profit and Loss Account. When spoiled work is the result of rigid specification, the cost of spoiled work is absorbed by good production while the cost of disposal is charged to production overhead.

To control spoilage, allowance for normal spoilage should be fixed and actual spoilage should be compared with standard set. A systematic procedure of reporting would help control over spoilage. A systematic procedure of reporting would help control over spoilage. A spoilage report should highlight the normal and abnormal spoilage, the department responsible, the causes of spoilage and the corrective action taken, if any.

2.13.4 Defectives - It signifies those units or portions of production which can be rectified and turned out as good units by the application of additional material, labour or other service. For example, some mudguards produced in a bicycle factory may have dents; or there may be duplication of pages or omission of some pages in a book. Defectives arise due to sub-standard materials, bad-supervision, bad-planning, poor workmanship, inadequate-equipment and careless inspection. To some extent, defectives may be unavoidable but usually, with proper care it should be possible to avoid defect in the goods produced.

Reclamation of loss from defective units - In the case of articles that have been spoiled, it is necessary to take steps to reclaim as much of the loss as possible. For this purpose:

- (i) All defective units should be sent to a place fixed for the purpose;
- (ii) These should be dismantled;
- (iii) Goods and serviceable parts should be separated and taken into stock;
- (iv) Parts which can be made serviceable by further work should be separated and sent to the workshop for the purpose and taken into stock after the defects have been removed; and
- (v) Parts which cannot be made serviceable should be collected in one place for being melted or sold.

Printed forms should be used to record quantities for all purposes aforementioned.

Control - When defectives are found, the Inspector will make out the Defective Work Report, giving particulars of the department, process or job, defective units, normal and abnormal defectives, cost of rectification etc. On receipt of the defective Work Report, it may be decided to rectify the defective work; all costs of rectification are collected against the rectification work order, precaution will be taken to see that number of defectives is



within normal limits. Defectives are generally treated in two ways, either they are brought up to the standard by incurring further costs on additional material and labour or where possible, they are sold as inferior production (seconds) at lower prices.

Defectives are generally treated in two ways: either they are brought up to the standard by incurring further costs on additional material and labour or where possible, they are sold as inferior products (seconds) at lower prices. The following illustration is given to explain the accounting procedure followed in either case.

Total expenses of manufacture	Rs. 5,000
Output	Good: 450 units Defective: 50 units
Cost of rectifying defectives	Rs. 50
Cost per unit of production	$= \frac{\text{Rs. } 5,000 + \text{Rs. } 50}{500} = \text{Rs. } 10.10 \text{ per unit}$

If the defectives are not rectified but sold as 'second's say, @ Rs. 8 each then cost of goods produced will be;

$$= \frac{\text{Rs. } 5,000 - \text{Rs. } 400}{450} = \text{Rs. } 10.22 \text{ per unit.}$$

Distinction between spoilage and defectives :

The difference between spoilage and defectives is that while spoilage cannot be repaired or reconditioned, defectives can be rectified and transferred, either back to standard production or to seconds.

Treatment of spoilage and defectives in Cost Accounting – Under Cost Accounts normal spoilage costs *i.e.*, (which is inherent in the operation) are included in cost either by charging the loss due to spoilage to the production order or charging it to production overhead so that it is spread over all products. Any value realised from the sale of spoilage is credited to production order or production overhead account, as the case may be. The cost of abnormal spoilage (*i.e.* arising out of causes not inherent in manufacturing process) is charged to the Costing Profit and Loss Account. When spoiled work is the result of rigid specifications the cost of spoiled work is absorbed by good production while the cost of disposal is charged to production overheads.

The problem of accounting for defective work is the problem of accounting of the costs of rectification or rework.



Cost Accounting

The possible ways of treatment are as below:

- (i) Defectives that are considered inherent in the process and are identified as normal can be recovered by using the following methods:
 - (a) *Charged to good products* - The loss is absorbed by good units. This method is used when 'seconds' have a normal value and defectives rectified into 'seconds' or 'first' are normal;
 - (b) *Charged to general overheads* - When the defectives caused in one department are reflected only on further processing, the rework costs are charged to general overheads;
 - (c) *Charged to the department overheads* - If the department responsible for defectives can be identified then the rectification costs should be charged to that department;
 - (d) *Charged to Costing Profit and Loss Account* - If defectives are abnormal and are due to causes beyond the control of organisation, the rework cost should be charged to Costing Profit and Loss Accounts.
- (ii) Where defectives are easily identifiable with specific jobs, the work costs are debited to the job.

Procedure for the control of Spoilage and Defectives - To control spoilage, allowance for a normal spoilage should be fixed up and actual spoilage should be compared with standard set. A systematic procedure of reporting would help control over spoilage. A spoilage report (as below) would highlight the normal and abnormal spoilage, the department responsible, the causes of spoilage and the corrective action taken if any.

Spoilage Report

Units/Deptt. No.....

Date.....

Production Order No.....

Units Produced	Units spoiled	Normal	Spoilage	Abnormal	Spoilage	Cost of abnormal spoilage Rs.	Reason spoilage	Action taken
		Qty.	%	Qty.	%			

Control of defectives may cover the following two areas:

- (a) Control over defectives produced
- (b) Control over reworking costs.



Material

For exercising effective control over defectives produced and the cost of reworking, standards, for normal percentage of defectives and reworking costs should be established.

Actual performance should be compared with the standards set. Defective Work Report (as shown on below page should be fed back to the respective Centres of Control.)

Defective Work Report

Dept.....

Date.....

Causes of defects.....

Nature of defects.....

Job/	Defective		Detail of work to be done	Re-work Costs			Total Rs.	Unit Cost of reworking Rs.	Net good output after re-wroking
	Normal	Abnormal		Materials Rs.	Labour Rs	Overhead Rs.			

Losses due to obsolete stores - Obsolescence is defined as “the loss in the intrinsic value of an asset due to its supersession”. Materials may become obsolete under any of the following circumstances:

- (i) where it is a spare part or a component of a machinery used in manufacture and that machinery becomes obsolete ;
- (ii) where it is used in the manufacture of a product which has become obsolete ;
- (iii) where the material itself is replaced by another material due to either improved quality or fall in price.

In all three cases, the value of the obsolete material held in stock is a total loss and immediate steps should be taken to dispose it off at the best available price. The loss arising out of obsolete materials on abnormal loss does not form part of the cost of manufacture. Losses due to obsolescence can be minimised through careful forethought and reduced stocking of spares, etc. Stores records should be continuously gone through to see whether any item is likely to become obsolete. There will be such likelihood if an item has not been used for a long time. (This does not apply to spare parts of machines still in use).



2.14 CONSUMPTION OF MATERIALS

Any product that is manufactured in a firm entails consumption of resources like material, labour etc. The management for planning and control must know the cost of using these resources in manufacturing. The consumption of materials takes place say when the material is used in the manufacture of the product. It is important to note that the amount of materials consumed in a period by a cost object need not be equal to the amount of material available with the concern. For example, during any period the total of raw material stock available for use in production may not be equal to the amount of materials actually consumed and assigned to the cost object of the production. The difference between the material available and material consumed represents the stock of material at the end of the period.

2.14.1 Identification of Materials: For the identification of consumption of materials with products of cost centres the followings points should be noted:

1. It is required that the concern should follow coding system for all materials so that each material is identified by unique code number.
2. It is required that each product of a cost centre should be given a unique code number so that the direct material issued for production of particular product of a cost centre can be collected against the code number of that product.

However, it may not be possible to allocate all materials directly to individual product of a cost centre e.g. maintenance materials, inspection and testing materials etc. The consumption of these materials are collected for cost centre and then charged to individual product by adopting suitable overhead absorption rate of cost centre.

$$\text{Overhead absorption rate of cost centre} = \frac{\text{Cost for cost centre}}{\text{Base relating to cost centre}} \\ \text{(e.g. labour hrs. or machine hrs.)}$$

3. Each issue of materials should be recorded. One way of doing this is to use a material requisition note. This note shows the details of materials issued for product of cost centre and the cost centre which is to be charged with cost of materials.
4. A material return note is required for recording the excess materials returned to the store. This note is required to ensure that original product of cost centre is credited with the cost of material which was not used and that the stock records are updated.
5. A material transfer note is required for recording the transfer of materials from one product of cost centre to other or from one cost centre to other cost centre.



6. The cost of materials issued would be determined according to stock valuation method used.

2.14.2 Monitoring Consumption of Materials: For monitoring consumption of materials a storekeeper should periodically analyse the various material requisitions, material return notes and material transfer notes. Based on this analysis, a material abstract or material issue analysis sheet is prepared, which shows at a glance the value of material consumed in manufacturing each product. This statement is also useful for ascertaining the cost of material issued for each product.

Format of Material Abstract

Week Ending.....

Material requisition or Transfer Note or Returned Note No.	Amount Rs.	Product Nos.						Total for Product	Overheads (Indirect Material charged) Rs.
		101	102	103	104	105	106		
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.		
	—	—	—	—	—	—	—	—	
Total									

The material abstract statement serves a useful purpose. It in fact shows the amount of material to be debited to various products & overheads. The total amount of stores debited to various products & overheads should be the same as the total value of stores issued in any period.

2.14.3 Basis for consumption entries in Financial Accounts: Every manufacturing organisation assigns material costs to products for two purposes. Firstly, for external financial accounting requirements, in order to allocate the material costs incurred during the period between cost of goods produced and inventories; secondly to provide useful information for managerial decision making requirements. In order to meet external financial accounting requirements, it may not be necessary to accurately trace material costs to individual products. Some products costs may be overstated and others may be understated but this may not matter for financial accounting purposes as long as total of individual materials costs assigned to cost of production and inventories are equal to total cost of materials.

In Financial Accounts the external transactions are recorded i.e. transaction between the firm and other entities are recorded in a manner that facilitates periodical reporting of



Cost Accounting

assets, liabilities, revenue and expenditures for a firm as a whole or for each business segment or geographical segment in which firm operates. In Cost Accounting the internal transactions are recorded i.e., transactions between cost centre within the firm are recorded in a manner that facilitates analysis of costs for assigning them to cost units.

The consumption entries in financial accounts are made on the basis of total cost of purchases of materials after adjustment for opening and closing stock of materials. The stock of materials is taken at cost or net realisable value whichever is less.

2.15 Miscellaneous Illustration

Illustration 1

The average annual consumption of a material is 18,250 units at a price of Rs.36.50 per unit. The storage cost is 20% on an average inventory and the cost of placing an order is Rs.50. How much quantity is to be purchased at a time?

Solution:

Economic Order Quantity

$$= \sqrt{\frac{2 \times 18,250 \text{ units} \times \text{Rs.}50}{\text{Rs.}36.50 \times 20/100}} = \sqrt{\frac{18,25,000}{7.3}} = 500 \text{ units}$$

Illustration 2

Anil & Company buys its annual requirement of 36,000 units in 6 instalments. Each unit costs Re. 1 and the ordering cost is Rs. 25. The inventory carrying cost is estimated at 20% of unit value. Find the total annual cost of the existing inventory policy. How much money can be saved by Economic Order Quantity.

Solution:

	Rs.
(a) Ordering cost (6 orders @ Rs. 25)	150
Carrying cost of average inventory (36,000 ÷ 6) = 6,000 units per order	
Average inventory = 3,000 units	
Carrying cost = 20% of Re. 1 × 3,000 = 3,000 × 0.20	<u>600</u>
Total cost	<u>750</u>



$$EOQ = \sqrt{\frac{2 \times 36,000 \times 25}{\text{Re. } 1 \times 20\%}} = 3000 \text{ units}$$

No. of orders = $36,000 \div 3,000 \text{ units} = 120 \text{ orders}$

Ordering cost ($12 \times \text{Rs. } 25$) = Rs. 300

Carrying cost of average inventory ($3,000 \times 0.20$) $\div 2 =$ Rs. 300

Total Cost Rs. 600

Savings due to EOQ Rs. ($750 - 600$) = Rs. 150

Note : As the units purchase cost of Re 1 does not change in both the computation, the same has not been considered to arrive at total cost of inventory for the purpose of savings.

Illustration 3

A Company manufactures a special product which requires a component 'Alpha'. The following particulars are collected for the year 2008 :

- i) Annual demand of Alpha 8,000 units
- ii) Cost of placing an order Rs.200 per order
- iii) Cost per unit of Alpha Rs.400
- iv) Carrying cost % p.a. 20%

The company has been offered a quantity discount of 4 % on the purchase of 'Alpha' provided the order size is 4,000 components at a time.

Required :

- i) Compute the economic order quantity
- ii) Advise whether the quantity discount offer can be accepted.

Solution:

- i) Calculation of Economic Order Quantity

$$EOQ = \sqrt{\frac{2AB}{CS}} = \sqrt{\frac{2 \times 8,000 \text{ units} \times \text{Rs. } 200}{\text{Rs. } 400 \times 20/100}} = 200 \text{ units}$$



Cost Accounting

ii) Evaluation of Profitability of Different Options of Order Quantity

(a) When EOQ is ordered (Rs.)

Purchase Cost	(8,000 units × Rs 400)	32,00,000
Ordering Cost	[(8,000 units/200 units) × Rs.200]	8,000
Carrying Cost	(200 units × Rs.400 × ½ × 20/100)	<u>8,000</u>
Total Cost		32,16,000

(b) When Quantity Discount is accepted (Rs.)

Purchase Cost	(8,000 units × Rs.384)	30,72,000
Ordering Cost	[(8,000 units/4000 units) × Rs.200]	400
Carrying Cost	(4000 units × Rs.384 × ½ × 20/100)	<u>1,53,600</u>
Total Cost		32,26,000

Advise – The total cost of inventory is lower if EOQ is adopted. Hence, the company is advised not to accept the quantity discount.

Illustration 4

PQR Limited produces a product which has a monthly demand of 52,000 units. The product requires a Component X which is purchased at Rs.15 per unit. For every finished product, 2 units of Component X are required. The ordering cost is Rs.350 per order and the carrying cost is 12% p.a.

Required :

- Calculate the economic order quantity for Component X.
- If the minimum lot size to be supplied is 52,000 units, what is the extra cost, the company has to incur?
- What is the minimum carrying cost, the company has to incur ?

Solution:

Annual consumption of Component X

$$= 52,000 \text{ units} \times 2 \times 12 \text{ months} = 12,48,000 \text{ units}$$



i) Calculation of Economic Order Quantity

$$EOQ = \sqrt{\frac{2 \times 12,48,000 \text{ units} \times \text{Rs.}350}{\text{Rs.}15 \times 12/100}} = 22,030 \text{ units}$$

ii) Calculation of Extra Cost if Minimum Lot size to be supplied is 52,000 units (Rs.)

Calculation of Extra Cost if Minimum Lot size to be supplied is 52,000 units		
(a) If Lot size is 52,000 units		
Ordering cost	=(12,48,000 / 52,000 × Rs.350)	8,400
Carrying cost	=(52,000 units × ½ × Rs.15 × 12/100)	<u>46,800</u>
		<u>55,200</u>
(b) If Lot size is 22,030 units (EOQ)		
Ordering cost	=(12,48,000/22,030 × Rs.350)	19,828
Carrying cost	=(22,030 units × ½ × Rs.15 × 12/100)	<u>19,827</u>
		<u>39,655</u>
Extra cost (a) – (b)		15,545

iii) Minimum Carrying Cost

$$= 22,030 \text{ units} \times \frac{1}{2} \times \text{Rs.}15 \times 12/100 = \text{Rs.}19,827$$

Illustration 5

The complete Gardener is deciding on the economic order quantity for two brands of lawn fertilizer. Super Grow and Nature’s Own. The following information is collected:

	Fertilizer	
	Super Grow	Nature’s Own
Annual demand	2,000 bags	1,280 bags
Relevant ordering cost per purchase order	Rs. 1,200	Rs. 1,400
Annual relevant carrying cost per bag	Rs. 480	Rs. 560

Required:

- (i) Compute EOQ for Super Grow and Nature’s own.
- (ii) For the EOQ, what is the sum of the total annual relevant ordering costs and total annual relevant carrying costs for Super Grow and Nature’s own?



Cost Accounting

- (iii) For the EOQ, compute the number of deliveries per year for Super Grow and Nature's own.

Solution:

$$(i) \quad EOQ = \sqrt{\frac{2ab}{CS}}$$

Where,

a = annual consumption

b = Buying cost per order

C = Cost per unit

S = Storage and other inventory carrying cost rate.

EOQ for Super Grow	EOQ for Nature's own
$EOQ = \sqrt{\frac{2 \times 2,000 \times 1,200}{480}}$ $= \sqrt{10,000} \text{ or } 100 \text{ bags}$	$EOQ = \sqrt{\frac{2 \times 1,280 \times 1,400}{560}}$ $= \sqrt{6,400} \text{ or } 80 \text{ bags}$

- (ii) Total annual relevant cost for Super Grow Fertilizer
= Total annual relevant ordering costs + Total annual relevant carrying cost
= $(1,200/100) \times 2,000 + \frac{1}{2} \times 100 \text{ bags} \times 480$
= Rs. 24,000 + Rs. 24,000 = Rs. 48,000
Total annual relevant costs for Nature's own fertilizer
= Total annual relevant ordering costs + Total annual relevant carrying costs
= $(1,400/80) \times 1,280 \text{ bags} + \frac{1}{2} \times 80 \text{ bags} \times \text{Rs. } 560$
= Rs. 22,400 + Rs. 22,400 = Rs. 44,800



(iii) Number of deliveries for Super Grow Fertilizer per year

$$= \frac{\text{Annual demand for fertilizer bags}}{\text{EOQ}}$$

$$= \frac{2,000 \text{ bags}}{100 \text{ bags}} = 20 \text{ orders}$$

= Number of deliveries for Nature's own fertilizer per year

$$= \frac{1,280 \text{ bags}}{80 \text{ bags}} = 16 \text{ orders.}$$

Illustration 6

(a) The Purchase Department of your organization has received an offer of quantity discounts on its orders of materials as under:

Price per tonne	Tonnes
Rs.	
1,200	Less than 500
1,180	500 and less than 1,000
1,160	1,000 and less than 2,000
1,140	2,000 and less than 3,000
1,120	3,000 and above

The annual requirement for the material is 5,000 tonnes. The delivery cost per order is Rs. 1,200 and the stock holding cost is estimated at 20% of material cost per annum.

You are required to advise the Purchase Department the most economical purchase level.

(b) From the following data for the year ended 31st December, 2006, calculate the inventory turnover ratio of the two items and put forward your comments on them.

	Material A	Material B
	Rs.	Rs.
Opening stock 1.1.2006	10,000	9,000
Purchase during the year	52,000	27,000
Closing stock 31.12.2006	6,000	11,000



Cost Accounting

Solution:

(a) Statement showing the most economic purchase level

1. Order size (tonne)	400	500	1,000	2,000	3,000
2. No. of orders (Annual requirement ÷ order size)	12.5	10	5	2.5	1.67
3. Value of orders (Order size × Price per tonne) (Rs. '000)	480	590	1,160	2,280	3,360
4. Average inventory (Value per order ÷ 2) (Rs. '000)	240	295	580	1,140	1,680
5. Ordering Cost (No. of orders × ordering cost per order, i.e., Rs. 1,200)	15,000	12,000	6,000	3,000	2,000
Carrying cost (20% of item 4)	48,000	59,000	1,16,000	2,28,000	3,36,000
Total of 5	63,000	71,000	1,22,000	2,31,000	3,38,000
<i>Add:</i> Annual cost of material (Annual demand × Price per tonne)	60,00,000	59,00,000	58,00,000	57,00,000	56,00,000
Total annual cost	60,63,000	59,71,000	59,22,000	59,31,000	59,38,000

Rs. 59,22,000 is the total minimum cost at 1,000 order size. Therefore, the most economical purchase level is 1,000 tonnes.

(b) First of all it is necessary to find out the material consumed:

<i>Cost of materials consumed</i>	<i>Material A</i>	<i>Material B</i>
	<i>Rs.</i>	<i>Rs.</i>
Opening stock	10,000	9,000
<i>Add:</i> Purchases	<u>52,000</u>	<u>27,000</u>
	62,000	36,000
<i>Less:</i> Closing stock	<u>6,000</u>	<u>11,000</u>
Materials consumed	<u>56,000</u>	<u>25,000</u>



Material

Average inventory: (Opening Stock + Closing Stock) ÷ 2	8,000	10,000
Inventory Turnover ratio: (Consumption ÷ Average inventory)	7 times	2.5 times
Inventory Turnover (Number of Days in a year/IT ratio)	52 days	146 days

Comments: Material A is more fast moving than Material B.

Illustration 7

A company uses three raw materials. A, B and C for a particular product for which the following data apply:

Raw material	Usage per unit of product (Kgs.)	Re-order Quantity (Kgs.)	Price per Kg. (Re.)	Delivery in period (in weeks)			Re-order level (Kgs.)	Minimum level (Kgs.)
				Minimum	Average	Maximum		
A	10	10,000	0.10	1	2	3	8,000	
B	4	5,000	0.30	3	4	5	4,750	
C	6	10,000	0.15	2	3	4		2,000

Weekly production varies from 175 to 225 units, averaging 200 units of the said product. What would be the following quantities:

- (i) Minimum stock of A
- (ii) Maximum Stock of B
- (iii) Re-order level of C
- (iv) Average Stock level of A

Solution:

- (i) Minimum stock level of A = Reorder level – (Normal Usage × Average Delivery Time)
= 8,000 kgs. – {(200 units × 10 kg.) × 2 weeks}
= 4,000 kgs.
- (ii) Maximum stock of B = Reorder level + Reorder Quantity – Minimum consumption to obtain delivery
= 4,750 kgs. + 5,000 kgs. – (175 units × 4 kgs. × 3 weeks)
= 7,650 kgs.



Cost Accounting

- (iii) Reorder level of C = Maximum reorder period \times Maximum usage
= 4 weeks \times (225 units \times 6 kgs.) = 5,400 kgs.
- OR
- = Minimum stock + (Average rate of consumption \times Average Delivery Period)
= 2,000 kgs. + {(200 \times 6) \times 3 weeks} = 5,600 kgs.
- (iv) Average stock level of A = Minimum level + $\frac{1}{2}$ \times Reorder quantity
= 4,000 kgs. + $\frac{1}{2}$ \times 10,000 = 9,000 kgs.
- OR
- = (Minimum stock + Maximum stock) \div 2
= (4,000 + 16,250*) \div 2 = 10,125 kgs.

*(Reorder Level + Reorder Quantity) – (Minimum Consumption \times Minimum Reorder Period)

$$= 8,000 + 10,000 \text{ kgs} - (175 \times 10 \times 1)$$
$$= 16,250 \text{ kgs.}$$

2.16 Self Examination Questions

Multiple Choice Questions

- (a) Direct material is a
- (i) Fixed cost
 - (ii) Variable cost
 - (iii) Semi-variable cost.
- (b) In most of the industries, the most important element of cost is
- (i) Material
 - (ii) Labour
 - (iii) Overheads.
- (c) Which of the following is considered to be the normal loss of materials?
- (i) Loss due to accidents
 - (ii) Pilferage
 - (iii) Loss due to breaking the bulk



- (iv) Loss due to careless handling of materials
 - (v) All of these.
- (d) In which of following methods of pricing, costs lag behind the current economic values?
- (i) Last-in-first out price
 - (ii) First-in-first out price
 - (iii) Replacement price
 - (iv) Weighted average price.
- (e) Continuous stock taking is a part of
- (i) Annual stock taking
 - (ii) Perpetual inventory
 - (iii) ABC analysis.
- (f) In which of the following methods, issues of materials are priced at pre-determined rate?
- (i) Inflated price method
 - (ii) Standard price method
 - (iii) Replacement price method
 - (iv) Specific price method.
- (g) When material prices fluctuate widely, the method of pricing that gives absurd results is
- (i) Simple average price
 - (ii) Weighted average price
 - (iii) Moving average price
 - (iv) Inflated price.
- (h) When prices fluctuate widely, the method that will smooth out the effect of fluctuations is
- (i) Simple average
 - (ii) Weighted average
 - (iii) FIFO
 - (iv) LIFO.
- (i) Which of the following is considered to be a normal loss of material?
- (i) Loss due to accidents
 - (ii) Pilferage
 - (iii) Loss due to careless handling of material.
 - (iv) Loss due to breaking the bulk.
- (j) Continuous stock taking is a part of,
- (i) Annual stock taking



Cost Accounting

- (ii) Perpetual inventory
 - (iii) ABC analysis
 - (iv) None of the above.
- (k) Lead time 5 weeks, average weekly consumption 28 units. What should be the re-ordering level ?
- (i) 120 units
 - (ii) 130 units
 - (iii) 140 units
 - (iv) 150 units.
- (l) Price per unit Rs 150, annual consumption 2,000 units, ordering cost Rs 300 per order and other charges 20% of cost. What should be the quantity of each order?
- (i) 150 units
 - (ii) 200 units
 - (iii) 225 units
 - (iv) None of the above.
- (m) Bin card is maintained by the
- (i) Accounts department
 - (ii) Costing department
 - (iii) Stores
 - (iv) None of the above.
- (n) Bin card contains
- (i) Details of the price of raw material lying in the Bin
 - (ii) Details of the price and quantity of raw material lying in the Bin
 - (iii) Details of quantity of material lying in the Bin
 - (iv) None of the above.
- (o) Which of the following assumptions hold true for the calculation of Economic Order Quantity?
- (i) Anticipated usage of material in units is known
 - (ii) Cost per unit of material is constant and known
 - (iii) Ordering cost per order is fixed
 - (iv) None of the above.



Answers to Multiple Choice Questions

(a) (ii); (b) (i); (c) (ii); (e) (ii); (f) (ii); (g) (i); (h) (ii);. (i) ii; (j) ii; (k) iii ; (l) ii; (m) iii ; (n) iii ; (o) iv

Short Answer Type Questions

1. What are the main objectives of material control ? Explain the important requirements to attain these objectives.
2. Give specimen form of the following :
 - (i) Bill of material.
 - (ii) Purchase requisition.
3. State how you would treat the following in cost records :
 - (a) Pricing of materials returned to stores and
 - (b) Pricing of materials returned to suppliers.
4. What do you mean by waste, scrap, spoilage and defectives ? How they are treated in Cost Accounts ?
5. How would you deal the following in Cost Accounts :
 - (i) Carriage inwards on raw materials.
 - (ii) Cost of handling materials.

Long Answer Type Questions

1. Define re-ordering level and explain its relationship to maximum and minimum stock levels. What factors may be considered in fixing reordering levels?
2. Discuss the use of perpetual inventory records and continuous stock taking.
3. Explain the concept of 'ABC Analysis' as a technique of inventory control.
4. Explain FIFO and LIFO methods of valuation of material issue. Discuss the effect of rising prices and falling prices on these two methods of pricing of material issues.
5. Discuss in detail the procedure followed for procuring material.

Numerical Questions

1. The rate of interest is 12%, the price per unit is Rs. 50, the number of units required in a year is 5,000 and the cost of placing one order and receiving the goods once is Rs. 54. How much should be purchased at a time ?
2. The following is the record of an item in a stores ledger

		<i>Units</i>	<i>Amount</i>			<i>Units</i>	<i>Amount</i>
			Rs.				Rs.
Jan. 1	To Balance b/d	10,000	20,000	Jan. 15	By Issue	14,000	30,000
Jan. 10	To Purchase	5,000	12,000	Feb. 8	By Issue	6,000	15,000



Cost Accounting

Feb. 3	To Purchase	20,000	55,000	Mar. 15	By Issue	22,000	60,000
Mar. 10	To Purchase	<u>10,000</u>	<u>30,000</u>	Mar. 31	By Bal. C/d	<u>3,000</u>	<u>12,000</u>
		<u>45,000</u>	<u>1,17,000</u>			<u>45,000</u>	<u>1,17,000</u>

Comment upon the method followed to price the issues. Find out the value of closing stock assuming issue to have been made for period on (i) FIFO basis, (ii) LIFO basis, and (iii) Weighted average basis.

3. In a printing press, a form of 8 pages was fitted upside down and this was discovered only after 5,000 sheets had been printed. The total print order was for 10,000 sheets, the cost per 1,000 sheets being Rs. 50. Would it be correct to say that the loss is Rs. 250 ?
4. A company ordered 54 tonnes of coal from a colliery. The invoice was for Rs. 1,000, the freight being Rs. 300. The actual quantity received was 52 tonnes. What should be the price per tonne ?
Ten tonnes of coal were destroyed by an accident quantity received was 52 tonnes. How should be the loss be treated ?
5. In a section of ready-made garments factory the monthly wages and overhead respectively amounted to Rs. 5,875 and Rs. 3,650. In a period 10,000 metres of cloth were introduced out of which 600 metres still remained in stock. It takes 2 metres to make the garments but in the month, the total output was 4,500 garments. The cost of the cloth is Rs. 3.50 per metre. Ascertain the cost of garment, assuming cuttings were sold for Rs. 125.
6. The purchase Department of your organisation has received an offer of quantity discounts on its orders of materials as under :

<i>Price per tonne</i>	<i>Tonnes</i>
Rs.	Nos.
1,400	Less than 500
1,380	500 and less than 1,000
1,360	1,000 and less than 2,000
1,340	2,000 and less than 3,000
1,320	3,000 and above.

The annual requirement for the material is 5,000 tonnes. The delivery cost per order is Rs. 1,200 and the annual stock holding cost is estimated at 20% of the average inventory.

The Purchase Department wants you to consider the following purchase options and advise which among them will be the most economical ordering quantity, presenting the relevant information in a tabular form.



The purchase quantity options to be considered are 400 tonnes, 500 tonnes, 1,000 tonnes, 2,000 tonnes and 3,000 tonnes.

7. Component 'Pee' is made entirely in cost centre 100. Material cost is 6 paise per component and each component takes 10 minutes to produce. The machine operator is paid 72 paise per hour, and the machine hour rate is Rs. 1.50. The setting up of the machine to produce the component 'Pee' takes 2 hours 20 minutes.

On the basis of this information, prepare a cost sheet showing the production and setting up cost, both in total and per component, assuming that a batch of :

- (a) 10 components,
 - (b) 100 components, and
 - (c) 1,000 components
- is produced.

8. From the details given below, calculate :

- (i) Re-ordering level
- (ii) Maximum level
- (iii) Minimum level
- (iv) Danger level

Re-ordering quantity is to be calculated on the basis of following information.

- cost of placing a purchase order is Rs. 20
- Number of units to be purchased during the year is 5,000.
- Purchase price per unit inclusive of transportation cost is Rs. 50
- Annual cost of storage per unit is Rs. 5
- Details of lead time :
Average 10 days, Maximum 15 days, Minimum 6 days. For emergency purchase 4 days.
- Rate of consumption
Average : 15 units per day.
Minimum : 20 units per day.

Answers to Numerical Questions.

- 1. 300 units
- 2. (i) Rs. 9,000
(ii) Rs. 7,500



Cost Accounting

- (iii) Rs. 8,497
3. No, wages of machine man should be added. Loss of overhead.
 4. Rs. 25 Debit Costing Profit and Loss A/c Rs. 250.
 5. Cost Rs. 9.09 per unit; loss debited to Costing Profit and Loss A/c 1,400.
 6. Most economical order size is 1,000 tonnes.
 7. Total cost (Rs. 9.48; Rs. 48.18; Rs. 435.18) and per component cost is (Rs. 0.948; Rs. 0.4818 and Rs. 0.43518) respectively when the batch size is 10,100 and 1,000 components.
 8.

(i) ROL	=	300 units.
(ii) Maximum level	=	440 units
(iii) Minimum level	=	150 units
(iv) Danger level	=	60 units.

CHAPTER 3

LABOUR

Learning Objectives

When you have finished studying this chapter, you should be able to

- ◆ Understand the need of labour cost control.
- ◆ Understand the attendance and the payroll procedure.
- ◆ Describe the meaning and accounting treatment of idle time and overtime.
- ◆ Understand the concept of labour turnover and the various methods of computing the same.
- ◆ Understand various types of systems of wage payment and incentives.
- ◆ Describe the efficiency rating procedures.

3.1 INTRODUCTION

Labour cost after material cost is another significant element of cost not only because the wage bill in a modern organisation is generally substantial but also because it has certain peculiar characteristics which other elements of cost do not have. A good cost accountant must understand the special features of labour cost, the most important of which is that there is almost no limit to the increase of output of this most important and wonderful factor of production.

3.2 LABOUR COST CONTROL

Labour costs are associated with human beings. To control labour costs one has to understand why human beings work and what factors motivate them to give best performance. Control over labour costs does not imply control over the size of the wage bill; it also does not imply that wages of each worker should be kept as low as possible. Actually if a policy of low wages is adopted, it may turn out to be expensive since the ill-paid workers will be dissatisfied and turn out low output. Low wages are, therefore, often dear wages. The aim should be to keep the wages cost per unit of output as low as possible. This can only be brought about by giving workers optimum wages and then harnessing their energies to optimise output. A well motivated team of workers can bring about wonders. Each concern should, therefore,



Cost Accounting

constantly strive to raise the productivity of labour. The efforts for the control of labour costs should begin from the very beginning. There has to be a concerted effort by all the concerned departments. In a large organisation, generally the following departments are involved in the control of labour costs :

1. *Personnel Department* - This department is assigned the duty of recruiting workers, training them and maintaining their record. It is the duty of this department to ensure that the persons recruited possess the qualifications and qualities necessary to perform well the concerned jobs.
2. *Engineering and Work Study Department* - This department prepares plans and specifications for each job, supervises production activities, conducts time and motion studies, undertakes job analysis, etc.
3. *Time-keeping Department* - This Department is primarily concerned with the maintenance of attendance records of the employees and the time spent by them on various jobs, etc.
4. *Payroll Department* - This department is responsible for the preparation of payroll of the employees.
5. *Cost Accounting Department* - This department is responsible for the accumulation and classification etc. of all type of costs. All such data pertaining to labour costs are also collected, analysed and allocated to various jobs, processes, departments, etc., by this department.

3.2.1 Important Factors for the Control of Labour Cost : To exercise an effective control over the labour costs, the essential requisite is efficient utilisation of labour and allied factors. The main points which need consideration for controlling labour costs are the following :

- (i) Assessment of manpower requirements.
- (ii) Control over time-keeping and time-booking.
- (iii) Time & Motion Study.
- (iv) Control over idle time and overtime.
- (v) Control over labour turnover.
- (vi) Wage systems.
- (vii) Incentive systems.
- (viii) Systems of wage payment and incentives.
- (ix) Control over casual, contract and other workers.
- (x) Job Evaluation and Merit Rating.
- (xi) Labour productivity.



3.2.2 Collection of Labour Costs : The task of collecting labour costs is performed by the Cost Accounting Department which record separately wages paid to direct and indirect labour. It is the duty of this department to ascertain the effective wages per hour in each department and to analyse the total payment of wages of each department into :

- (i) the amount included in the direct cost of goods produced or jobs completed;
- (ii) the amount treated as indirect labour and thus included in overheads ; and
- (iii) the amount treated as the cost of idle time and hence loss.

Through this process costs of various jobs are ascertained. Naturally, in this the proper recording of time spent by the workers is essential. Labour cost per hour may be collected through the use of the form given below :

A.B.C. Co. Ltd.

<i>Department</i>		<i>Labour Cost Report</i>						<i>Weekended</i>			
		<i>Productive Time</i>				<i>Wages Paid</i>					
<i>Name of the employee</i>	<i>Section</i>	<i>Day Work Hrs.</i>	<i>O/Time Hours</i>	<i>Total Hours</i>	<i>Paid Idle Time Hrs.</i>	<i>Total Time Hrs.</i>	<i>Time Hrs.</i>	<i>O/Time Premium</i>	<i>Bonus</i>	<i>Total</i>	<i>Cost per Production Hours</i>
							<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>

3.3 ATTENDANCE & PAYROLL PROCEDURES

3.3.1 Attendance Procedure / Time-keeping : It refers to correct recording of the employees' attendance time. Students may note the difference between "time keeping" and "time booking". The latter refers to break up of time on various jobs while the former implies a record of total time spent by the workers in a factory.

Objectives of Time-keeping : Correct recording of employees' attendance time is of utmost importance where payment is made on the basis of time worked. Where payment is made by results viz; straight piece work, it would still be necessary to correctly record attendance for the purpose of ensuring that proper discipline and adequate rate of production are maintained. In fact the various objectives of time-keeping are as follows:

- (i) For the preparation of payrolls.
- (ii) For calculating overtime.
- (iii) For ascertaining and controlling labour cost.
- (iv) For ascertaining idle time.



- (v) For disciplinary purposes.
- (vi) For overhead distribution.

Methods of Time-keeping : There are two methods of time-keeping. They are the manual methods and the mechanical methods. The choice of a particular method depends upon the requirements and policy of a firm. But whichever method is followed, it should make a correct record of the time incurring the minimum possible expenditure and should minimise the risk of fraudulent payments of wages.

Manual method : The manual methods of time-keeping are as follows :

- (a) Attendance Register Method, and (b) Metal Disc Method.

(a) *Attendance Register Method* : It is the oldest method of recording time. Under this method, an attendance register is kept in the time office adjacent to the factory gate or in each department for workers employed therein. The attendance register contains such columns as the name of the worker, the worker's number, the department in which he is working, the rate of wages, the time of arrival and departure, normal time and the overtime. The time of a arrival and departure, may be noted down by an employee know as time-keeper.

This method is simple and inexpensive and can be used in small firms where the number of workers is not large. This method may lead to dishonest practice of recording wrong time because there is possibility of collusion between some of the workers and the time-keeper. However, for recording the time of workers who work at customers' premises and places which are situated at a distance from the factory, this may be the only suitable method.

(b) *Metal Disc Method* : Under this method, each worker is allotted a metal disc or a token with a hole bearing his identification number. A board is kept at the gate with pegs on it and all token are hung on this board. These boards can be maintained separately for each department so that the workers could remove their tokens from the board without undue delay. As the workers enter the factory gate, they remove their respective discs or tokens and place them in a box or tray kept near the board. Immediately after the scheduled time for entering the factory, the box is removed and the late comers will have to give their tokens to the time-keeper personally so that the exact time of their arrival could be recorded. The discs or tokens still left on the board represent the absentee workers. Later the time-keeper records the attendance in a register known as Daily Muster Roll which is subsequently passed on to the Pay Roll Department.

This method is simple because illiterate workers can very easily recognize their tokens and put them in the box. This method is better than attendance register method and is useful when the number of employees is not large. But it has certain disadvantages of its own as given below :



1. There are chances that a worker may try to remove his companion's token from the board in order to get his presence marked when he is absent.
2. There are chances of disputes regarding the exact time of arrival of a worker because the time-keeper marking the attendance can commit mistakes deliberately or through carelessness. There is no authentic proof of the presence or absence of the workers.
3. There are chances of inclusion of dummy or ghost workers by the time-keeper in the attendance register or Daily Muster Roll.

Mechanical methods : The mechanical methods that are generally used for the recording of time of workers may be as follows :

(a) Time Recording Clocks; and (b) Dial Time Records.

(a) *Time Recording Clocks* : The time recording clock is mechanical device which automatically records the time of the workers. This method has been developed to obviate some of the difficulties experienced in case of manual methods and this method is useful when the number of workers is fairly large. Under this method, each worker is given a Time Card usually of one week duration. Time cards are serially arranged in a tray near the factory gate and as the worker enters the gate, he picks up his card from the tray, puts it in the time recording clock which prints the exact time of arrival in the proper space against the particular day. This process is repeated for recording time of departure for lunch, return from lunch and time of leaving the factory in the evening. Late arrivals, early leavings and overtime are printed in red to attract the attention of the management.

A time card may also give such particulars as hourly rate, total gross wages, less deductions and net wages payable. If these particulars are included in the time card, it would be known as combined time and pay-roll card divided into two parts, the upper part being the record of time and the lower one serving as the wage ticket. Wages are calculated on the basis of time recorded in the upper portion and are entered in the lower portion by the pay-roll department. The specimen of a combined time and pay-roll card may be as given below :



Cost Accounting

COMBINED TIME AND PAY ROLL CARD

Name of the worker.....

Week ending.....

No. of the worker.....

Department.....

Day		Regular		Over Time		Total Time	
		In	Out	In	Out	Normal Time	Overtime
Monday	A.M.						
	P.M.						
Tuesday	A.M.						
	P.M.						
Wednesday	A.M.						
	P.M.						
Thursday	A.M.						
	P.M.						
Friday	A.M.						
	P.M.						
Saturday	A.M.						
	P.M.						
Sunday	A.M.						
	P.M.						
		Normal Time	Hours worked	Rate	Amount	Deductions	Net Amount

Calculation of Wages

Over Time

Total

Time-keeper.....

Pay Roll Clerk.....

Foreman.....

Received the net amount as above.....

Worker.....



The main advantage of this method is that there are no chances of disputes arising in connection with recording of time of workers because time is recorded by the time recording clock and not by the time-keeper. There is no scope for partiality or carelessness of the time-keeper as it is in case of manual methods. But this method suffers from the following defects :

1. There are chances that a worker may try to get his friend's time card from the tray in order to get him marked present in time when he is actually late or get his presence marked when he is absent. This drawback can be removed if the time-keeper does not show carelessness.
2. Sometimes, the time recording clock goes out of order and the work of recording of time is dislocated.

(b) *Dial Time Records* : The dial time recorder is a machine which has a dial around the clock. This dial has a number of holes (usually about 150) and each hole bears a number corresponding to the identification number of the worker concerned. There is one radial arm at the centre of the dial. As a worker enters the factory gate, he is to press the radial arm after placing it at the hole of his number and his time will automatically be recorded on roll of a paper inside the dial time recorder against the number. The sheet on which the time is recorded provides a running account of the worker's time. This machine allows greater accuracy and can itself transcribe the number of hours to the wages sheets. This machine can also calculate the wages of the workers and thus avoids much loss of time. However, the high installation cost of the dial time recorder and its use for only a limited of workers are the drawbacks of this method.

Requisites of a Good Time-keeping System : A good time-keeping system should have a following requisites :

1. System of time-keeping should be such which should not allow proxy for another worker under any circumstances.
2. There should also be a provision of recording of time of piece workers so that regular attendance and discipline may be maintained. This is necessary to maintain uniformity of flow of production.
3. Time of arrival as well as time of departure of workers should be recorded so that total time of workers may be recorded and wages may be calculated accordingly.
4. As far as possible, method of recording of time should be mechanical so that chances of disputes regarding time may not arise between workers and the time-keeper.
5. Late-comers should record late arrivals. Any relaxation by the time-keeper in this regard will encourage indiscipline.
6. The system should be simple, smooth and quick. Unnecessary queuing at the factory gate should be avoided. Sufficient clocks should be installed keeping in view the number



Cost Accounting

of workers so that workers may not have to wait for a long period for recording their time of arrivals and departures.

7. A responsible officer should pay frequent visits at the factory gate to see that proper method of recording of time is being followed.

Time-Booking - The clock card is required, essentially, for the correct determination of the amount of wages due to a worker on the basis of time he has put in the factory. It merely records day by day and period by period the total time spent by each individual worker in the factory. But it does not show how that time was put to use in the factory—how an individual worker utilised his time in completing jobs entrusted to him and how long he was kept waiting for one reason or another due to lack of work, lack of material and supplies, lack of instructions, machine breakdowns, power failures and the like. These are all vital pieces of information necessary for the proper collection of cost data and for effective controlling of costs. For the collection of all such information, a separate record, generally known as Time (or Job) card, is kept.

The time (or job) card can be of two types—one containing analysis of time with reference to each job and the other with reference to each worker. In case of job card made out according to job a separate job card is employed in respect of a job undertaken; where a job involves several operations, a separate entry is made in respect of each operation. Thus the job card would record the total time spent on a particular job or operation. If a number of people are engaged on the same job or operation, the time of all those workers would be booked on the same card. One obvious advantage of this method is that it provides complete data on the labour content of job or operation collectively so that the computation of labour cost is greatly facilitated. But this method has drawbacks as well. Since a worker's job timing is scattered over a number of job cards the time spent on all these jobs and idle time must be abstracted periodically for finding each worker's total time spent on different jobs and the time for which he remained idle during the period. The total of these two times (job and idle) must obviously equal his total attendance time, as shown by his clock card or attendance register. Thus, it would be seen that if the job cards are made out according to job or operation a separate summary has to be prepared for reconciling each worker's job and idle time with his gate time. It would be quite obvious that such a reconciliation is of great importance from the point of view of labour costs.

If on the other hand, one job (or time) card were to be issued for each worker, it would greatly facilitate reconciliation of the worker's job time with his gate time. Under this system, a card would be issued to each worker for each day or for each week and the time which he spends on different jobs (and also any idle time) would be recorded in the same card so that the card would have a complete history on it as to how his time had been spent during the period. Since all the details would be on one card the total time accounted for in the job card would be readily tallied with the total time put in the Gate Card or attendance register. In this case



however, a Labour Abstract for different jobs would have to be prepared from the card of individual worker so that total hours (and/or their value) put in by different workers on different jobs during the period could be ascertained and aggregated. It would thus be seen that according to either of the method a process of abstraction and reconciliation is necessary. Specimens of two types of job cards are given below:

JOB CARD (1st type)

Description of Job No.

Department Date.....

Worker's No.	Start	Stop	Elapsed time	Actual time taken	Rate	Amount
--------------	-------	------	--------------	-------------------	------	--------

Supervisor's initial

JOB (OR TIME) CARD (2nd type)

No. Date.....

Name of the worker Ticket

No.....

Department.....

Operation.....

Job No.	Start	Stop	Time Elapsed	Time	Rate	Amount
---------	-------	------	--------------	------	------	--------

Supervisor's initial

Reconciliation of gate and job cards - An advantage of the introduction of job card is that it enables a reconciliation to be made of the time spent by the worker in each department with the time paid for as per the attendance record. Reconciliation not only helps in locating wastage of time, but also in preventing dummy workers being put on the payroll of workers paid for time not worked by them. The two sets of records serve separate purposes. Where payment to labour is on the time rate basis, the Gate Card is a record of the hours of work that should be paid for. Since the Gate Card merely records the hours during which the worker has been within the premises of the factory and it does not contain any details as to how those hours have been put to use by the worker in his department, a job card must be prepared to provide the necessary information. As we have already seen, the job card may be prepared either worker-wise or job-wise.



Cost Accounting

Objectives of Time-Booking - Objectives of time-booking are as follows:

1. To ensure that time paid for, according to time keeping, has been properly utilised on different jobs or work orders.
2. To ascertain the cost of each job or work order.
3. To provide a basis for the apportionment of overhead expenses over various jobs/work orders when the method for the allocation of overhead depends upon time spent on different jobs.

3.3.2 Payroll procedure : The hours worked by each employee as reflected on the completed clock cards are entered by an accounting department employee (or employees) on the payroll sheet or payroll summary. All employees authorized for employment by the personnel department are first listed on the payroll sheet. Hours and hourly rates are then transferred from the clock cards, and total earnings are computed. Should a clock card for an employee not listed on the payroll sheet be found, investigation of its propriety is required. Likewise, there should be an explanation for any missing clock cards.

After the gross earnings (that is, the total amount earned by an employee before any deductions are taken into consideration) have been calculated for every employee, deduction are entered on the payroll sheet, and the net pay of each employee is determined. Under a computerized system, each employee's payroll data would be input into the computer and it would prepare the entire payroll sheet. Payroll deductions are of two kinds, non-tax and tax. Non-tax deductions are made at the request of the employee or are required by union contracts. Among the more common examples are union dues, hospitalization insurance, withholding for the purchase of savings bonds, and contributions to charities. Tax deductions are made in compliance with Income Tax Act.

Paying the wages : The payroll sheet is the basis for the preparation of a payroll voucher by the accounting department authorizing disbursements for the net amounts payable to employees. If the number of employees is large, payments are usually made from a special payroll account. Using a separate payroll account contributes to good internal control, since the audit trail of payroll activities is easier to follow when a separate account for payroll disbursements is used by a company. In each pay period an amount to cover the net payroll is transferred from the company's general account to a special payroll account. Cheques payable to the individual employees are then drawn against the payroll account. In a computerized system, the employees' paycheques would be printed out by the computer based on the information within the computer-prepared payroll sheet. In addition to providing a better means of control, use of a separate account for payroll simplifies record keeping by reducing the number of cheques that will clear through the general account.

Precautions to ensure proper payment of the payroll should be taken. Payments should be made only to the employees themselves after proper identification. As a control, payroll



cheques should not be given to factory supervisors or department heads for distribution to the employees under their jurisdiction, since they were probably involved in the process of accumulating the hours worked by their employees. Rather, an individual (or individuals) having no record-keeping functions associated with the payroll (such as the time-keeping function and the preparation of payroll function) should be assigned the job of distributing paycheques. Unclaimed paycheques should be investigated to determine why they have not been picked up by employees.

3.3.3 Overview of Statutory requirements : According to the Factories Act, 1948, every worker is required to work not more than 9 hours a day or 48 hours in a week. If, due to the urgency of the work, a worker is required to work for more than 9 hours a day, excess time over 48 hours i.e. overtime is to be paid to the worker at a higher rate, generally at double the normal wage rate. The excess rate over normal wage rate is called overtime premium.

3.4 IDLE TIME

It is a time during which no production is carried out because the worker remains idle even though they are paid. Idle time can be normal idle or abnormal idle time.

Normal idle time : It is inherent in any work situation and cannot be eliminated.

Abnormal idle time : Apart from normal idle time, there may be factors which give rise to abnormal idle time.

Machines and men cannot be expected to work continuously. In the midst of operations, a machine may have to be stopped for some adjustments being made. Each morning and on the resumption of work in the post-lunch period, some time will be lost before a job can be started. There may also be some waiting time in between the finishing of one job and the starting of another. Similarly, even if a plant operates with a reasonable degree of efficiency, some allowance may be required for loss of time due to occasional power failure, machines or tool break-down, delay in delivery of material and stores or of tools etc. All such reasonable time losses are normal idle time. Normal idle time of direct workers can be treated as a part of the direct cost. This can be done by inflating the wage rates for costing purposes. Suppose 10 minutes per hour of work are treated as normal idle time. If a worker puts in 3 hours on a job, his wages for 3½ hours can be charged to the job. Alternatively the cost of normal idle time may be treated as a part of factory overheads.

Losses in excess of the normal idle time are not properly chargeable as overheads; abnormal losses on account of idle time should be written off by being directly debited to the Costing Profit and Loss Account. It is obvious that for establishing abnormal idle time, the normal time required for each product or job will have to be determined.

Accurate recording of the idle time in the departments is of great importance from the point of view of cost finding and cost control. For controlling costs, careful analysis and recording of



Cost Accounting

idle time under significant heads is essential. In order to facilitate identification, the major causes which account for idle time may be grouped under the following two heads :

(i) *Normal causes* : Some idle time is inherent in every situation. The time lost between factory gate and the place of work, the interval between one job and another, the setting up time for the machine, normal fatigue etc. result in normal idle time.

(ii) *Abnormal causes* : Idle time may also arise due to abnormal factors like lack of coordination, power failure, breakdown of machines, non-availability of raw materials, strikes, lockouts, poor supervision, fire, flood etc. The causes for abnormal idle time should be further analysed into controllable and uncontrollable. Controllable abnormal idle time refers to that time which could have been put to productive use had the management been more alert and efficient. All such time which could have been avoided is controllable idle time. However, time lost due to abnormal causes, over which management does not have any control e.g., breakdown of machines, flood etc. may be characterised as uncontrollable idle time.

Treatment of idle time in Cost Accounting : Normal idle time is treated as a part of the cost of production. Thus, in the case of direct workers an allowance for normal idle time is built into the labour cost rates. In the case of indirect workers, normal idle time is spread over all the products or jobs through the process of absorption of factory overheads.

Abnormal idle time cost is not included as a part of production cost and is shown as a separate item in the Costing Profit and Loss Account so that normal costs are not disturbed. This also helps in drawing the attention of the management towards the exact losses due to abnormal idle time. The cost of abnormal idle time should be further categorised into controllable and uncontrollable. For each category, the break-up of cost due to various factors should be separately shown. This would help the management in fixing responsibility for controlling idle time.

Management should aim at eliminating controllable idle time and on a long-term basis reducing even the normal idle time. This would require a detailed analysis of the causes leading to such idle time. Depending upon the particular causes, proper managerial action would be required to reduce the impact of such idle time. Basic control can be exercised through periodical reports on idle time showing a detailed analysis of the causes for the same, the departments where it is occurring and the persons responsible for it, along with a statement of the cost of such idle time.

Illustration : 'X' an employee of ABC Co. gets the following emoluments and benefits:

(a) Basic pay	Rs. 1,000 p.m.
(b) Dearness allowance	Rs. 200 p.m.
(c) Bonus	20% of salary and D.A.



- (d) Other allowances Rs. 250 p.m.
(e) Employee's contribution to P.F. 10% of salary and D.A.
'X' works for 2,400 hours per annum, out of which 400 hours are non-productive and treated as normal idle time. You are required to find out the effective hourly cost of employee 'X'.

Solution

Statement showing computation of effective hourly cost of employee 'X'

(i) Earning of Employee 'X':

	<i>Per month</i>	<i>Per annum</i>
	<i>Rs.</i>	<i>Rs.</i>
Basic pay	1,000	12,000
Dearness Allowance	200	2,400
Bonus	240	2,880
Employees' contribution to provident fund	120	1,440
Other allowance	<u>250</u>	<u>3,000</u>
	<u>1,810</u>	<u>21,720</u>

(ii) Effective working hours :

Annual working hours	2,400
Less : Normal idle time	<u>400</u>
Effective working hours	2,000
Effective hourly cost of 'X' : Rs. 21,720/2,000	10.86

3.5 OVERTIME

Work done beyond normal working hours is known as 'overtime work'. Overtime has to be paid in India at double the rate of wages including dearness allowance and the value of food concession, according to the Factories Act, 1948. This Act as stated earlier also lays down that a worker is entitled to overtime when he works for more than 9 hours on any day or more than 48 hours in a week.

Occasional overtime is a healthy sign since it indicates that the firm has the optimum capacity and that the capacity is being fully utilised. But persistent overtime is rather a bad sign because it may indicate either : (a) that the firm needs larger capacity in men and machines, or (b) that men have got into the habit of postponing their ordinary work towards the evening so that they can earn extra money in the form of overtime wages.

Overtime work may arise in a department in one of the following circumstances :



Cost Accounting

- (1) The customer may agree to bear the entire charge of overtime because of urgency of work.
- (2) Overtime may be called for to make up any shortfall in production due to some unexpected development.
- (3) Overtime work may be necessary to make up a shortfall in production due to some fault of management.
- (4) Overtime work may be resorted to, to secure an out-turn in excess of the normal output to take advantage of an expanding market or of rising demand.

Overtime premium : Overtime payment is the amount of wages paid for working beyond normal working hours. The rate for overtime work is higher than the normal time rate; usually it is at double the normal rates. The extra amount so paid over the normal rate is called overtime premium.

Effect of overtime payment on productivity : Overtime work should be resorted to only when it is extremely essential because it involves extra cost. The overtime payment increases the cost of production in the following ways :

1. The overtime premium paid is an extra payment in addition to the normal rate.
2. The efficiency of operators during overtime work may fall and thus output may be less than normal output.
3. In order to earn more the workers may not concentrate on work during normal time and thus the output during normal hours may also fall.
4. Reduced output and increased premium of overtime will bring about an increase in costs of production.

Treatment of overtime premium in Cost Accounting : Under Cost Accounting the overtime premium is treated as follows :

- (1) If overtime is resorted to at the desire of the customer, then overtime premium may be charged to the job directly.
- (2) If overtime is required to cope with general production programmes or for meeting urgent orders, the overtime premium should be treated as overhead cost of the particular department or cost centre which works overtime.
- (3) If overtime is worked in a department due to the fault of another department, the overtime premium should be charged to the latter department.
- (4) Overtime worked on account of abnormal conditions such as flood, earthquake etc., should not be charged to cost, but to Costing Profit and Loss Account.



Steps for controlling overtime : To keep overtime to its minimum, it is necessary to exercise proper control over the overtime work. The suitable procedure which may be adopted for controlling overtime comprises the following steps :

1. Watch on the output during normal hours should be maintained to ensure that overtime is not granted when normal output is not obtained during the normal hours, without any special reasons.
2. Statement concerning overtime work be prepared along with justifications, at appropriate places for putting up before the competent authority.
3. Prior sanction about overtime should be obtained from competent authority.
4. Actual rate of output produced during the overtime period should be compared with normal rate of output.
5. Periodical reports on overtime wages should be sent to top management for taking corrective action.
6. If possible an upper limit may be fixed for each category of workers in respect of overtime.

Illustration : It is seen from the job card for repair of the customer's equipment that a total of 154 labour hours have been put in as detailed below :

	<i>Worker 'A' paid at Rs. 2 per day of 8 hours</i>	<i>Worker 'B' paid at Re. 1 per day of 8 hours</i>	<i>Supervisory worker 'C' paid of Rs. 3 per day of 8 hours</i>
Monday	10 - 1/2 hours	8 hours	10 - 1/2 hrs.
Tuesday	8 "	8 "	8 "
Wednesday	10 - 1/2 hours	8 "	10 - 1/2 hours
Thursday	9 - 1/2 "	8 "	9 - 1/2 "
Friday	10 - 1/2 "	8 "	10 - 1/2 "
Saturday	—	8 "	8 "
Total	49 hours	48 hours	57 hours

In terms of an award in a labour conciliation, the workers are to be paid dearness allowance on the basis of cost of living index figures relating to each month which works out @ Rs. 96 for the relevant month. The dearness allowance is payable to all workers irrespective of wage rate if they are present or are on leave with wages on all working days.

Sunday is a weekly holiday and each worker has to work for 8 hours on all week days and 4



Cost Accounting

hours on Saturdays; the workers are however paid full wages for Saturday (8 hours for 4 hours worked).

Workers are paid overtime according to the Factories Act for hours worked in excess of normal working hours on each day. Excluding holidays (including 4 hours work to be put in on Saturday) the total number of hours work out to 172 in the relevant month. The company's contribution to Provident Fund and Employees State Insurance Premium are absorbed into overheads.

Work out the wages payable to each worker.

Solution

(1) Calculation of hours to be paid for worker A :

	Normal hours	Extra hours	Overtime hours	Equivalent normal overtime	Total normal hours
Monday	8	1	1½	3	12
Tuesday	8	-	-	-	8
Wednesday	8	1	1½	3	12
Thursday	8	1	½	1	10
Friday	8	1	1½	3	12
Saturday	-	-	-	-	-
	40	4	5	10	54

Worker B will get wages for 52 hours *i.e.*, actually worked *plus* 4 hours worked extra on Saturday. Worker C will get wages for 66 hours—the same as for A till Friday *plus* 12 hours for work on Saturday.

(a) Wages payable :

	A	B	C
Basic wages per hour (Rs.)	0.250	0.125	0.375
Dearness allowance per hour (Rs.)	0.500	0.500	0.500
Hourly rate (Rs.)	0.750	0.625	0.875
Normal hours	44	52	56
Overtime hours	5	-	5
Normal wages (Rs.)	33.00	32.50	49.00
Overtime wages (Rs.)	<u>7.50</u>	-	<u>8.75</u>
Total wages payable : (Rs.)	<u>40.50</u>	32.50	<u>57.75</u>



Illustration

In a factory, the basic wage rate is Rs. 10 per hour and overtime rates are as follows :

Before and after normal working hours	:	175% of basic wage rate
Sundays and holidays	:	225% of basic wage rate

During the previous year, the following hours were worked :

Normal time	:	1,00,000 hours
Overtime before and after working hours	:	20,000 hours
Overtime on Sundays and holidays	:	<u>5,000 hours</u>
Total	:	<u>1,25,000 hours</u>

The following hours have been worked on job 'Z' :

Normal	:	1000 hours.
Overtime before and after working hrs.	:	100 hours.
Sundays and holidays	:	25 hours.

Total	:	1125 hours.
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You are required to calculate the labour cost chargeable to jobs 'Z' and overhead in each of the following instances:

- (a) Where overtime is worked regularly throughout the year as a policy due to the labour shortage.
- (b) Where overtime is worked irregularly to meet the requirements of production.
- (c) Where overtime is worked at the request of the customer to expedite the job.

Solution

Workings

Computation of average inflated wage rate (including overtime premium) :

Basic wage rate	:	Rs. 10 per hour
Overtime wage rate before and after working hours	:	Rs. 10 × 175% = Rs. 17.50 per hour
Overtime wage rate for Sundays and holidays	:	Rs. 10 × 225% =Rs. 22.50 per hour
Annual wages for the previous year for normal time	:	1,00,000 hrs. × Rs. 10 = Rs. 10,00,000
Wages for overtime before and after working hours	:	20,000 hrs. × Rs. 17.50=Rs. 3,50,000



Cost Accounting

Wages for overtime on Sundays and holidays	: 5,000 hrs. × Rs. 22.50 = <u>Rs. 1,12,500</u>
Total wages for 1,25,000 hrs.	= Rs. 14,62,500
Average inflated wage rate	: <u>Rs. 14,62,500</u> = Rs. 11.70 per hour. = 1,25,000 hrs.

- (a) **Where overtime is worked regularly as a policy due to labour shortage**, the overtime premium is treated as a part of labour cost and job is charged at an inflated wage rate.

Hence,

$$\begin{aligned}\text{Labour cost chargeable to job Z} &= \text{Total hours} \times \text{Inflated wage rate} \\ &= 1,125 \text{ hrs.} \times \text{Rs. } 11.70 = \text{Rs. } 13,162.50\end{aligned}$$

- (b) **Where overtime is worked irregularly to meet the requirements of production**, basic wage rate is charged to the job and overtime premium is charged to factory overheads as under :

Labour cost chargeable to		
Job Z : 1,125 hours @ Rs. 10 per hour	=	Rs. 11,250.00
Factory overhead : 100 hrs. × Rs. (17.50 – 10)	=	Rs. 750.00
25 hrs. × Rs. (22.50 – 10)	=	<u>Rs. 312.50</u>
Total factory overhead		<u>Rs. 1,062.50</u>

- (c) **Where overtime is worked at the request of the customer**, overtime premium is also charged to the job as under :

			Rs.
Job Z labour cost	1,125 hrs. @ Rs. 10	=	11,250.00
Overtime premium	100 hrs. @ Rs. (17.50 – 10)	=	750.00
	25 hrs. @ Rs. (22.50 – 10)	=	<u>312.50</u>
Total			<u>12,312.50</u>

3.6 LABOUR TURNOVER

Labour turnover in an organisation is the rate of change in the composition of labour force during a specified period measured against a suitable index. The standard of usual labour turnover in the industry or locality or the labour turnover rate for a past period may be taken as the index or norm against which actual turnover rate is compared. There are three methods of calculating labour turnover which are given below :



$$(i) \text{ Replacement method} = \frac{\text{Number of employees replaced}}{\text{Average number of employees on roll}} \times 100$$

$$(ii) \text{ Separation method} = \frac{\text{Number of employees separated during the year}}{\text{Average number of employees on rolls during the period}} \times 100$$

$$(iii) \text{ Flux method} = \frac{\text{Number of employees separated} + \text{number of employees replaced}}{\text{Average number of employees on rolls during the period}} \times 100$$

Labour turnover due to new recruitment:

Workers joining a business concern on account of its expansion do not account for labour turnover. But these newly recruited workers are certainly responsible for a change in the composition of labour force, due to this feature, some cost accountants measure workers to the extent of new (excluding replacements) joining the labour force as follows :

$$\frac{\text{No. of new workers joining in a period (excluding replacements)}}{\text{Average number of workers on the roll in a period}} \times 100$$

The total number of workers joining, including replacements, are called accessions. The labour turnover rate, in such a case, may also be computed in respect of total number of workers joining (accessions) the business concern, during a given period both on account of replacements and because of expansion is as under :

$$\frac{\text{No. of accessions in a period}}{\text{Average number of workers in a period}} \times 100$$

When number of accessions are considered for measuring labour turnover, the labour turnover rate by flux method may be computed by using any one of the following expressions :

$$\text{Labour turnover rate (Flux method)} = \frac{\text{No. of separations} + \text{No. of replacements} + \text{No. of new recruitments}}{\text{Average number of workers}} \times 100$$

OR

$$\frac{\text{No. of separations} + \text{No. of accessions}}{\text{Average number of workers}} \times 100$$



Cost Accounting

The above rate of labour turnover indicates the total effect of number of workers separated, number of workers replaced and number of new workers recruited and joined the concern on account of its expansion, etc.

If in the above computations, the data given is for a period other than a year, the labour turnover rate so computed may be converted into equivalent annual labour turnover rate by the following formula:

$$\text{Equivalent annual labour turnover rate} = \frac{\text{Turnover rate for the period}}{\text{Number of days in the period}} \times 365$$

Causes of labour turnover : The main causes of labour turnover in an organisation/industry can be broadly classified under the following three heads :

- (a) Personal Causes;
- (b) Unavoidable Causes; and
- (c) Avoidable Causes.

Personal causes are those which induce or compel workers to leave their jobs; such causes include the following :

- (i) Change of jobs for betterment.
- (ii) Premature retirement due to ill health or old age.
- (iii) Domestic problems and family responsibilities.
- (iv) Discontent over the jobs and working environment.

In all the above cases the employee leaves the organisation at his will and, therefore, it is difficult to suggest any possible remedy in the first three cases. But the last one can be overcome by creating conditions leading to a healthy working environment. For this, officers should play a positive role and make sure that their subordinates work under healthy working conditions.

Unavoidable causes are those under which it becomes obligatory on the part of management to ask one or more of their employees to leave the organisation; such causes are summed up as listed below:

- (i) Seasonal nature of the business;
- (ii) Shortage of raw material, power, slack market for the product etc.;
- (iii) Change in the plant location;
- (iv) Disability, making a worker unfit for work;
- (v) Disciplinary measures;



(vi) Marriage (generally in the case of women).

Avoidable causes are those which require the attention of management on a continuous basis so as to keep the labour turnover ratio as low as possible. The main causes under this case are indicated below :

- (1) Dissatisfaction with job, remuneration, hours of work, working conditions, etc.,
- (2) Strained relationship with management, supervisors or fellow workers;
- (3) Lack of training facilities and promotional avenues;
- (4) Lack of recreational and medical facilities;
- (5) Low wages and allowances.

Proper and timely management action can reduce the labour turnover appreciably so far as avoidable causes are concerned.

Effects of labour turnover

High labour turnover increases the cost of production in the following ways:

- (i) Even flow of production is disturbed;
- (ii) Efficiency of new workers is low; productivity of new but experienced workers is low in the beginning;
- (iii) There is increased cost of training and induction;
- (iv) New workers cause increased breakage of tools, wastage of materials, etc.

In some companies, the labour turnover rates are as high as 100%; it means that on the average, all the work is being done by new and inexperienced workers. This is bound to reduce efficiency and production and increases the cost of production.

Two types of costs which are associated with labour turnover are :

- (a) *Preventive costs* : These include costs incurred to keep the labour turnover at a low level, *i.e.* cost of medical services, welfare schemes and pension schemes. If a company incurs high preventive costs, the rate of labour turnover is usually low.
- (b) *Replacement costs* : These are the costs which arise due to high labour turnover. If men leave soon after they acquire the necessary training and experience of good work, additional costs will have to be incurred on new workers, *i.e.*, cost of employment, training and induction, abnormal breakage and scrap and extra wages and overheads due to the inefficiency of new workers.

It is obvious that a company will incur very high replacement costs if the rate of labour turnover is high. Similarly, only adequate preventive costs can keep labour turnover at a low level. Each company must, therefore, work out the optimum level of labour turnover keeping in



Cost Accounting

view its personnel policies and the behaviour of replacement cost and preventive costs at various levels of labour turnover rates.

Remedial steps to minimise labour turnover - The following steps are useful for minimising labour turnover.

1. *Exit interview* : An interview be arranged with each outgoing employee to ascertain the reasons of his leaving the organisation.
2. *Job analysis and evaluation* : Before recruiting workers, job analysis and evaluation may be carried out to ascertain the requirements of each job.
3. *Scientific system of recruitment, placement and promotion* - The organisation should make use of a scientific system of recruitment, selection, placement and promotion for employees.
4. *Enlightened attitude of management* - The management should introduce the following steps for creating a healthy working atmosphere :
 - (i) Service rules should be framed, discussed and approved among management and workers, before their implementation.
 - (ii) Provide facilities for education and training of workers.
 - (iii) Introduce a procedure for settling worker's grievances.
5. *Use of committee* : Issues like control over workers, handling their grievances etc., may be dealt by a committee, comprising of members from management and workers.

Illustration

The management of Bina and Rina Ltd. are worried about their increasing labour turnover in the factory and before analyzing the causes and taking remedial steps, they want to have an idea of the profit foregone as a result of labour turnover in the last year.

Last year sales amounted to Rs. 83,03,300 and P/V ratio was 20 per cent. The total number of actual hours worked by the Direct Labour force was 4.45 Lakhs. As a result of the delays by the Personnel Department in filling vacancies due to labour turnover, 1,00,000 potentially productive hours were lost. The actual direct labour hours included 30,000 hours attributable to training new recruits, out of which half of the hours were unproductive.

The costs incurred consequent on labour turnover revealed, on analysis, the following :

Settlement cost due to leaving	Rs. 43,820
Recruitment costs	Rs. 26,740
Selection costs	Rs. 12,750
Training costs	Rs. 30,490



Assuming that the potential production lost as a consequence of labour turnover could have been sold at prevailing prices, find the profit foregone last year on account of labour turnover.

Solution

Determination of contribution foregone

Actual hours worked (given)	4,45,000
Less : Unproductive training hours	<u>15,000</u>
Actual productive hours	<u>4,30,000</u>

The potentially productive hours lost are 1,00,000

$$\text{Sales lost for 1,00,000 hours} = \frac{\text{Rs. } 83,03,300}{4,30,000 \text{ hrs}} \times 1,00,000 \text{ hrs} = \text{Rs. } 19,31,000$$

Contribution lost for 1,00,000 hrs.

$$= \frac{\text{Rs. } 19,31,000}{100} \times 20 = \text{Rs. } 3,86,200 \dots\dots\dots (i)$$

Statement showing profit foregone last year on account of labour turnover of Bina and Rina Ltd.

	Rs.
Contribution foregone as per (i)	3,86,200
Settlement cost due to leaving	43,820
Recruitment cost	26,740
Selection cost	12,750
Training costs	<u>30,490</u>
<i>Profit foregone</i>	<u><i>5,00,000</i></u>

Illustration

The Cost Accountant of Y Ltd. has computed labour turnover rates for the quarter ended 31st March, 2007 as 10%, 5% and 3% respectively under 'Flux method', 'Replacement method' and 'Separation method' respectively. If the number of workers replaced during that quarter is 30, find out the number of:

- (1) workers recruited and joined and
- (2) workers left and discharged.



Cost Accounting

Solution

Working Note:

Average number of workers on roll:

$$\text{Labour turnover rate under replacement method} = \frac{\text{No. of replacements}}{\text{Average number of workers on roll}} \times 100$$

$$\text{Or } \frac{5}{100} = \frac{30}{\text{Average number of workers on roll}}$$

$$\text{Or Average number of workers on roll} = \frac{30 \times 100}{5} = 600$$

(1) Number of workers recruited and joined :

$$\text{Labour turnover rate} = \frac{\text{No. of separations}^* (S) + \text{No. of accessions}(A)}{\text{Average number of workers on roll}} \times 100$$

(Flux method)

(Refer to Working Note)

$$\text{Or } \frac{10}{100} = \frac{18^* + A}{600}$$

$$\text{Or } A = \left[\frac{6000}{100} - 18 \right] = 42$$

No. of workers recruited and joined 42.

(2) Number of workers left and discharged :

$$\text{Labour turnover rate} = \frac{\text{No. of separations}(S)}{\text{Average number of workers on roll}} \times 100$$

(Separation method)

(Refer to working note)

$$\frac{3}{100} = \frac{S}{600}$$



Or S^*

$S^* = 18$

Hence, number of workers left and discharged comes to 18.

3.7 INCENTIVE SYSTEM

3.7.1 Important factors necessary for introducing an incentive system : An incentive can be defined as the stimulation for effort and effectiveness by offering monetary inducement or enhanced facilities. It may be monetary in the form of a bonus or non-monetary tending to improve living and working conditions. It may be provided individually or collectively. In the first case, the employee gets a reward for his efforts directly and in the second, a group of employees share the reward arising out of their combined effort in equitable production.

The main factors that should be taken into account before introducing a scheme of incentives are stated below :

- (i) The need for producing goods of high quality or those having very good workmanship or finish and the manner this can be ensured. Only if a system of quality control can be relied upon to maintain the quality of goods of the standard required, an incentive scheme should be introduced; otherwise, workers should be paid on time basis.
- (ii) The need to maximise production—thus required incentives to be given to workers. But sometimes workmanship is more important than quantity of output; in such cases, incentive schemes of wage payment are not suitable.
- (iii) Where the quantity of work done cannot be measured precisely, incentive schemes cannot be offered.
- (iv) The role of management and workers in achieving greater efficiency, if it is unnecessary for the management to constantly plan work, for example, when the work is repetitive, workers should be offered good incentives to achieve high efficiency; but in case management is constantly required to plan the work, as in the case of job work, the management should share the fruits of extra efficiency achieved. This factor determines the choice of a particular incentive scheme.
- (v) Whether the quantity of output is within the control of the worker and if so, to what extent. Sometimes, as in the case of chain assembly work the output is not dependent on the effort put in by workers; incentive schemes in such cases are not suitable.
- (vi) The exactitude with which standards of performance can be laid down. Fixation of standard is necessary for the introduction of a scheme of incentives. When this requires heavy expenditure, incentive schemes may be rather costly.
- (vii) The effect of an incentive scheme for one set of workers on other workers. If for instance, an incentive scheme makes it possible for unskilled workers to earn high wages, the wage rates for skilled workers must also be raised (if they are paid on time



Cost Accounting

basis) to avoid dissatisfaction among them. In that event, the incentive scheme may raise labour cost instead of lowering it.

- (viii) The system of wage payment prevailing in other areas and industries or similar occupations. If possible, there should be uniformity.
- (ix) The attitude of labour and trade unions towards incentive schemes. Workers usually like to have a certain guaranteed time-basis wage but also like to earn extra through an incentive scheme.

On the whole, the system of wage payment should be such as would increase production without lowering quality. This will increase the surplus and will enable the employer to pay higher wages which, in turn, will lead to higher output.

3.7.2 Main principles for a sound system of wage incentive : The objective of wage incentives is to improve productivity and increase production so as to bring down the unit cost of production. In order to make the incentive scheme effective and useful, the following general principles have to be considered while designing a sound system of wage incentives.

- (i) The reward for a job should be linked with the effort involved in that job and the scheme should be just and fair to both employees and employers. This involves the following :
 - (a) The standard required of the workers should be carefully set, if possible through proper time and motion studies.
 - (b) If the work is of repetitive type, the entire benefit of the time saved should be available to the worker but, in the case of non-standardised work or where precise standards cannot be set, the benefit of the time saved, if any, should be shared by the employer, the supervisor and the worker.
- (ii) The scheme should be clearly defined and be capable of being understood by the employees easily. The standards set should be such that they can be achieved even by average employees. While standards are being set, the workers concerned should be consulted.
- (iii) As far as possible, no limit should be placed on the amount of additional earnings, otherwise it will dampen the initiative of the workers. In this regard, what is important is not what actually prevails but what the workers think—if they think, even wrongly, that the employer will stop wages from rising beyond a certain limit, the incentive scheme may not be really effective.
- (iv) The scheme should be reasonable and stable, and should not be changed or modified too often without consulting the employees.
- (v) The scheme should take care that the employees are not penalised for reasons beyond their control.



- (vi) The scheme should provide for inspection of output so that only good pieces qualify for incentives. It would even be better not to introduce any incentive scheme if workmanship is of vital importance in sales.
- (vii) The management should ensure that there is no cause for complaint by the workers that they are sitting idle, say for want of tools or materials. Management has to see that there is, as far as practicable, no interruption of production.
- (viii) The operation of the scheme should not entail heavy clerical costs. In fact the scheme should facilitate the introduction of budgetary control and standard costing.
- (ix) It should be capable of improving the morale of the employees and it should be in conformity with the local trade union agreements and other government regulations.
- (x) There should be a guaranteed wage on time basis which generally works as a good psychological boost to incentive scheme.
- (xi) Last, but not least, the effect of incentive scheme on those who cannot be covered should be gauged and taken note of. Sometimes, highly skilled workers have to be paid on time basis whereas semiskilled or unskilled workers may be put on incentive scheme. If the latter earn more than former, the incentive schemes on the whole prove harmful.

3.7.3 Essential characteristics of a good incentive system : to recapitulate

- (i) It should be just both to the employer and to the employee. It should be positive and not unnecessarily punitive and so operated as to promote confidence.
- (ii) It should be strong both ways i.e. it should have a standard task and a generous return. The latter should be in direct proportion to employee's efforts. It should reflect the employer's contribution to the success of the company.
- (iii) It should be unrestricted as to the amount of the earning.
- (iv) It should be reasonable, apart from being simple, for employee to figure out his incentive in relation to his individual performance, as far as practicable.
- (v) It should be flexible and intimately related to other management controls.
- (vi) It should automatically assist supervision and, when necessary, aid team work.
- (vii) It should have employee's support and in no way should it be paternalistic.
- (viii) It should have managerial support in so far as production material, quality control, maintenance and non-financial incentives are concerned.
- (ix) It should not be used temporarily and dropped in recession times as means of wage reduction.

3.7.4 Procedure for laying down an incentive system : An incentive is a reward for effort made; hence correct measurement of the effort involved is a prerequisite for any incentive



system. Measurement of effort is made by time and motion study by specialists appointed for the purpose. Based on its finding and that of job evaluation, the rates of wages are fixed for different operations. The levels of efficiency that must be attained to qualify for incentives are then fixed on a consideration of the factors mentioned above. Having drawn up the broad outlines of the scheme, the next step is to educate the workers as regards the benefits of the proposed scheme. This is done through joint consultation with the leading employees or with union representatives. The scheme is then publicised extensively with the specimen, calculations of the rewards that would arise under it. After the basic scheme has been accepted by all, a decision on two vital points will have to be made viz. how spoiled work will be treated and the intervals at which payment of wages will be made. An incentive system tends to increase the rate of production and consequently increases spoilage. But the very purpose of the scheme would be defeated if spoilage increases beyond a certain limit. It is, therefore, necessary that the method of treating the spoiled work should be agreed upon in advance. The prevention of spoiled work can be encouraged either by making the worker do the job again in his own time or by paying the worker at the time rate for the period covered by spoiled work not giving him credit at all for the spoiled work; of these, the first method is more commonly employed since it is both equitable and deterrent.

The incentive should be paid promptly at short intervals of time. This would give the worker immediate satisfaction of having earned something by the extra effort he had put in. If payment is delayed the effect of the incentive would be greatly diminished.

3.8 LABOUR UTILISATION

For identifying utilisation of labour a statement is prepared (generally weekly) for each department / cost centre. This statement should show the actual time paid for, the standard time (including normal idle time) allowed for production and the abnormal idle time analysed for causes thereof.

3.8.1 Distinction between Direct and Indirect Labour Cost : Any labour cost that is specifically incurred for or can be readily charged to or identified with a specific job, contract, work order or any other unit of cost, is termed as direct labour cost; it includes : (i) all labour that is engaged in converting raw materials into manufactured articles in the case of manufacturing industries, and (ii) other forms of labour, which although not immediately engaged in converting raw materials into manufactured articles nonetheless is incurred wholly or specifically for any particular unit of production and hence, can be readily identified with the unit of production (Example: A helper attending solely a machine operator in the case of manufacturing industries ; the entire contingent of labour and staff employed on a construction job or project). Any labour that does not meet the above test is indirect, e.g. men generally employed in machine shop such as tool setters, fitters, workers in tool room, stores, etc. Their wages are charged as indirect expenses.



Labour Utilisation Statement

Department Week Ending

Sl. No.	Category of workers	Number of hours paid for	Standard Time						Causes				Inefficiency	Etc.
			Output in units	Time per unit of output	Standard time for output (3) - (6)	Idle time	Break-down	Power failure	Lack of materials	Lack of planning	Set up time			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	

Cost Accountant

Action taken.....

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Department Supdt.



Cost Accounting

Thus direct labour is for a specific job or product while indirect labour is for work in general. In a printing press, for example, wages paid to compositors will be direct while wages paid to the cleaners of machines will be indirect.

The distinction is one relative to each particular firm or industry. Labour which is direct in one unit may indeed be indirect in another where the work or process or method of manufacture is different in nature. The importance of the distinction lies in the fact that whereas direct labour can be identified with and charged to the job, indirect labour cannot be so charged and has therefore to be treated as part of the factory overheads to be included in the cost of production on some suitable basis of apportionment and absorption.

3.8.2 Identification of utilisation of labour with cost centres : For the identification of utilisation of labour with the cost centre a wage analysis sheet is prepared. Wage analysis sheet is a columnar statement in which total wages paid are analysed according to cost centre, jobs, work orders etc. The data for analysis is provided by wage sheet, time card, piece work cards and job cards.

The preparation of such sheet serves the following purposes :

- (i) It analyse the labour time into direct and indirect labour by cost centres, jobs, work orders.
- (ii) It provides details of direct labour cost comprises of wages, overtime to be charged as production cost of cost centre, jobs or work orders.
- (iii) It provides information for treatment of indirect labour cost as overhead expenses.

Wage Analysis Sheet

No. week- ending	Department/ cost centre	Total	Work in progress	Factory Overhead control A/c	Administration Overhead control A/c	Selling & Distribution overhead control Account
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ABC & CO.
Wages Analysis Sheet
(Sharing break-up of work in progress)

Job No.			Job No.			Job No.			Summary	Cost		
Clock No.	Hrs.	Amount	Clock No.	Hrs.	Amount	Clock No.	Hrs.	Amount	Job No.	Hrs.	Amount	Total
1			2			3						Ledger Folio

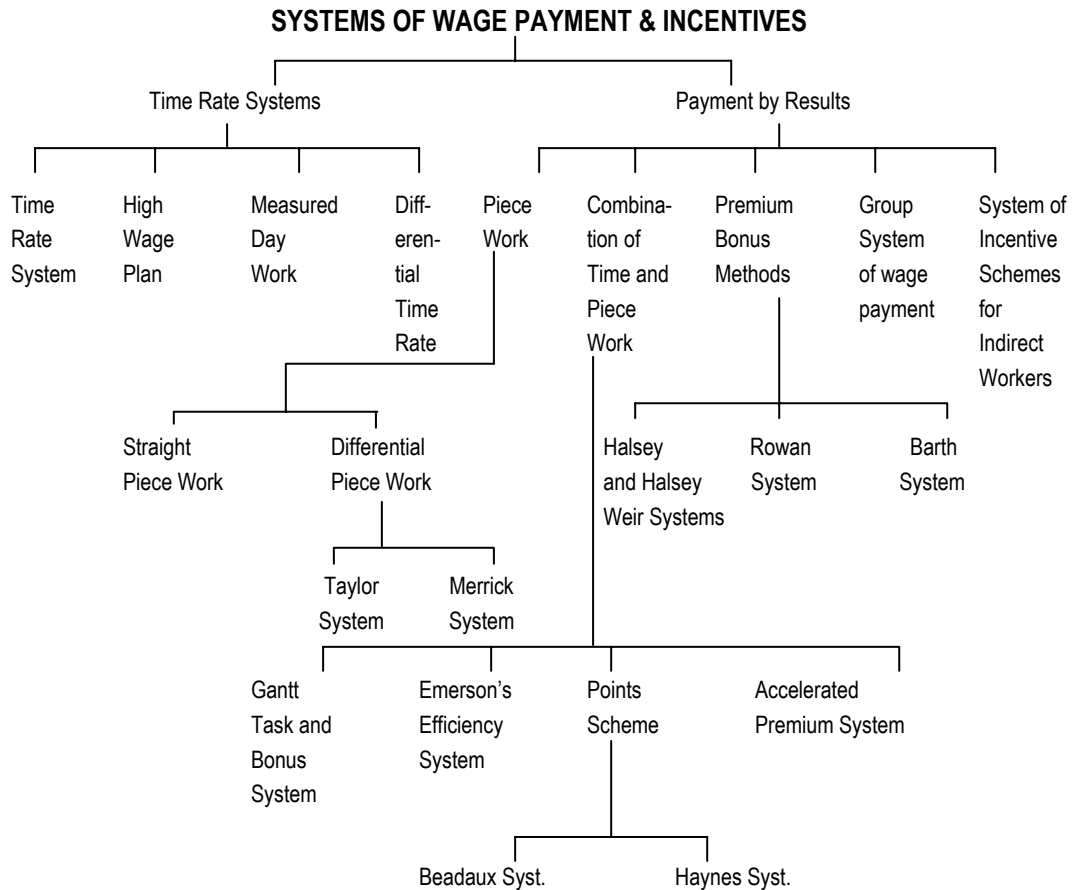
Total

3.8.3 Identification of labour hours with work order or batches or capital job : For identification of labour hours with work order or batches or capital jobs or overhead work orders the following points are to be noted :

- (i) The direct labour hours can be identified with the particular work order or batches or capital job or overhead work orders on the basis of details recorded on source document such as time sheet or job cards.
- (ii) The indirect labour hours cannot be directly identified with the particular work order or batches or capital jobs or overhead work orders. Therefore, they are traced to cost centre and then assigned to work order or batches or capital jobs or overhead work orders by using overhead absorption rate.

3.9 SYSTEMS OF WAGE PAYMENT AND INCENTIVES

There exist several systems of employee wage payment and incentives, which can be classified under the following heads :



One should remember that Provident Fund, Employees State Insurance Corporation Premium and bonus are payable on the basic wages, dearness allowance and value of food concession.

3.9.1 Time rate system : It is perhaps the oldest system of remunerating labour. It is also known by other names such as time work, day work, day wages and day rates. Under this system, the worker is paid by the hour, day, week, or month. The amount of wages due to a worker are arrived at by multiplying the time worked (as shown by the gate card) by the appropriate time rate. The time rate here is fixed after taking into account the rates relevant in the particular industrial locality for similar trade and skill. The rate may be either fixed or may be a progressive one, starting from a minimum and rising upto a maximum, in stages, through periodical increments.



- Merits :*
- (i) Simple to understand and to calculate wages.
 - (ii) Reduces temptation on the part of workers to increase the output at the cost of quality.

- Demerits:*
- (i) No monetary incentive to raise the level of production.
 - (ii) No distinction between the slow and the efficient worker.
 - (iii) The tendency is for the fall in output; this raises the cost per unit (because both labour and fixed expenses will be spread over a smaller number of units).
 - (iv) A firm cannot be sure of labour costs per unit under this method and, hence, may suffer a loss on quotations if already submitted.

In the following cases, time rates are to be preferred.

- (1) Persons whose services cannot be directly or tangibly measured, e.g., general helpers, supervisory and clerical staff etc.
- (2) Workers engaged on highly skilled jobs or rendering skilled services, e.g., tool making, inspection and testing.
- (3) Where the pace of output is independent of the operator, e.g., automatic chemical plants.

3.9.2 High wage plan : This plan was first introduced by Ford Motor Company (in USA) in order to induce workers to exercise extra effort in their work. Under this plan a worker is paid a wage rate which is substantially higher than the rate prevailing in the area or in the industry. In return, he is expected to maintain a very high level of performance, both quantitative and qualitative. As a result, high rate men are not as costly or expensive as they might appear at first sight.

High wage plan is suitable where high quality of work and also increased productivity are required. The advantage which may accrue from the implementation of this plan are :

- (1) It is simple and inexpensive to operate.
- (2) It helps in attracting highly skilled and efficient workers by providing suitable incentive.
- (3) It reduces the extent of supervision.
- (4) Increased productivity may result in reduction of unit labour cost.

3.9.3 Measured day work : According to this method the hourly rate of the time worker consists of two parts *viz*, fixed and variable. The fixed element is based on the nature of the job *i.e.* the rate for this part is fixed on the basis of job requirements. The variable portion varies for each worker depending upon his merit rating and the cost of living index. The aggregate of fixed and variable part for a day is termed as Measured day's work rate of a worker.



As the rate is based on two different elements, there are separate time rates not only for each worker but also for each job. This method does not find much favour with workers due to the following :

1. The rates fixed are not easily understood by the workers.
2. Merit rating tends to be arbitrary and unless changed at rapid intervals, the ratings will not reflect the correct ranking of the qualities of a worker.

3.9.4 Differential time rate : According to this method, different hourly rates are fixed for different levels of efficiency. Up to a certain level of efficiency the normal time or day rate is paid. Based on efficiency level the hourly rate increases gradually. The following table shows different differential rates :

Up to, say 75% efficiency	Normal (say Rs. N per hr.)
From 76% to 80% efficiency	1.10 × N
From 81% to 90% efficiency	1.20 × N
From 91% to 100% efficiency	1.30 × N
From 101% to 120% efficiency	1.40 × N

As this method is linked with the output and efficiency of workers, therefore, it cannot be strictly called as a time rate method of wage payment. This method in fact is similar to differential piece work system.

3.9.5 Payment by result : Under this system the payment made has a direct relationship with the output given by a worker. The attendance of the worker or the time taken by him for doing a job has no bearing on the payment. The system of payment by results may be classified into the following four categories :

- (a) Systems in which the payment of wages is directly proportionate to the output given by workers.
- (b) Systems in which the proportion of the wage payment to the worker increases progressively with increase in production.
- (c) Systems in which payment rate decreases with the increase in output.
- (d) Systems with earnings varying in proportions which differ at different levels of production.

3.9.6 Straight piece work system : Under this system of wage payment, each operation, job or unit of production is termed a piece. A rate of payment, known as the piece rate or piece work rate is fixed for each piece. The wages of the worker depend upon his output and rate of each unit of output; it is in fact independent of the time taken by him. The wages paid to a worker are calculated as :



Wages = Number of units produced × Piece rate per unit.

Considerable care and judgment are called for fixing the piece rate. If the rate fixed is too high or too low, it would operate to the disadvantage of either the employer or the employee. Any attempt on the part of the management to revise a piece rate, erroneously set too high, is likely to lead to friction and conflict with labour. If on the other hand, it is too low, it would fail in its objective. The only way all this may be avoided is by employing scientific methods of job evaluation and time and motion study for the purpose of setting the rates.

Advantages :

1. The system is simple to operate and also easy to understand.
2. The incentive provided is quite effective as the workers get the full benefit of any increase in production and the employer also gains by saving on overhead costs.
3. Labour cost per unit being constant, these can be calculated in advance and quotations can be confidently submitted.

Disadvantages :

1. The quality of output usually suffers.
2. Maintenance of detailed statistics as regards production of individual workers is necessary.
3. Maintenance of satisfactory discipline in the matter of arrival and departure of workers becomes somewhat difficult.
4. In the anxiety to produce as large a quantity as possible, workers may damage the machines and may also increase wastage of materials.
5. Skilled workers and supervisors (who are often paid on time basis) may resent higher wages to unskilled workers paid on the piece basis.

3.9.7 Differential piece work system : This system provide for higher rewards to more efficient workers. The main feature of all differential piece-work systems is that several piece rates on a slab scale are fixed for a job or operation which is put on piece-work. For different levels of output below and above the standard, different piece rates are applicable. Taylor Differential Piece Work System and Merrick Differential Piece Rate System are two important differential piece work systems discussed briefly as below:

(a) *Taylor's differential piece work system* - The Taylor's Differential Piece Rate System aims at rewarding efficient workers by providing increased piece rate beyond certain level of output. Under this system two widely differing piece-rates are prescribed for each job. The lower rate is 83% of the normal piece rate and the higher rate is 125% of the normal piece rate. In other words the higher rate is 150% of the lower rate. The lower rate is given to a worker when his efficiency level is less than 100%. The higher rate is offered at efficiency



Cost Accounting

level of either 100% or more. Due to the existence of the two piece rates, the system is known as differential piece rate system.

Note: Some authors also use 80% and 120% of the piece rates as lower and higher rates respectively at the efficiency levels, as indicated in the above paragraph.

Advantages:

1. It is simple to understand and operate.
2. The incentive is very good and attractive for efficient workers.
3. It has a beneficial effect where overheads are high as increased production has the effect of reducing their incidence per unit of production.

This system is quite harsh to workers, as a slight reduction in output may result in a large reduction in the wages earned by them. This system is no longer in use in its original form, though the main idea behind it is used in many wage schemes.

Illustration :

Using Taylor's differential piece rate system, find the earnings of the Amar, Akbar and Ali from the following particulars:

Standard time per piece	:	20 minutes
Normal rate per hour	:	Rs. 9.00
In a 8 hour day		
Amar produced	:	23 units
Akbar produced	:	24 units
Ali produced	:	30 units

Solution

Earnings under Differential piece rate system

<i>Workers</i>	<i>Amar</i>	<i>Akbar</i>	<i>Ali</i>
Standard output per day (units)	24	24	24
Actual output per day (units)	23	24	30
Efficiency (%)	95.83%	100%	125%
$\frac{\text{Actual output}}{\text{Standard output}} \times 100$	$\frac{23 \text{ unit}}{24 \text{ unit}} \times 100$	$\frac{24 \text{ unit}}{24 \text{ unit}} \times 100$	$\frac{30 \text{ unit}}{24 \text{ unit}} \times 100$
* Earning rate per unit	83% of	125% of	125% of



Labour

	the piece rate	the piece rate	the piece rate
Earning rate per unit (Rs.) (Refer to working note)	2.49 (83% of Rs.3)	3.75 (125% of Rs.3)	3.75 (125% of Rs.3)
Earnings (Rs.)	57.27 (23 units × Rs. 2.49)	90.00 (24 units × Rs. 3.75)	112.50 (30 units × Rs. 3.75)

* Under Taylor's Differential price rate system, two widely differing price rates are prescribed for each job. The lower rate is 83% of the normal piece rate and is applicable if efficiency of the worker is below 100%. The higher piece rate is 125% of the normal piece rate and is applicable if work completed is at efficiency level of 100% and above.

Working Note:

Normal rate per hour = Rs. 9.00

Normal rate per unit = $\frac{\text{Rs.9.00}}{\text{Standard production per hour}} = \frac{\text{Rs.9.00}}{3 \text{ units}}$
= Rs. 3

(b) *Merrick differential piece rate system* - Under this system three piece rates for a job are fixed. None of the fixed rates is below the normal. These three piece rates are as below:

<u>Efficiency</u>	<u>Piece rate applicable</u>
Upto 83%	Normal rate,
Above 83% and upto 100%	10% above normal rate.
Above 100%	20% or 30% above normal rate.

This system is an improvement over Taylor's Differential Piece Rate System.

Illustration

Refer to the statement of previous Illustration and compute the earnings of workers under Merrick Differential Piece Rate System.



Solution

<i>Workers</i>	<i>Amar</i>	<i>Akbar</i>	<i>Ali</i>
* Earning rate per unit (Refer to previous illustration)	10% above the normal rate	10% above the normal rate	20% above the normal rate or 30% above the normal rate
Earning rate per unit (Rs.)	3.30	3.30	3.60 or 3.90
Earnings (Rs.)	75.90	79.20	108 or 117
	(23 units × Rs. 3.30)(24 units × Rs. 3.30)		(30 units × Rs. 3.60) or (30 units × Rs. 3.90)

3.9.8 Gantt task and bonus system : This system is a combination of time and piece work system. According to this system a high standard or task is set and payment is made at time rate to a worker for production below the set standard. If the standards are achieved or exceeded, the payment to the concerned worker is made at a higher piece rate. The piece rate fixed under this system also includes an element of bonus the extent of 20%. The figure of bonus to such workers is calculated over the time rate of the workers.

Thus in its essence, the system consists of paying a worker on time basis if he does not attain the standard and on piece basis if he does.

Wages payable to workers under this plan are calculated as under :

<i>Output</i>	<i>Payment</i>
(i) Output below standard	Guaranteed time rate.
(ii) Output at standard	Time rate <i>plus</i> bonus of 20% (usually) of time rate.
(iii) Output above standard	High piece rate on worker's whole output. It is so fixed, so as to include a bonus of 20% of the time rate.

Advantages :

1. It provides good incentive for efficient workers and at the same time protects the less efficient by guaranteeing the time rate.



2. It is simple to understand and operate.
3. It encourages better supervision and planning.

Disadvantage

The guaranteed time rate may have the effect of weakening the urge of slower worker to increase his output.

Illustration :

In a factory the standard time allowed for completing a given task (50 units), is 8 hours. The guaranteed time wages are Rs. 20 per hour. If a task is completed in less than the standard time, the high rate of Rs. 4 per unit is payable. Calculate the wages of a worker, under the Gantt system, if he completes the task in

(i) 10 hours; (ii) 8 hours, and (iii) in 6 hours. Also ascertain the comparative rate of earnings per hour under the three situations.

Solution

(i) When the worker performs the task in 10 hours, his earnings will be at the time wage rate i.e. 10 hours × Rs. 20 per hour = Rs. 200.

(ii) When the worker performs the task is standard time i.e. in 8 hours, his earning will be:

$$\begin{aligned} 8 \text{ hours} \times \text{Rs. } 20 &= \text{Rs. } 160 \\ \text{Bonus @ 20\% of time wages} &= \underline{\text{Rs. } 32} \\ \text{Total earnings} &= \underline{\text{Rs. } 192} \end{aligned}$$

(iii) When the worker performs the task in less than the standard time his earning will be at piece rate i.e.

$$50 \text{ units} \times \text{Rs. } 4 \text{ per hour} = \text{Rs. } 200$$

The comparative rate of earnings per hour under the above three situations is:

- (i) Rs. 200/10 hrs. = Rs. 20 per hour
- (ii) Rs. 192/8 hrs. = Rs. 24 per hour
- (iii) Rs. 200/6 hrs. = Rs. 33.33 per hour

3.9.9 Emerson's efficiency system : Under this system minimum time wages are guaranteed. But beyond a certain efficiency level, bonus in addition to minimum day wages is given.

A worker who is able to attain efficiency, measured by his output equal to 2/3rd of the



Cost Accounting

standard efficiency, or above, is deemed to be an efficient worker deserving encouragement. The scheme thus provides for payment of bonus at a rising scale at various levels of efficiency, ranging from 66.67% to 150%. For a performance below 66.67% only time rate wages without any bonus are paid. Above 66⅔% to 100% efficiency, bonus varies between 0.01% and 20%. Above 100% efficiency bonus of 20% of basic wages plus 1% for each 1% increase in efficiency is admissible. This system is superior to one to the differential piece rate in so far as it encourages the slow worker to do a little better than before. Also it does not presuppose a high degree of average performance. Wages on time basis are guaranteed.

Illustration

From the following information you are required to calculate the bonus and earnings under Emerson Efficiency System. The relevant information is as under:

Standard working hours	:	8 hours a day
Standard output per hour in units	:	5
Daily wage rate	:	Rs. 50
Actual output in units		
Worker A		25 units
Worker B		40 units
Worker C		45 units

Solution

Statement showing bonus and earnings under Emerson Efficiency System

Workers	A	B	C
Actual output in units	25	40	45
Standard output in units	40	40	40
Efficiency level (%)	62.5%	100%	112.50%
$\left[\frac{\text{Actual output}}{\text{Standard output}} \times 100 \right]$			
Rate of bonus	No bonus	20%	32.50% (20% + 12.5%)
Time wages (Rs.)	50	50	50
Bonus (Rs.)	Nil	10 (20% of Rs. 50)	16.25 (32.5% of Rs. 50)
Total earnings (Rs.)	50	60	66.25



3.9.10 Points scheme or Bedeaux system : Under this scheme, firstly the quantum of work that a worker can perform is expressed in Bedaux points or B's. These points represent the standard time in terms of minutes required to perform the job. The standard number of points in terms of minutes are ascertained after a careful and detailed analysis of each operation or job. Each such minute consists of the time required to complete a fraction of the operation or the job, and also an allowance for rest due to fatigue.

Workers who are not able to complete tasks allotted to them within the standard time are paid at the normal daily rate. Those who are able to improve upon the efficiency rate are paid a bonus, equal to the wages for time saved as indicated by excess of B's earned (standard minutes for work done) over actual time. Workers are paid 75% of the time saved.

Illustration

Calculate the earnings of worker from the following information under Bedeaux system :

Standard time for a product A-30 seconds *plus* relaxation allowance of 50%.

Standard time for a product B-20 second *plus* relaxation allowance of 50%.

During 8 hour day for

Actual output of product for A	500 units.
Actual output of product B	300 units
Wage rate	Rs. 10 per hour

Solution

Bedeaux point per unit of product A :

$$\frac{30 \text{ seconds} + 15 \text{ seconds}}{60} = \frac{45}{60} = 0.75 \text{ B's}$$

Bedeaux point per unit of product B:

$$\frac{15 \text{ seconds} + 10 \text{ seconds}}{60} = \frac{30}{60} = 0.50 \text{ B's}$$

Total production in terms of B's:

$$500 \times 0.75 + 300 \times 0.50 = 525 \text{ B's}$$

Standard B's (8 hours \times 60) = 480 B's

$$\text{No. of B's saved } (525 \text{ B's} - 480 \text{ B's}) = 45 \text{ B's}$$



$$\text{Earnings} = \text{Hrs. worked} \times \text{rate per hour} + 75/100 \times \frac{45}{60} \times \text{Rs. } 10 = \text{Rs. } 80 + \text{Rs. } 5.63 = \text{Rs. } 85.63$$

3.9.11 Hayne's system : Under this system also the standard is set in minutes. The standard time for the job is expressed in terms of the standard man-minutes called as "MANIT". Manit stands for man-minute. In the case of repetitive work the time saved is shared between the worker and the foreman in the ratio 5 : 1. If the work is of non-repetitive nature, the worker, the employer and the foreman share the value of time saved in the ratio of 5 : 4 : 1. Each worker is paid according to hourly rate for the time spent by him on the job.

3.9.12 Accelerated premium system : Under this system earnings increase with output; the rate of increase of earnings itself increases progressively with output; in fact the earnings increase in greater proportion than the increase in production. This system acts as a strong incentive for skilled workers to earn high wages by increasing output and for production beyond standard.

3.9.13 Premium bonus methods : Under these methods, standard time is established for performing a job. The worker is guaranteed his daily wages (except in Barth System), if his output is below and upto standard. In case the task is completed in less than the standard time, the saved time is shared between the employee and the employer. There are two types of time-sharing plans in use viz., constant sharing plans and variable sharing plans.

3.9.14 Halsey and Halsey Weir systems : Under Halsey system a standard time is fixed for each job or process. If there is no saving on this standard time allowance, the worker is paid only his day rate. He gets his time rate even if he exceeds the standard time limit, since his day rate is guaranteed. If, however, he does the job in less than the standard time, he gets a bonus equal to 50 percent of the wages of time saved; the employer benefits by the other 50 percent. The scheme also is sometimes referred to as the Halsey fifty percent plan.

Formula for calculating wages under Halsey system

$$= \text{Time taken} \times \text{Time rate} + 50\% \text{ of time saved} \times \text{Time rate.}$$

The *Halsey Weir System* is the same as the Halsey System except that the bonus paid to workers is 30% of the time saved.

Advantages:

1. Time rate is guaranteed while there is opportunity for increasing earnings by increasing production.
2. The system is equitable in as much as the employer gets a direct return for his efforts in improving production methods and providing better equipment.



Disadvantages:

1. Incentive is not so strong as with piece rate system. In fact the harder the worker works, the lesser he gets per piece.
2. The sharing principle may not be liked by employees.

Illustration

Calculate the earning of a worker under Halsey System. The relevant data is as below :

Time Rate (p.h.)	Re. 0.6
Time allowed	8 hours
Time taken	6 hours
Time saved	2 hours

Solution

Calculation of total earnings :

$$6 \text{ hrs.} \times \text{Re. } 0.6 + 1/2 \times (2 \text{ hrs.} \times \text{Re. } 0.60) \text{ or Rs. } 3.60 + \text{Re. } 0.60 = \text{Rs. } 4.20$$

Of his total earnings, Rs. 3.60 is on account of the time worked and Re. 0.60 is on account of his share of the premium bonus.

3.9.15 Rowan system : According to this system a standard time allowance is fixed for the performance of a job and bonus is paid if time is saved. Under Rowan System the bonus is that proportion of the time wages as time saved bears to the standard time.

Formula for calculating wages under Rowan system

$$= \text{Time taken} \times \text{Rate per hour} + \frac{\text{Time Saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Rate per hour}$$

Advantages :

1. It is claimed to be a fool-proof system in as much as a worker can never double his earnings even if there is bad rate setting.
2. It is admirably suitable for encouraging moderately efficient workers as it provides a better return for moderate efficiency than under the Halsey Plan.
3. The sharing principle appeals to the employer as being equitable.

Disadvantages:

1. The system is a bit complicated.



Cost Accounting

2. The incentive is weak at a high production level where the time saved is more than 50% of the time allowed.
3. The sharing principle is not generally welcomed by employees.

Illustration

Calculate the earnings of a worker under Rowan System. The relevant data is given as below:

Time rate (per Hour)	Re. 0.6
Time allowed	8 hours.
Time taken	6 hours.
Time saved	2 hours.

Solution

Calculation of total earnings:

$$\begin{aligned} &= \text{Time taken} \times \text{Rate per hour} + \frac{\text{Time Saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Rate per hour} \\ &= 6 \text{ hours} \times \text{Rs. } 0.60 + \frac{2 \text{ hours}}{8 \text{ hours}} \times 6 \text{ hours} \times 0.60 \\ &= \text{Rs. } 3.60 + \text{Rs. } 0.90 = \text{Rs. } 4.50 \end{aligned}$$

3.9.16 Barth system : The formula used for calculating the remuneration under this system is as follows :

$$\text{Earnings} = \text{Hourly rate} \times \sqrt{\text{Standard hours} \times \text{Hours worked}}$$

The system is particularly suitable for trainees and beginners and also for unskilled workers. The reason is that for low production efficiency, the earnings are higher than in the piece-work system but as the efficiency increases, the rate of increase in the earnings falls.

Illustration

A factory having the latest sophisticated machines wants to introduce an incentive scheme for its workers, keeping in view the following:

- (i) The entire gains of improved production should not go to the workers.
- (ii) In the name of speed, quality should not suffer.
- (iii) The rate setting department being newly established are liable to commit mistakes.



You are required to devise a suitable incentive scheme and demonstrate by an illustrative numerical example how your scheme answers to all the requirements of the management.

Solution

Rowan Scheme of premium bonus (variable sharing plan) is a suitable incentive scheme for the workers of the factory. If this scheme is adopted, the entire gains due to time saved by a worker will not pass to him.

Another feature of this scheme is that a worker cannot increase his earnings or bonus by merely increasing its work speed. The reason for this is that the bonus under Rowan Scheme is maximum when the time taken by a worker on a job is half of the time allowed. As this fact is known to the workers, therefore, they work at such a speed which helps them to maintain the quality of output too.

Lastly, Rowan System provides a safeguard in the case of any loose fixation of the standards by the rate-setting department. It may be observed from the following illustration that in the Rowan Scheme the bonus paid will be low due to any loose fixation of standards. Workers cannot take undue advantage of such a situation. The above three features of Rowan Plan can be discussed with the help of the following illustration:

$$\begin{aligned} \text{(i) Time allowed} &= 4 \text{ hours} \\ \text{Time taken} &= 3 \text{ hours} \\ \text{Time saved} &= 1 \text{ hour} \\ \text{Rate} &= \text{Rs. 5 per hour} \\ \text{Bonus} &= \frac{\text{Time taken}}{\text{Time allowed}} \times \text{Time saved} \times \text{Rate} \\ &= \frac{3 \text{ hours}}{4 \text{ hours}} \times 1 \text{ hour} \times \text{Rs. 5} = \text{Rs. 3.75} \end{aligned}$$

In the above illustration time saved is 1 hour and, therefore, total gain is Rs. 5. Out of Rs. 5 according to Rowan Plan only Rs. 3.75 is given to the worker in the form of bonus and the remaining Rs. 1.25 remains with the management. In other words a worker is entitled for 75 percent of the time saved in the form of bonus.

(ii) The figures of bonus in the above illustration when the time taken is 2 hours and 1 hour respectively are as below:

$$\text{Bonus} = \frac{\text{Time taken}}{\text{Time allowed}} \times \text{Time saved} \times \text{Rate}$$



Cost Accounting

$$= \frac{2 \text{ hours}}{4 \text{ hours}} \times 2 \text{ hours} \times \text{Rs. } 5 = \text{Rs. } 5$$

$$= \frac{1 \text{ hour}}{4 \text{ hours}} \times 3 \text{ hours} \times \text{Rs. } 5 = \text{Rs. } 3.75$$

The above figures of bonus clearly show that when time taken is half of the time allowed, the bonus is maximum. When the time taken is reduced from 2 to 1 hour, the bonus figure fell by Rs. 1.25. Hence, it is quite apparent to workers that it is of no use to increase speed of work. This feature of Rowan Plan thus protects the quality of output.

- (iii) If the rate-setting department erroneously sets the time allowed as 10 hours instead of 4 hours, in the above illustration; then the bonus paid will be as follows:

$$\text{Bonus} = \frac{3 \text{ hours}}{10 \text{ hours}} \times 7 \text{ hours} \times \text{Rs. } 5 = \text{Rs. } 10.50$$

The bonus paid for saving 7 hours thus is Rs. 10.50 which is approximately equal to the wages of 2 hours. In other words the bonus paid to the workers is low. Hence workers cannot take undue advantage of any mistake committed by the time setting department of the concern.

Illustration

- (a) Bonus paid under the Halsey Plan with bonus at 50% for the time saved equals the bonus paid under the Rowan System. When will this statement hold good? (Your answer should contain the proof).
- (b) The time allowed for a job is 8 hours. The hourly rate is Rs. 8. Prepare a statement showing:
- The bonus earned
 - The total earnings of labour and
 - Hourly earnings.

Under the Halsey System with 50% bonus for time saved and Rowan System for each hour saved progressively.

Solution

- (a) *Bonus under Halsey Plan*
= Standard wage rate \times 50/100 \times Time saved ...*(i)*



Bonus under Rowan Plan

$$= \text{Standard wage rate} \times \frac{\text{Time taken}}{\text{Time allowed}} \times \text{Time taken} \quad \dots(ii)$$

Bonus under Halsey Plan will be equal to the

Bonus under Rowan Plan when the following condition holds good

$$= \text{Standard wage rate} \times 50/100 \times \text{Time saved}$$

$$= \text{Standard wage rate} \times \frac{\text{Time taken}}{\text{Time allowed}} \times \text{Time saved}$$

or
$$\frac{1}{2} = \frac{\text{Time taken}}{\text{Time allowed}}$$

or
$$\text{Time taken} = \frac{1}{2} \text{ of time allowed.}$$

Hence, when the time taken is 50% of the time allowed, the bonus under Halsey and Rowan Plans is equal.

(b) Statement of Bonus, Total earnings of Labour and hourly earnings under Halsey and Rowan Systems

<i>Time allowed</i>	<i>Time taken</i>	<i>Time saved</i>	<i>Basic Wages</i>	<i>Bonus under Halsey System</i>	<i>Bonus under Rowan system</i>	<i>Total earning under Halsey System</i>	<i>Total earning under Rowan System</i>	<i>Hourly earning under Halsey System</i>	<i>Hourly earning under Rowan System</i>
A	B	C=(A-B)	D	E	F	G	H	I	J
<i>hours</i>	<i>hours</i>	<i>hours</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
8	8	-	64	-	-	64	64	8.00	8.00
8	7	1	56	4	7	60	63	8.57	9.00
8	6	2	48	8	12	56	60	9.33	10.00
8	5	3	40	12	15	52	55	10.40	11.00
8	4	4	32	16	16	48	48	12.00	12.00
8	3	5	24	20	15	44	39	14.67	13.00



Cost Accounting

8	2	6	16	24	12	40	28	20.00	14.00
8	1	7	8	28	7	36	15	36.00	15.00

Illustration

Mr. A. is working by employing 10 skilled workers. He is considering the introduction of some incentive scheme - either Halsey Scheme (with 50% bonus) or Rowan Scheme - of wage payment for increasing the labour productivity to cope with the increased demand for the product by 25%. He feels that if the proposed incentive scheme could bring about an average 20% increase over the present earnings of the workers, it could act as sufficient incentive for them to produce more and he has accordingly given this assurance to the workers.

As a result of the assurance, the increase in productivity has been observed as revealed by the following figures for the current month :

Hourly rate of wages (guaranteed)	Rs. 2.00
Average time for producing 1 piece by one worker at the previous performance (This may be taken as time allowed)	2 hours
No. of working days in the month	25
No. of working hours per day for each worker	8
Actual production during the month	1,250 units

Required :

1. Calculate effective rate of earnings per hour under Halsey Scheme and Rowan Scheme.
2. Calculate the savings to Mr. A in terms of direct labour cost per piece under the schemes.
3. Advise Mr. A about the selection of the scheme to fulfil his assurance.

Solution

Working Notes:

1. Total time wages of 10 workers per month :
= No. of working days in the month × No. of working hours per day of each worker ×
Hourly rate of wages × No. of workers
= 25 days × 8 hrs. × Rs. 2 × 10 workers = Rs. 4,000
2. *Time saved per month :*
Time allowed per piece by a worker 2 hours



No. of units produced during the month by 10 workers	1,250 pieces
Total time allowed to produce 1,250 pieces (1,250 × 2 hours)	2,500 hours
Actual time taken to produce 1,250 pieces	2,000 hours
Time saved (2,500 hours – 2,000 hours)	500 hours

3. Bonus under Halsey scheme to be paid to 10 workers :

$$\begin{aligned}\text{Bonus} &= (50\% \text{ of time saved}) \times \text{hourly rate of wages} \\ &= 50/100 \times 500 \text{ hours} \times \text{Rs. } 2 = \text{Rs. } 500\end{aligned}$$

Total wages to be paid to 10 workers are (Rs. 4,000 + Rs. 500) Rs. 4,500, if Mr. A considers the introduction of Halsey Incentive Scheme to increase the labour productivity.

4. Bonus under Rowan Scheme to be paid to 10 workers :

$$\text{Bonus} = \frac{\text{Time taken}}{\text{Time allowed}} \times \text{Time wages} = \times \text{Rs. } 4,000 = \text{Rs. } 800$$

Total wages to be paid to 10 workers are (Rs. 4,000 + Rs. 800) Rs. 4,800, if Mr. A considers the introduction of Rowan Incentive Scheme to increase the labour productivity.

1. (i) **Effective hourly rate of earnings under Halsey scheme :**

(Refer to Working Notes 1, 2 and 3)

$$\begin{aligned}&= \frac{\text{Total time wages of 10 workers} + \text{Total bonus under Halsey scheme}}{\text{Total hours worked}} \\ &= \frac{\text{Rs. } 4,000 + \text{Rs. } 500}{2,000 \text{ hours}} = \text{Rs. } 2.25\end{aligned}$$

- (ii) **Effective hourly rate of earnings under Rowan scheme :**

(Refer to Working Notes 1, 2 and 4)

$$\begin{aligned}&= \frac{\text{Total time wages of 10 workers} + \text{Total bonus under Rowan scheme}}{\text{Total hours worked}} \\ &= \frac{\text{Rs. } 4,000 + \text{Rs. } 800}{2,000 \text{ hours}} = \text{Rs. } 2.40\end{aligned}$$



Cost Accounting

2. (i) **Saving in terms of direct labour cost per piece under Halsey scheme :**

(Refer to Working Note 3)

Labour cost per piece (under time wage scheme) = 2 hours × Rs. 2 = Rs. 4.

Labour cost per piece (under Halsey scheme)

$$= \frac{\text{Total wages paid under the scheme}}{\text{Total number of units produced}} = \frac{\text{Rs.4,500}}{1,250} = \text{Rs. 3.60}$$

Saving per piece : (Rs. 4 – Rs. 3.60) = Re. 0.40.

(ii) **Saving in terms of direct labour cost per piece under Rowan Scheme :**

(Refer to Working Note 4)

Labour cost per piece under Rowan scheme = Rs. 4,800/1,250 units = Rs. 3.84

Saving per piece = Rs. 4 – Rs. 3.84 = Re. 0.16.

3. From the labour cost per piece under Halsey scheme (Rs. 3.60) and Rowan scheme (Rs. 3.84), it is quite clear that Halsey scheme brings about more saving than Rowan scheme to the concern. But Halsey scheme does not fulfil the assurance given to the workers about 20% increase in their earnings as it secures only 12.5% $[500/4,000] \times 100$ increase.

On the other hand, Rowan scheme secures 20% $[800/4,000] \times 100$ increase in the earnings and it fulfils the assurance. Therefore, Rowan scheme may be adopted.

Illustration

Wage negotiations are going on with the recognised Labour Union and the Management wants you as the Cost Accountant of the Company to formulate an incentive scheme with a view to increase productivity.

The case of three typical workers Achyuta, Ananta and Govida who produce respectively 180, 120 and 100 units of the company's product in a normal day of 8 hours is taken up for study.

Assuming that day wages would be guaranteed at 75 paise per hour and the piece rate would be based on a standard hourly output of 10 units, calculate the earnings of each of the three workers and the labour cost per 100 pieces under (i) Day wages, (ii) Piece rate, (iii) Halsey scheme, and (iv) The Rowan scheme.

Also calculate under the above schemes the average cost of labour for the company to produce 100 pieces.

Solution

Calculation of earnings of each of the three workers and the labour cost per 100 pieces under



Labour

different wage schemes.

(i) Day wages

<i>Name of workers</i>	<i>Day wages</i>	<i>Actual output (units)</i>	<i>Labour cost per 100 pieces</i>
	<i>Rs.</i>		<i>Rs.</i>
Achyuta	6.00	180	3.33
Ananta	6.00	120	5.00
Govinda	<u>6.00</u>	<u>100</u>	6.00
Total	<u>18.00</u>	<u>400</u>	

Average cost of labour for the company to produce 100 pieces :

$$\frac{\text{Total wages paid}}{\text{Total output}} \times 100 = \frac{\text{Rs.18}}{400} \times 100 = \text{Rs. 4.50}$$

(ii) Piece rate

<i>Name of workers</i>	<i>Actual output (units)</i>	<i>Piece rate</i>	<i>Wages earned</i>	<i>Labour cost per 100 pieces</i>
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Achyuta	180	0.075	13.50	7.50
Ananta	120	0.075	9.00	7.50
Govinda	100	0.075	7.50	7.50
Total	400		30.00	

Average cost of labour for the company to produce 100 pieces : $= \frac{\text{Rs.30}}{400} \times 100 = \text{Rs. 7.50}$



Cost Accounting

(iii) Halsey Scheme

Name of workers	Actual output (units)	Std. time for actual output Hrs.	Actual time for actual output Hrs.	Time saved Hrs.	Bonus Hrs. (50% of time saved Hrs.)	Total wages including Bonus* Rs.	Labour cost per 100 pieces Rs.
Achyuta	180	18	8	10	5	9.75	5.42
Ananta	120	12	8	4	2	7.50	6.25
Govinda	100	10	8	2	1	<u>6.75</u>	6.75
						<u>24.00</u>	

Average cost of labour for the company to produce 100 pieces = $\frac{\text{Rs.} 24}{400} \times 100 = \text{Rs.} 6.00$

*Total wages = (Actual hours worked + bonus hours) × Rate per hour

Hence total wages of Achyuta are: (8 + 5) × Rs. 0.75 = Rs. 9.75

Similarly, the total wages of Ananta and Govinda are Rs. 7.50 and Rs. 6.75 respectively.

(iv) Rowan Scheme:

Name of workers	Actual output (units)	Std. time for actual output (hrs.)	Actual time taken hours	Time saved (hours)	Bonus* hrs.	Wages for actual hrs. @ 75 P per hr. Rs.	Bonus @ 75 P per hour Rs.	Total earnings Rs.	Labour cost per 100 pieces Rs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(7)+(8)=(9)	(10)
Achyuta	180	18	8	10	4.44	6.00	3.33	9.33	5.18
Ananta	120	12	8	4	2.67	6.00	2.00	8.00	6.67
Govinda	100	10	8	2	1.6	6.00	1.20	<u>7.20</u>	7.20
								<u>24.53</u>	

Average cost of labour to the company for 100 pieces = $\frac{\text{Rs.} 24.53}{400} \times 100 = \text{Rs.} 6.13$



$$\text{*Bonus hours} = \text{Time taken} \times \frac{\text{Time saved}}{\text{Time allowed}}$$

$$\text{Bonus hours of Achyuta} = \frac{8 \text{ hours} \times 10 \text{ hours}}{18 \text{ hours}} = 4.44$$

Similarly, bonus hours of Ananta and Govinda are 2.67 hours and 1.6 hours respectively.

3.9.17 Group System of wage payment : Certain jobs or operations are required to be performed collectively by a number of workers. Under such cases each man's work depends on the work performed by one or more of his colleagues and as such it is not possible to measure separately the output of each worker.

The workers constituting a group or a team here are considered as a composite unit and the combined output of such a unit is measured for the purpose of wage calculation. The methods usually used for distributing wages to each worker are the following :

1. Equally, if all the workers of the group are of the same grade and skill, same rate of pay and has worked for same duration.
2. Prorata to the time-rate of each worker where the time spent by the individual worker is the same.
3. On the basis of the time rates and attendance of each worker.
4. On a specified percentage basis; the percentage applicable to a worker is pre-determined on the basis of the skill, rate of pay etc.
5. In a group of unskilled and skilled workers, a method of distribution is to pay the unskilled workers at their time rates. The balance amount remaining out of the total earnings after payment to the unskilled workers is distributed among the skilled workers by any of the methods discussed above.

Group Bonus - Group Bonus refers to the bonus paid for the collective efforts made by a group of workers. The amount of bonus is distributed among the individual members of the group on some agreed basis.

Group Bonus Schemes - Under a group bonus scheme, bonus is paid to a team/group of employees working together. Such a scheme is introduced generally where individual efficiency cannot be established for the payment of bonus. For example, in the construction work, it is the team work of masons and labourers which produces results. If any incentive is to be offered, it should be offered to the team as a whole and not to an individual. Group bonus is based on the combined output of the team as a whole. The quantum of bonus is determined on the basis of the productivity of the team and the bonus is shared by individual workers in specified proportions, often in the proportion of wages on time basis.



Cost Accounting

Objectives of Group Bonus Schemes:

The objectives of a group bonus scheme are the following :-

- (i) To create collective interest and team spirit among workers.
- (ii) To create interest among supervisors to improve performance.
- (iii) To reduce wastage in materials and idle time.
- (iv) To achieve optimum output at minimum cost.
- (v) To encourage individual members of the group, team where only the output of the team as a whole can be measured.

Advantages of Group Bonus Schemes :

1. They create a sense of team spirit since all the workers in a group realise that their personal incentives are dependent upon group effort.
2. A spirit of healthy competition amongst various groups doing identical jobs is also created. This results in the elimination of excessive waste of materials.
3. The operators and supervisors also feel interested in raising the production to higher levels.
4. The scheme is usually easier to understand and entails less costing and accounting work. It is easier to set up group activity targets, since the performance unit is large.

Schemes of group bonus - There are five schemes of group bonus as discussed below :

- (1) *Priestman's Production Bonus* : This method was adopted by Priestman Bros. Ltd., in 1917. According to this method when the actual production in units or points exceeds the standard fixed, a bonus is paid to the workers as additional wages equivalent to the percentage of actual output over the standard output.
- (2) *Cost Efficiency Bonus* : Under this scheme, the amount of bonus is calculated when the cost is reduced below the normal established targets. Targets of cost, for example, material cost, labour cost and overhead cost etc., per unit are fixed. If the measurement of actual performance shows a saving in the total labour and material cost or a reduction in the total cost per unit, a fair percentage of the saving is distributed among the staff. Three popular schemes usually used for calculating the amount to be distributed to workers as Bonus are as below :
 - (i) *Nunn-Bush Plan* : According to this plan a norm of direct labour cost is fixed and expressed as a percentage of the sales value. The amount calculated at this percentage is credited to a fund. The actual labour cost is debited to this fund and the balance remaining to the credit of this fund is distributed as bonus to all the workers and employees.



- (ii) *Scanlon Plan* : Here also a fund is created for the normal cost of wages and salaries. This fund is debited with the actual labour costs. Two-thirds to three-fourths of the credit balance, if any, is distributed as bonus, the balance is kept as reserve for future set-backs.
- (iii) *Rucker Plan* : This plan is quite similar to Nunn-Bush Plan except that the percentage for crediting the fund is based on the total value added by manufacturer (*i.e.* the total cost less the value of the material) and not on total sales value.
- (3) *Town Gain Sharing Plan* : Under this plan bonus is dependent upon a saving in the labour cost as compared to standard. The bonus is calculated at 50% of the saving achieved.
- (4) *Budgeted Expense Bonus* : Bonus is determined in advance and paid as a percentage of savings effected in the actual total expenses as compared to the budgeted expense. It is payable to indirect workers also.
- (5) *Waste Reduction Bonus* : Bonus becomes payable under this scheme if the team of workers brings about a reduction in the percentage of material wastages as compared to the standard set. It is applicable to industries where the material cost assumes a greater proportion of the total cost.

Many times group bonus schemes do not enjoy the approval of workers. Some workers tend to feel that their personal incentives are low merely because some members of the group are lazy or inefficient. Such workers believe that it is better to provide incentives on individual basis, if it is possible.

3.9.18 System of Incentive schemes for Indirect Workers: Since the setting of work standards and measurement of output in the case of indirect workers is not an easy task in respect of maintenance, internal transport, inspection, packing and cleaning, therefore the introduction of a system of payment by results for indirect workers is difficult. In spite of the aforesaid difficulty, it has been felt necessary to provide for incentives to indirect workers, due to the following reasons:

1. Payment of incentive bonus to direct workers and time rate to indirect workers leads to dissatisfaction and labour unrest.
2. Indirect workers are as much entitled to bonus as direct workers.
3. Bonus payment to indirect workers creates team spirit.
4. An incentive system for indirect workers assists in maintaining the efficiency of services such as plant repairs, stores maintenance, material handling etc.
5. The efficiency of direct workers is reduced where their work is dependent upon the service rendered by the indirect workers.



Cost Accounting

A few examples of incentive schemes to indirect workers are as below :

- (i) *Incentive to supervisors and foremen* : Supervisors and foremen are an important link between the management and the workers. Incentive payment to these persons would assist in maintaining all round efficiency. Incentive to supervisors and foremen may be provided in the form of non-financial benefits.

Incentive can also be provided to these workers in the form of Bonus. The extent of bonus which will be distributed as incentive will depend on the savings effected over the standards.

- (ii) *Incentive to maintenance and repairs staff* : Under mass production work, repair and maintenance duties can be considered as routine and repetitive for which percentage of efficiency can be evaluated. In case such an evaluation is not possible or practicable, a group bonus system may be established, on the basis of reduction in breakdown or on the number of complaints.

Illustration

A, B and C were engaged on a group task for which a payment of Rs. 725 was to be made. A's time basis wages are Rs. 8 per day, B's Rs. 6 per day and C's Rs. 5 per day. A worked for 25 days; B worked for 30 days; and C for 40 days. Distribute the amount of Rs. 725 among the three workers.

Solution

Total wages on time basis :	Rs.
A 25 @ Rs. 8	200
B 30 @ Rs. 6	180
C 40 @ Rs. 5	<u>200</u>
	580
Payment for the task	
Bonus : (Rs. 725 – Rs. 580)	<u>145</u>
or, 25% of the time-basis wages.	725

Worker	Earnings of each worker		Total
	Wages on time basis	Group task Bonus 25%	
	Rs.	Rs.	Rs.
A	200	50	250
B	180	45	225
C	<u>200</u>	<u>50</u>	<u>250</u>
	<u>580</u>	<u>145</u>	<u>725</u>



Illustration

Both direct and indirect labour of a department in a factory are entitled to production bonus in accordance with a group incentive scheme, the outline of which is as follows :

- (a) For any production in excess of the standard rate fixed at 16,800 tonnes per month (of 28 days) a general incentive of Rs. 15 per tonne is paid in aggregate. The total amount payable to each separate group is determined on the basis of an assumed percentage of such excess production being contributed by it, namely @ 65% by direct labour, @ 15% by inspection staff, @ 12% by maintenance staff and @ 8% by supervisory staff.
- (b) Moreover, if the excess production is more than 20% above the standard, direct labour also get a special bonus @ Rs. 5 per tonne for all production in excess of 120% of standard.
- (c) Inspection staff are penalized @ Rs. 20 per tonne for rejection by customer in excess of 2% of production.
- (d) Maintenance staff are also penalized @ Rs. 20 per hour for breakdown.

From the following particulars for a month, work out production bonus earned by each group :

- (a) Actual working days : 25
- (b) Production : 21,000 tonnes
- (c) Rejection by customer : 500 tonnes
- (d) Machine breakdown : 40 hours

Solution

$$\begin{aligned} 1. \quad \text{Standard output per day} &= \frac{\text{Standard output per month}}{\text{Budgeted number of days in a month}} \\ &= \frac{16,800 \text{ tonnes}}{28 \text{ days}} = 600 \text{ tonnes} \end{aligned}$$

$$2. \quad \text{Standard output for 25 days} = 600 \text{ tonnes} \times 25 \text{ days} = 15,000 \text{ tonnes}$$

(a) General Incentive

- (i) Standard output : 15,000 tonnes
- (ii) Actual output : 21,000 tonnes
- (iii) Excess output over standard : 21,000 – 15,000 = 6,000 tonnes



Cost Accounting

(iv) Percentage of excess : 40%

production to standard output : $\frac{6,00 \text{ tonnes}}{15,000 \text{ tonnes}} \times 100$

(v) Aggregate general incentive : = Excess output \times Rs. 15

: = 6,000 tonnes \times Rs.15 = Rs. 90,000

(vi) Allocation of general incentive

Direct labour : 65% of Rs. 90,000 Rs. 58,500

Inspection staff : 15% of Rs. 90,000 Rs. 13,500

Maintenance staff : 12% of Rs. 90,000 Rs. 10,800

Supervisory staff : 8% of Rs. 90,000 Rs. 7,200

Total Rs. 90,000

(b) Special bonus to direct workers

(i) 20% is the excess output over 120% of standard output

or 3,000 tonnes (15,000 tonnes \times 20%)

(ii) Special incentive = 3,000 tonnes \times Rs. 5 = Rs. 15,000

(c) Penalty imposed on inspection staff

(i) Normal rejection = 2% of production = 2% of 21,000 tonnes

= 420 tonnes

(ii) Actual rejection = 500 tonnes

(iii) Excess rejection over normal rejection = 500 – 420 = 80 tonnes

(iv) Penalty = 80 tonnes \times Rs. 20 per tonne = Rs. 1,600



(d) Penalty imposed on maintenance staff

(i) Breakdown hours = 40 hours

(ii) Penalty = 40 hours × Rs. 20 per hour = Rs. 800

Statement of production bonus earned by each group

Particulars	Direct	Inspection	Maintenance	Supervisory	Total
	labour	staff	staff	staff	staff
	(Rs.)	(Rs.)	(Rs.)	(Rs.)	(Rs.)
	1	2	3	4	5
Aggregate					
general incentive	58,500	13,500	10,800	7,200	90,000
Special bonus	15,000	-	-	-	15,000
Penalty	- (1,600)	(800)	-	(2,400)	
Production bonus	73,500	11,900	10,000	7,200	1,02,600

3.9.19 Profit-sharing and Co-partnership schemes - A profit-sharing scheme implies that the net profit of business would be shared between the workers and the shareholders or the partners in a pre-determined ratio. Co-partnership, on the other hand, implies that the workers shall own the business jointly with the shareholders. In this case, usually the workers share of profits is given in the form of shares.

Some employers in our country originally introduced profit-sharing schemes with a view of stimulating interest among workers for increasing production. But the schemes have not been successful on account of unwillingness on the part of the management to consult workers. Even a demand for copies of final accounts of the business to be shown to them has been considered by some employers to be an unwarranted interference. The question of bonus has thus been one of the major causes of industrial disputes in recent years. (Payment of compulsory bonus is now governed by the payment of Bonus Act.)

Though profit sharing has become a normal feature of the industrial life in this country, co-partnership is comparatively unknown. Nevertheless it must be pointed out that in England and other Western countries, a number of successful concerns have been allotting shares to



Cost Accounting

their workers in proportion to their shares of bonus. Some of them have advanced loans to them to purchase shares. Both these forms of benefit have been quite popular with labour.

Advantages :

- (i) Employees are made to feel that they too have a stake in the well-being of the undertaking and have a contribution to make in earning of profits by improving production and operations.
- (ii) Labour turnover may be reduced, particularly if a minimum period of service is laid down as a condition for participating in such schemes.

Disadvantages :

- (i) Profit may fluctuate from year to year; there is thus an element of uncertainty in such schemes.
- (ii) Profit depends upon many factors of which labour efficiency is only one. Insufficiency of bonus may lead to dissatisfaction instead of promoting good relations, if the good work done by labour is nullified by other factors.
- (iii) The reward may be too remote to sustain continued interest in and zeal for work.
- (iv) There may be doubt and suspicion about the profit disclosed.
- (v) Since all are entitled to participate in such schemes, there is no recognition of individual merit.
- (vi) The individual share of profit may be too meagre to be appealing.
- (vii) Since in practice bonus has to be fought in India, so it has become an important cause of labour disputes.

Treatment in Costing : In foreign countries bonus is an ex-gratia payment and hence it is regarded as an appropriation of profit not to be included in costs. In fact trade unions there do not look upon bonus with favour. In India however, payment of bonus is compulsory under the Payment of Bonus Act under which 8.33% of wages earned or Rs. 100 whichever is higher, is the minimum bonus payable, the maximum being 20%. Hence bonus must be treated as part of costs in India. There can be two methods of dealing with bonus. It may be treated as part of overheads; in any case, this must be so for bonus paid to indirect workers. In the case of direct workers the bonus payable may be estimated beforehand and wage rates for costing purposes suitably inflated by including the bonus that would be paid.

Suppose, a worker gets Rs. 800 p.m. as wages and it is expected that he will be paid two months's wages as bonus. His total earning will be Rs. 11,200 (Rs. 9,600 + Rs. 1,600). If the worker works for 2,400 hours in a year the wage rate for costing purposes will be : Rs. 4.67, i.e., Rs. 11,200/2,400 hours.



Illustration

A skilled worker in XYZ Ltd. is paid a guaranteed wage rate of Rs. 30 per hour. The standard time per unit for a particular product is 4 hours. P, a machineman, has been paid wages under the Rowan Incentive Plan and he had earned an effective hourly rate of Rs. 37.50 on the manufacture of that particular product.

What could have been his total earnings and effective hourly rate, had been put on Halsey Incentive Scheme (50%) ?

Solution

Let T hours be the total time worked in hours by the skilled worker (machineman P); Rs. 30/- is the rate per hour; standard time is 4 hours per unit and effective hourly earning rate is Rs. 37.50 then

$$\text{Earnings} = \text{Hours worked} \times \text{Rate per hour} + \frac{\text{Time saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Rate per hour}$$

(Under Rowan incentive plan)

$$\text{Rs. } 37.5 T = T \times \text{Rs. } 30 + \frac{(4 - T)}{4} \times T \times \text{Rs. } 30$$

$$\text{Rs. } 37.5 = \text{Rs. } 30 + (4 - T) \times \text{Rs. } 7.5$$

$$\text{Or } \text{Rs. } 7.5 T = \text{Rs. } 22.5$$

$$\text{Or } T = 3 \text{ hours}$$

Total earnings and effective hourly rate of skilled worker (machineman P) under Halsey Incentive Scheme (50%)

$$\text{Total earnings} = \text{Hours worked} \times \text{Rate per hour} + \frac{1}{2} \text{ Time saved} \times \text{Rate per hour}$$

(Under 50% Halsey incentive Scheme)

$$= 3 \text{ hours} \times \text{Rs. } 30 + \frac{1}{2} \times 1 \text{ hour} \times \text{Rs. } 30 = \text{Rs. } 105$$

$$\text{Effective hourly rate} = \frac{\text{Time earnings}}{\text{Time allowed}} = \frac{\text{Rs. } 105}{3 \text{ hours}} = \text{Rs. } 35$$



Cost Accounting

Illustration

During audit of account of G Company, your assistant found errors in the calculation of the wages of factory workers and he wants you to verify his work.

He has extracted the following information :

- (i) The contract provides that the minimum wage for a worker is his base rate. It is also paid for downtimes i.e., the machine is under repair or the worker is without work. The standard work week is 40 hours. For overtime production, workers are paid 150 percent of base rates.
- (ii) Straight Piece Work – The worker is paid at the rate of 20 paise per piece.
- (iii) Percentage Bonus Plan – Standard quantities of production per hour are established by the engineering department. The workers' average hourly production, determined from his total hours worked and his production, is divided by the standard quantity of production to determine his efficiency ratio. The efficiency ratio is then applied to his base rate to determine his hourly earnings for the period.
- (iv) Emerson Efficiency Plan – A minimum wages is paid for production upto $66\frac{2}{3}\%$ of standard output or efficiency. When the workers production exceeds $66\frac{2}{3}\%$ of the standard output, he is paid bonus as per the following table :

Efficiency Level	Bonus
Upto $66\frac{2}{3}\%$	Nil
Above $66\frac{2}{3}\%$ to 79 %	10%
80% – 99%	20%
100% – 125%	45%

Your assistant has produced the following schedule pertaining to certain workers of a weekly pay roll :

Workers	Wage Incentive Plan	Total Hours	Down Time Hours	Units Produced	Standard Units	Base Rate	Gross Wages as per Book
						Rs.	Rs.
Rajesh	Straight piece work	40	5	400	—	1.80	85
Mohan*	Straight piece work	46	—	455	—	1.80	95
John	Straight piece work	44	—	425	—	1.80	85
Harish	Percentage bonus plan	40	4	250	200	2.20	120



Labour

Mahesh	Emerson	40	—	240	300	2.10	93
Anil	Emerson	40	—	600	500	2.00	126

(40 hours production)

* Total hours of Mohan include 6 overtime hours.

Prepare a schedule showing whether the above computation of workers' wages are correct or not. Give details.

Solution

**Schedule showing the correct figure of
minimum wages, gross wages and wages to be paid**

<i>Workers</i>	<i>Wage incentive plan</i>	<i>Minimum wages (Rs.)</i>	<i>Gross wages computed as per Incentive plan (Rs.)</i>	<i>Gross wage as per book (Rs.)</i>	<i>Wages to be paid are Maximum of : minimum and gross computed wages (Rs.)</i>
Rajesh	Straight piece work	72.00	80.00	85	80.00
<i>(Refer to W. Note 1)</i>					
Mohan	Straight piece work	88.20	91.00	95	91.00
<i>(Refer to W. Note 2)</i>					
John	Straight piece work	82.80	85.00	85	85.00
<i>(Refer to W. Note 3)</i>					
Harish	Percentage bonus plan	88.00	110.00	120	110.00
<i>(Refer to W. Note 4)</i>					
Mahesh	Emerson	84.00	100.80	93	100.80
<i>(Refer to W. Note 5)</i>					
Anil	Emerson	80.00	116.00	126	116.00
<i>(Refer to W. Note 6)</i>					

Working notes :

- Minimum wages = Total normal hours × rate per hour
= 40 hours × Rs. 1.80 = Rs. 72
- Gross wages (computed) = No. of units × rate per unit



Cost Accounting

as per incentive plan	= 400 units × Rs. 0.20 = Rs. 80
2. Minimum wages	= Total normal hours × Rate per hour + Overtime hours × Overtime rate per hour = 40 hours × Rs. 1.80 + 6 hours × Rs. 2.70 = Rs. 72 + Rs. 16.20 = Rs. 88.20
Gross wages (computed)	
as per incentive plan	= 455 units × Re. 0.20 = Rs. 91.00
3. Minimum wages	= 40 hours × Rs. 1.80 + 4 hours × Rs. 2.70 = Rs. 72 + Rs. 10.80 = Rs. 82.80
Gross wages (computed)	= 425 units × Rs. 0.20 = Rs. 85
as per incentive plan	
4. Minimum wages	= 40 hours × Re. 2.20 = Rs. 88
Efficiency of worker	= $\frac{\text{Actual production per hour}}{\text{Standard production per hour}} \times 100$ = $\frac{(250 \text{ units}/40 \text{ hours})}{(200 \text{ units}/40 \text{ hours})} \times 100 = 125\%$
Hourly rate	= Rate per hour × Efficiency of worker = Rs. 2.20 × 125% = Rs. 2.75
Gross wages (computed)	
as percentage of bonus plan	= 40 hours × Rs. 2.75 = Rs. 110/-
5. Minimum wages	= 40 hours × Rs. 2.10 = Rs. 84
Efficiency of worker	= $\frac{(240 \text{ units}/40 \text{ hours})}{(300 \text{ units}/40 \text{ hours})} \times 100 = 80\%$
Bonus (as per Emerson's plan)	= Total minimum wages × Bonus percentage = Rs. 84 × 20% = Rs. 16.80
Gross wages (computed) as per	
Emerson's Efficiency plan	= Minimum wages + Bonus = Rs. 84 + Rs. 16.80 = Rs. 100.80



$$\begin{aligned} 6. \quad \text{Minimum wages} &= 40 \text{ hours} \times \text{Rs. } 2 = \text{Rs. } 80 \\ &\frac{600}{500} \times 100 = 120\% \\ \text{Bonus (as per Emerson's plan)} &= \text{Rs. } 80 \times 45\% = \text{Rs. } 36 \\ \text{Gross wages (computed) as per} & \\ \text{Emerson's Efficiency plan} &= \text{Rs. } 80 + \text{Rs. } 36 = \text{Rs. } 116 \end{aligned}$$

Illustration

The present output details of a manufacturing department are as follows :

Average output per week	48,000 units from 160 employees
Saleable value of output	Rs. 6,00,000
Contribution made by output	
towards fixed expenses and profit	Rs. 2,40,000

The Board of Directors plans to introduce more mechanisation into the department at a capital cost of Rs. 1,60,000. The effect of this will be to reduce the number of employees to 120, and increasing the output per individual employee by 60%. To provide the necessary incentive to achieve the increased output, the Board intends to offer a 1% increase on the piece work rate of Re. 1 per unit for every 2% increase in average individual output achieved.

To sell the increased output, it will be necessary to decrease the selling price by 4%.

Calculate the extra weekly contribution resulting from the proposed change and evaluate for the Board's information, the desirability of introducing the change.

Solution

1. Present average output per employee and total future expected output per week

$$\begin{aligned} \text{Present average output per employees per week} &= \frac{\text{Total present output}}{\text{Total number of present employees}} \\ &= \frac{48,000 \text{ units}}{160 \text{ employees}} = 300 \text{ units} \end{aligned}$$

$$\text{Total Future expected output per week} = \text{Total number of future employees}(\text{present output} + 60\% \text{ of present output per employee})$$



Cost Accounting

$$= 120 \text{ employees } (300 \text{ units} + 60\% \times 300 \text{ units})$$
$$= 57,600 \text{ units}$$

2. Present and proposed piece work rate

Present piece work rate	= Re 1.00 per unit
Proposed piece work rate	= Present piece work rate + 30% × Re. 1
	= Re. 1.00 + 0.30 P
	= Rs. 1.30 per unit

3. Present and proposed sale price per unit

Present sales price per unit	= Rs. 12.50
(Rs. 6,00,000/48,000 units)	
Proposed sale price per unit	= Rs. 12
(Rs. 12.50 – 4% × Rs. 12.50)	

4. Present marginal cost (excluding wages) per unit :

$$= \frac{\text{Present sales value} - \text{Fixed expenses \& profit} - \text{Contribution towards present wages}}{\text{Present output (units)}}$$
$$= \frac{\text{Rs.6,00,000} - \text{Rs.2,40,000} - \text{Rs.48,000}}{48,000 \text{ units}} = \text{Rs. 6.50 per unit}$$

Statement of extra weekly contribution (Information resulting from the proposed change of mechanisation meant for Board's evaluation)

Expected sales units (Refer to Working note 1)		57,600
	Rs.	Rs.
Sales value : (A) (57,600 units × Rs. 12) (Refer to Working note 3)		6,91,200
Marginal costs (excluding wages) : (B) (57,600 units × Rs. 6.50) (Refer to Working note 4)	3,74,400	
Wages : (C) (57,600 units × Rs. 1.30)	74,880	



(Refer to Working note 2)

Total marginal cost : (D) = {(B) – (C)}	<u>4,49,280</u>
Marginal contribution : {(A) – (D)}	2,41,920
Less : Present contribution	<u>2,40,000</u>
Increase in contribution (per week)	1,920

Evaluation: Since the mechanisation has resulted in the increase of contribution to the extent of Rs. 1,920 per week, therefore the proposed change should be accepted.

3.10 ABSORPTION OF WAGES

3.10.1 Elements of wages: In common parlance, the term 'wages' represents monetary payment which an employee receives at regular intervals for the services rendered. Strictly speaking, however, from the point of view of the employer and the cost to the industry, wages should be taken to include also non-monetary benefits which an employee receives by virtue of employment. Such non-monetary benefits may include:

- (i) medical facilities;
- (ii) educational and training facilities;
- (iii) recreational and sports facilities;
- (iv) housing and social welfare; and
- (v) cost of subsidised canteen and co-operative societies.

Such benefits are generally given in an industrial establishment. In some cases the provision of benefits is compulsory. Therefore, while computing the wage cost per worker, the monetary value of such non-monetary benefits should also be taken into account.

The monetary part of a worker's remuneration includes the basic wages, dearness allowance, overtime wages, other special allowance, if any, production bonus, employer's contribution to the provident fund, Employees State Insurance Corporation premium, contribution to pension fund, leave pay, etc.

The basic wage is the payment for work done, measured in terms of hours attended or the units produced, as the case may be. The basic wage rate is not normally altered unless there is a fundamental change in the working conditions or methods of manufacture. Dearness allowance is an allowance provided to cover the increase in cost of living from one period to another. This allowance is calculated either as percentage of the basic wage or as a fixed amount for the days worked. In either case, the percentage or the fixed amount is subject to revision whenever the cost of living index rises or falls by a certain figure as agreed to by the employer with the labour union. When permanent rise in the cost of living index occurs, a part



Cost Accounting

of the dearness allowance is often absorbed in the basic wage.

Overtime allowance is an allowance paid for the extra hours worked at the rates laid down in the Factories Act. In certain industries, where special allowance for the working conditions, tool maintenance, etc., are paid they are also considered as part of wages.

Production bonus is an incentive payment made to workers for efficiency that results in production above the standard. There are different methods of computing incentives. Under the Payment of Bonus Act, a worker is entitled to compulsory bonus of 8.33% wages earned in the relevant year or Rs. 100 (whichever is greater). The bonus may be upto 20% of wages depending upon the quantum of profits calculated as per the Act.

Contributions to provident fund and to E.S.I. schemes are compulsory. Under the first mentioned scheme, the employer contributes to the provident fund a sum equal to $8\frac{2}{3}\%$ of the basic wages together with the dearness allowance. Under the E.S.I. scheme, the employer contributes a fixed amount per month per worker calculated on the amount of wages as prescribed by the E.S.I. Act. The payments by the employer under these schemes are payable at the time, wages are paid for the relevant period; these payments form a part of the wages for the period.

3.10.2 Component of wages cost or wages for costing purposes : In addition to wages (including allowances, such as D.A.) that are paid to workers, a firm may have to spend on many other items (such as premium to the Employees State Insurance Corporation or provident fund or bonus). Further, the worker does not spend all the time for which he is paid on productive work. This is because he is entitled to weekly holiday and various type of leave. There is also a certain amount of unavoidable idle time. The question is : to what extent such additional payment or cost in respect of labour can be charged directly to unit of cost as part of direct labour cost? Of course, in the case of indirect labour, all such payments as also the wages paid to them, must be treated as part of overheads. But in the case of direct workers, two alternatives are possible. The additional charges may be treated as overheads. Alternatively, the wage rates being charged to job may be computed by including such payments; automatically then, such payments will be charged to the work done alongwith wages of the worker. (It should be remembered that such wage rate will be only for costing purposes and not for payment to workers). The total of wages and additional payment should be divided by effective hours of work to get such wage rates for costing purposes.

Illustration

A worker is paid Rs. 100 per month and a dearness allowance of Rs. 200 p.m. There is a provident fund @ $8\frac{2}{3}\%$ and the employer also contributes the same amount as the employee. The Employees State Insurance Corporation premium is $1\frac{1}{2}\%$ of wages of which $\frac{1}{2}\%$ is paid by the employees. It is the firm's practice to pay 2 months' wages as bonus each year.



Labour

The number of working days in a year are 300 of 8 hours each. Out of these the worker is entitled to 15 days leave on full pay. Calculate the wage rate per hour for costing purposes.

Solution	<i>Rs.</i>
Wages paid to worker during the year	3,600
*Add Provident Fund @ 8.33%	300
*E.S.I. Premium 1%	36
Bonus at 2 months' wages	<u>600</u>
Total	<u>4,536</u>

Effective hours per year: $285 \times 8 = 2,280$

Wage-rate per hour (for costing purpose): $\text{Rs. } 4,536/2,280 \text{ hours} = \text{Rs. } 1.989$

Illustration :

Calculate the earnings of A and B from the following particulars for a month and allocate the labour cost to each job X, Y and Z:

	<i>A</i>	<i>B</i>
(i) Basic wages	Rs. 100	160
(ii) Dearness allowance (on basic wages)	50%	50%
(iii) Contribution to provident fund (on basic wages)	8%	8%
(iv) Contribution to employees' state insurance (on basic wages)	2%	2%
(v) Overtime	Hours 10	

The normal working hours for the month are 200. Overtime is paid at double the total of normal wages and dearness allowance. Employer's contribution to State Insurance and Provident Fund are at equal rates and employees' contributions. The two workers were employed on jobs X, Y and Z in the following proportions:

	<i>Jobs</i>		
	<i>X</i>	<i>Y</i>	<i>Z</i>
Worker A	40%	30%	30%
Worker B	50%	20%	30%

Overtime was done on job Y.



Cost Accounting

Solution

Statement showing Earnings of Workers A and B

Workers	A	B
	Rs.	Rs.
Basic wages	100	160
Dearness allowance (50% of basic wages)	50	80
Overtime wages (Refer to working note 1)	<u>15</u>	<u>-</u>
Gross wages earned	165	240
Less: - Provident fund-8% of basic wages		
- ESI-2% of basic wage	<u>10</u>	<u>16</u>
Net wages paid	<u>155</u>	<u>224</u>

Statement of Labour cost

	Rs.	Rs.
Gross wages (excluding overtime)	150	240
Employer's contribution to P.F. and E.S.I.	<u>10</u>	<u>16</u>
Ordinary wages	<u>160</u>	<u>256</u>
Labour rate per hour	0.80	1.28
	(Rs.160/200)	(Rs. 256/200)

Statement showing allocation of wages to jobs

	Total Wages	Jobs		
		X	Y	Z
	Rs.	Rs.	Rs.	Rs.
Worker A :				
Ordinary wages: (4:3:3)	160	64	48	48
Overtime	15	—	15	—
Worker B :				
Ordinary wages: (5:2:3)	<u>256</u>	<u>128</u>	<u>51.20</u>	<u>76.8</u>
	<u>431</u>	<u>192</u>	<u>114.2</u>	<u>124.8</u>



Working Notes

Normal wages are considered as basic wages

$$\begin{aligned} \text{Overtime} &= 2 \times \frac{(\text{Basic} + \text{D.A.})}{200} \times 10 \text{ hours} \\ &= 2 \times (\text{Rs. } 150/200) \times 10 \text{ hours} = \text{Rs. } 15 \end{aligned}$$

Illustration

In a factory working six days in a week and eight hours each day, a worker is paid at the rate of Rs. 100 per day basic plus D.A. @ 120% of basic. He is allowed to take 30 minutes off during his hours shift for meals-break and a 10 minutes recess for rest. During a week, his card showed that his time was chargeable to :

Job X	15 hrs.
Job Y	12 hrs.
Job Z	13 hrs.

The time not booked was wasted while waiting for a job. In Cost Accounting, how would you allocate the wages of the workers for the week?

Solution

Working notes:

- (i) Total effective hours in a week :
[(8 hrs. – (30 mts. + 10 mts.)) × 6 days] = 44 hours
- (ii) Total wages for a week :
(Rs. 100 + 120% of Rs. 100) × 6 days = Rs. 1,320
- (iii) Wage rate per hour : = Rs. 30
- (iv) Time wasted waiting for job (Abnormal idle time):
= 44 hrs. – (15 hrs. + 12 hrs. + 13 hrs.)
= 4 hrs.

Allocation of wages in Cost Accounting

			Rs.
Allocated to Job X	: 15 hours × Rs. 30	=	450
Allocated to Job Y	: 12 hours × Rs. 30	=	360



Cost Accounting

Allocated to Job Z	: 13 hours × Rs. 30	=	390
Charged to Costing Profit & Loss A/c	: 4 hours × Rs. 30	=	<u>120</u>
Total			<u>1,320</u>

3.10.3 Holiday and leave wages : One alternative to account for wages paid on account of paid holiday and leave can be to include them as departmental overheads. In such a case, it is necessary to record such wages separately from “worked for wages”. Such a segregation can be made possible by providing a separate column in the payroll for holiday and leave wages in the same way as there are columns for dearness allowance, provident fund deductions, etc. If, however, a separate or additional column cannot be provided for this purpose it would be necessary to analyse the payroll periodically to ascertain how much of the total payment pertains to “worked for wages” and how much is attributed to leave and holiday wages.

Another way could be to inflate the wage rate for costing purposes to include holiday and leave wages. This can be done only in the case of direct workers.

Illustration

Calculate the labour hour rate of a worker X from the following data :

Basic pay	Rs. 1,000 p.m.
D.A.	Rs. 300 p.m.
Fringe benefits	Rs. 100 p.m.

Number of working days in a year 300. 20 days are availed off as holidays on full pay in a year. Assume a day of 8 hours.

Solution

(a) (i) Effective working hour/days in a year	300
Less : Leave days on full pay	<u>20</u>
Effective working days	280 days
Total effective working hours (280 days × 8 hours)	2,240
(ii) Total wages paid in a year	Rs.
Basic pay	12,000
D.A.	3,600
Fringe benefits	<u>1,200</u>
	<u>16,800</u>
(iii) Hourly rate : Rs. 16,800/2,240 hours	Rs. 7.50



3.10.4 Night shift allowance: In some cases, workers get extra payment if they work at night. Since the extra payment is not for any particular job, therefore such a payment should be treated as part of overheads.

3.10.5 Principles of remuneration: The term 'remuneration' has been defined as the reward for labour and service. It is the result of the agreement between the employer and the employee, whereby for a specified work or service rendered by the employee the employer agrees to pay a specified sum of money. Apart from this an employee by virtue of the fact that he is an employee becomes entitled to certain non-monetary benefits.

The method of remuneration adopted varies from industry to industry and, in certain cases, even among different units in the same industry. Whatever be the variation, the method of fixing remuneration payable to the various categories of employees has to be based on certain accepted principles. These are:

- (i) Wage-rates in an industry should be fixed in conformity with the general wage-levels in the geographical area i.e. the rate should be more or less the same for similar efforts and skill. The wage-level in an area would in turn depend upon demand for labour, the availability of labour, the cost of living in the area, the wage levels in neighbouring industrial area, and the capacity of the particular industry to pay.
- (ii) Wage-rates should be related to the degree of skill, effort, initiative and responsibility that the employee is expected to assume in respect of the various jobs he may be called upon to perform. There should be generally equal pay for equal work.
- (iii) Wage-rates should guarantee a minimum wage regardless of the existence of factors listed under (ii) above, particularly when the working conditions are difficult and dangerous.
- (iv) Wage-rates are considered satisfactory only if they enable the workers to maintain a reasonable standard of living.
- (v) Separate wage rates should be fixed for different classes of employees since each class expects to maintain a different standard of living; also the education, physical and mental efforts and responsibility required for performing different jobs are not the same.
- (vi) It should be possible for worker to increase his earnings through extra effort and by increasing output. If he alone is responsible, he should have the full benefit of the increased productivity. Otherwise, if increased output has resulted from co-operation between management and workers both should share the benefit.

It is important that these basic principles should be recognised in fixing the wage rate of workers; otherwise, there will be dissatisfaction among the employees and, consequently, there will be higher labour turnover. Satisfactory employer-employee relationship is a primary necessity for industrial development and this has to be ensured to a very great degree, by



satisfactory schemes of remunerating labour.

The aim should be to keep labour cost per unit of output (or service) as low as possible. It is not the same as keeping wages at low levels. There is a definite correlation between wages and productivity; high wages often lead to such an increase in productivity that wages per unit of output fall. However, this rule is also subject to diminishing returns—a point is reached at which any further increase in wage rates does not bring about a corresponding increase in efficiency. But generally, higher wages result in lower cost per unit.

Wages affect the national economy through cost of goods produced. If an increase in wages outpaces the corresponding increase in productivity, goods become costlier and cannot compete with those of other countries in the world markets.

From the point of view of an expert it is necessary to keep wages in check like other costs. The safe rule is to link up wages with productivity.

3.10.6 Absorption rates of labour cost: Labour cost as stated above include monetary compensation and non-monetary benefits to workers. Monetary benefits include, basic wages, D.A., overtime pay, incentive or production bonus contribution to employee provident fund, House Rent Allowance, Holiday and vacation pay etc. The non-monetary benefits include medical facilities, subsidized canteen services, subsidized housing, education and training facilities. Accounting of monetary and non-monetary benefits to indirect workers does not pose any problems because the total of monetary and non-monetary benefits are treated as overhead and absorbed on the basis of rate per direct labour hour, if overheads are predominantly labour oriented.

For direct workers, the ideal method is to charge jobs or units produced by supplying per hour rate calculated as below :

$$\text{Rate per hour} = \frac{\text{Total of estimated monetary benefits and cost of non - monetary benefits}}{\text{Budgeted direct labour hours - Normal idle time}}$$

Another alternative method is to treat the monetary benefits other than basic wages and dearness allowance as well as cost of non-monetary benefits as overheads.

3.11 EFFICIENCY RATING PROCEDURES

Efficiency is usually related with performance and may be computed by comparing the time taken with the standard time allotted to perform the given job/task. If the time taken by a worker on a job equals or less than the standard time, then he is rated efficient. In case he takes more time than the standard time he is rated as inefficient. It may be computed as follows :



$$\text{Efficiency in \%} = \frac{\text{Time allowed as per std.}}{\text{Time taken}} \times 100$$

For efficiency rating of employees the following procedures may be followed :

1. **Determining standard time/performance standards** : The first step is to determine the standard time taken by a worker for performing a particular job/task. The standard time can be determined by using Time & Motion study or Work study techniques. While determining the standard time for a job/task a heterogeneous group of workers is taken and contingency allowances are added for determining standard time.
2. **Measuring Actual Performance of workers** : For computing efficiency rating it is necessary to develop a procedure for recording the actual performance of workers. The system developed should record the output of each worker along with the time taken by him.
3. **Computation of efficiency rating** : The efficiency rating of each worker can be computed by using the above mentioned Formula.

3.11.1 Need for efficiency rating :

1. As discussed earlier when a firm follows a system of payment by results, the payment has a direct relationship with the output given by a worker. The firm for making payment to worker is required to ascertain his efficiency level. For instance, under Taylor's differential piece work system the lower rate i.e. 83% of piece rate is given to a worker when his efficiency rating is less than 100% and higher rate viz., 125% of piece rate is offered at efficiency level of either 100% or more. Similarly under Emerson efficiency plans bonus is paid at rising scale at various level of efficiency, ranging from 66.67% to 150%.
2. The efficiency rating also helps the management in preparing labour requirement budget or for preparing manpower requirements. For example, let P Ltd. manufactures two products by using one grade of labour. The following estimates are available :

	<i>Product A</i>	<i>Product B</i>
Budgeted production (units)	3,480	4,000
Std. hrs. allowed per product	5	4

It is further worked out that the efficiency rating (efficiency ratio) for productive hours worked by direct workers in actually manufacturing the production is 80% then the exact standard labour requirement can be worked out as follows :

	<i>Product A</i>	<i>Product B</i>	<i>Total</i>
Budgeted production (in units)	3,480	4,000	
Std. hours allowed for	17,400	16,000	33,400



Cost Accounting

budgeted production (3,480 units × 5 hours) (4,000 units × 4 hours)

Since efficiency ratio is given as 80% therefore Std. labour hours required for 100% efficiency

level are $\left(33,400 \text{ hours} \times \frac{100}{80} \right) = 41,750 \text{ hours.}$

Labour productivity : Productivity is generally determined by the input/output ratio. In the case of labour it is calculated as below :

Standard time for doing actual amount of work

Actual time taken to do work

Labour productivity is an important measure for measuring the efficiency of individual workers. It is an index of efficiency and a sign of effectiveness in the utilisation of resources-men, materials, capital, power and all kinds of services and facilities. It is measured by the output in relation to input. Productivity can be improved by reducing the input for a certain quantity or value of output or by increasing the output from the same given quantity or value of input.

Factors for increasing labour productivity : The important factors which must be taken into consideration for increasing labour productivity are as follows:

1. Employing only those workers who possess the right type of skill.
2. Placing a right type of man on the right job.
3. Training young and old workers by providing them the right types of opportunities.
4. Taking appropriate measures to avoid the situation of excess or shortage of labour at the shop floor.
5. Carrying out work study for the fixation of wage rate, and for the simplification and standardisation of work.

3.12 Miscellaneous Illustration

Illustration 1

Using Taylor's differential piece rate system, find the earning of A from the following particulars :

Standard time per piece	12 minutes
Normal rate per hour (in a 8 hours day)	Rs.20
A produced	37 units



Solution:

Actual output = 37 units

Standard output = $\frac{8 \text{ hrs.} \times 60 \text{ minutes}}{12 \text{ minutes per piece}}$ = 40 units

Efficiency = $\frac{37 \text{ units}}{40 \text{ units}} \times 100$ = 92.5%

Under Taylor's differential piece rate system, a worker is paid lower piece rate of 83%, since his efficiency is less than 100%.

Standard production per hour = $\frac{60 \text{ minutes}}{12 \text{ minutes}}$ = 5 units
Normal Rate per hour = Rs.20
Normal piece rate per unit = $\frac{\text{Rs.20}}{5 \text{ units}}$ = Rs.4
Lower piece rate per unit = $\text{Rs.4} \times \frac{83}{100}$ = Rs.3.32
Total earnings = $37 \text{ units} \times \text{Rs.3.32}$ = Rs.122.84

Illustration 2

- (a) Bonus paid under the Halsey Plan with bonus at 50% for the time saved equals the bonus paid under the Rowan System. When will this statement hold good? (Your answer should contain the proof).
- (b) The time allowed for a job is 8 hours. The hourly rate is Rs.8. Prepare a statement showing :
 - i. The bonus earned
 - ii. The total earnings of labour and
 - iii. Hourly earnings.

Under the Halsey System with 50% bonus for time saved and Rowan System for each hour saved progressively.

Solution:

(a) Bonus under Halsey Plan = $\frac{50}{100} \times (\text{SH} \times \text{AH}) \times \text{R}$ (i)



Cost Accounting

$$\text{Bonus under Rowan Plan : } = \frac{AH}{SH} \times (SH \times AH) \times R \quad (\text{ii})$$

Bonus under Halsey Plan will be equal to the bonus under Rowan Plan when the following condition holds good :

$$\frac{50}{100} \times (SH \times AH) \times R = \frac{AH}{SH} \times (SH \times AH) \times R$$

$$\frac{50}{100} = \frac{AH}{SH}$$

Hence, when the actual time taken (AH) is 50% of the time allowed (SH), the bonus under Halsey and Rowan Plans is equal.

- (b) Statement of Bonus, total earnings of labour and hourly earnings under Halsey and Rowan Systems.

SH	AH	Time saved	Basic wages (AH × Rs.8) (B × Rs.8)	Bonus under Halsey System $\left[\frac{50}{100} \times C \times 8 \right]$	Bonus under Rowan system $\left[\frac{B}{A} \times C \times 8 \right]$	Total Earnings under Halsey System D+E	Total Earnings under Rowan System D+F	Hourly Earnings under Halsey System G/B	Hourly Earnings under Rowan System H/B
A	B hours	C = (A-B) hours	D Rs.	E Rs.	F Rs.	G Rs.	H Rs.	I Rs.	J Rs.
8	8	-	64	-	-	64	64	8.00	8.00
8	7	1	56	4	7	60	63	8.57	9.00
8	6	2	48	8	12	56	60	9.33	10.00
8	5	3	40	12	15	52	55	10.40	11.00
8	4	4	32	16	16	48	48	12.00	12.00
8	3	5	24	20	15	44	39	14.67	13.00
8	2	6	16	24	12	40	28	20.00	14.00
8	1	7	8	28	7	36	15	36.00	15.00



Illustration 3

Two workmen, 'A' and 'B', produce the same product using the same material. Their normal wage rate is also the same. 'A' is paid bonus according to the Rowan system, while 'B' is paid bonus according to the Halsey system. The time allowed to make the product is 50 hours. 'A' takes 30 hours while 'B' takes 40 hours to complete the product. The factory overhead rate is Rs.5 per man-hour actually worked. The factory cost for the product for 'A' is Rs.3,490 and for 'B' it is Rs.3,600.

Required :

- (a) Compute the normal rate of wages;
- (b) Compute the cost of materials cost;
- (c) Prepare a statement comparing the factory cost of the products as made by the two workmen.

Solution:

Step 1 : Let X be the cost of material and Y be the normal rate of wages per hour.

Step 2 : **Factory Cost of Workman 'A'**

	<i>Rs.</i>
A. Material Cost	X
B. Wages	30 Y
C. Bonus = $\frac{AH}{SH} \times (SH - AH) \times R$	12 Y
Bonus = $\frac{30}{50} \times (50 - 30) \times Y$	
D. Overheads (30 × Rs.5)	150
E. Factory Cost	X + 30Y + 12 Y + Rs.150
or, = X + 42 Y = Rs.3,490 (Given) – Rs.150 = Rs.3,340	... Equation (I)



Cost Accounting

Step 3 : Factory Cost of Workman 'B'

	Rs.
A. Material Cost	X
B. Wages	40 Y
C. Bonus = 50% of (SH - AH) × R = 50% of (50 - 40) × R	5 Y
D. Overheads (40 × Rs.5)	200
E. Factory Cost	X + 40Y + 5 Y + Rs.200
or, = X + 45 Y = Rs.3,600 (Given) – Rs.200 = Rs.3,400	... Equation (II)

Step 4 : Subtracting Eq. (I) from Eq. (II)

$$3Y = \text{Rs.}60$$

$$Y = \text{Rs.}60/3 = \text{Rs.}20 \text{ per hour.}$$

- (a) The normal rate of wages : Rs.20 per hour
- (b) The cost of material : $X + 45 \times \text{Rs.}20 = \text{Rs.}3,400$
 $X = \text{Rs.}3,400 - \text{Rs.}900 = \text{Rs.}2,500$
- (c) **Comparative Statement of the Factory Cost of the product made by the two workmen.**

	'A'	'B'
	Rs.	Rs.
Material cost	2,500	2,500
Direct Wages	(30 × Rs.20) 600	(40 × Rs.20) 800
Bonus	(12 × Rs.20) 240	(5 × Rs.20) 100
Factory Overhead	<u>150</u>	<u>200</u>
Factory Cost	<u>3,490</u>	<u>3,600</u>

Illustration 4

Calculate the earnings of workers A, B and C under Straight Piece Rate System and Merrick's Piece Rate System from the following particulars:



Normal Rate per Hour Rs.5.40
Standard Time per Unit 1 Minute

Output per day is as follows:

Worker A – 390 Units

Worker B – 450 Units

Worker C – 600 Units

Working hours per day are 8.

Solution:

Earnings of Workers under Straight Piece Rate System :

Worker A = 390 units × Re.0.09 = Rs.35.10

Worker B = 450 units × Re.0.09 = Rs.40.50

Worker C = 600 units × Re.0.09 = Rs.54.00

Earnings of Workers under Merrick's Multiple Piece Rate System

Particulars	A	B	C
Efficiency level <i>(Refer to working note ii)</i>	81.25%	93.75%	125%
Applicable wage rate per unit	0.09	0.099	0.108*
Earnings (Rs.)	35.10 <i>(390 units × 0.09)</i>	44.55 <i>(450 units × 0.099)</i>	64.80 <i>(600 units × 0.108)</i>

Note : * Some author suggests an increase of 30% over normal piece rate at an efficiency level of 120% or more. In such a case the rate per unit would be Re.0.117 and total earnings would come to Rs.70.20.

Working Notes :

- (i) Normal wage rate per unit = Normal Rate per Hour/Standard output per hour
= Rs.5.40/60 = 9 Paise



Cost Accounting

(ii) Efficiency level

Workers	A	B	C
Actual output per day (units)	390	450	600
Standard output per day (units)	480	480	480

Efficiency level achieved

$$\begin{aligned} &= \frac{\text{Actual output units}}{\text{Standard output units}} \times 100 && \frac{390}{480} \times 100 && \frac{450}{480} \times 100 && \frac{600}{480} \times 100 \\ & && = 81.25\% && = 93.75\% && = 125\% \end{aligned}$$

Illustration 5

A skilled worker in XYZ Ltd. is paid a guaranteed wage rate of Rs.30 per hour. The standard time per unit for a particular product is 4 hours. P, a machineman, has been paid wages under the Rowan Incentive Plan and he had earned an effective hourly rate of Rs.37.50 on the manufacture of that particular product.

Required : What could have been his total earnings and effective hourly rate, had he been put on Halsey Incentive Scheme (50%)?

Solution:

$$\begin{aligned} \text{Total earnings (under 50\% Halsey Scheme)} &= \text{Hours worked} \times \text{Rate per hour} + \frac{1}{2} \times \text{time saved} \times \text{Rate per hour} \\ &= 3 \text{ hours} \times \text{Rs.30} + \frac{1}{2} \times 1 \text{ hour} \times \text{Rs.30} \\ &= \text{Rs. 105} \end{aligned}$$

$$\text{Effective hourly rate} = \frac{\text{Total earnings}}{\text{Hours taken}} = \frac{\text{Rs.105}}{3 \text{ hours}} = \text{Rs.35}$$

Working Note :

Let T hours be the total time worked in hours by the skilled workers (machine man P), Rs.30 is the rate per hour; standard time is 4 hours per unit and effective hourly earning rate is Rs.37.50 then



$$\text{Earning (under Rowan plan)} = \text{Hours worked} \times \text{Rate per hr} + \frac{\text{Time saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Rate per hr}$$

$$\text{Rs.}37.5 T = T \times \text{Rs.}30 + \frac{(4 - T)}{4} \times T \times \text{Rs.}30$$

$$\text{Rs.}37.5 = \text{Rs.}30 + (4 - T) \times \text{Rs.}7.5$$

$$\text{or, Rs.}7.5 T = \text{Rs.}22.5$$

$$\text{or, } T = 3 \text{ hours.}$$

3.13 Self Examination Questions

Multiple Choice Questions

1. The input-output ratio in case of labour means the ratio of
 - (a) the value of output to the wages paid.
 - (b) standard time of the production to the actual time paid for.
 - (c) abnormal idle time to normal idle time.
 - (d) number of workers employed to the sanctioned strength.
2. Job specification is
 - (a) the list of operations to be performed for completing the concerned job
 - (b) the requirement in terms of goods to be produced or work to be done.
 - (c) the list of qualities and qualifications which the employees concerned should have to do the job well.
 - (d) the name of the employees who will be assigned to a job.
3. Job specification is
 - (a) the list of operations to be performed for completing the concerned job
 - (b) the requirement in terms of goods to be produced or work to be done.
 - (c) the list of qualities and qualifications which the employees concerned should have to do the job well.
 - (d) the name of the employees who will be assigned to a job.



Cost Accounting

4. Direct labour means
 - (a) labour completing the work manually,
 - (b) labour which is recruited directly and not through contractors,
 - (c) permanent labour in the production department,
 - (d) labour which can be conveniently associated with a particular cost unit.
5. Time and motion study is essential for
 - (a) a rational promotion policy,
 - (b) completing a job on time,
 - (c) determining the standard-time and correct method of completing a task,
 - (d) determining prices of products.
6. For reducing the labour cost per unit, which of the following factors is the most important?
 - (a) low wage rates,
 - (b) higher input-output ratio,
 - (c) strict control and supervision,
 - (d) longer hours of work.
7. Which of the following statements are true ?
 - (a) Productivity of workers can be improved only if they are supervised closely.
 - (b) It is no use paying higher wages to labour because they would spend their money on drinking and smoking.
 - (c) A well satisfied team of workers can raise productivity to a large extent.
 - (d) None of the above
8. Labour turnover is measured by,
 - (a) Replacement method.
 - (b) Separation method.
 - (c) Flux method.
 - (d) All of the above.



9. Salary of a foreman should be classified as,
 - (a) Fixed overhead.
 - (b) Variable overhead.
 - (c) Semi fixed or semi variable overhead.
 - (d) None of the above.
10. For reducing the labour cost per unit, which of the following factors is the most important?
 - (a) Low wage rates.
 - (b) Higher input output ratio.
 - (c) Strict control.
 - (d) Long hours of work.

Answers To Multiple Choice Questions

1.(b);2.(c);3.(a);4.(d);5.(c);6.(b);7.(c);8.(d);9.(c);10 (b)

Short Answer Type Questions

1. Describe briefly the functions of the following departments in relation to labour :
 - (a) Personnel department.
 - (b) Engineering department.
 - (c) Cost Accounting department.
2. Distinguish between :
 - (a) Time keeping and Time booking
 - (b) Time study and motion study.
3. Discuss briefly the important factors for the control of labour cost.
4. Discuss briefly the objectives of time keeping.
5. Discuss briefly the various factors necessary for introducing an incentive system.

Long Answer Type Questions

1. What is idle time? Explain the causes leading to idle time and its treatment in Cost Accounts.



Cost Accounting

2. What do you mean by overtime premium? What are the causes of overtime? How would you treat overtime premium in Cost Accounts ?
3. What do you understand by labour turnover? How is it measured? What are its causes? What steps should be taken to check the increasing rate of labour turnover?
4. Define job evaluation and distinguish it from merit rating. Explain the methods and objectives of job evaluation.
5. Explain the factors to be considered in introducing an incentive system.

Numerical Questions

1. Calculate the number of hours worked as overtime by the following workers in a week:

	Ram	Shyam
Monday	8	8
Tuesday	7	9
Wednesday	4.5	8
Thursday	8	7
Friday	10	9
Saturday	<u>9</u>	<u>9</u>
	<u>46.5</u>	<u>50</u>

2. Three workers A, B and C are put on a common task for which the total remuneration is Rs. 150. A works for 40 hours, B works for 60 hours and C works for 44 hours on the job. The hourly rate is Re. 0.75 of A per hour, B gets Re. 0.80 per hour while C's remuneration is Re. 0.50 per hour. What should each man get ?
3. A worker is paid @ 50 paise per hour *plus* a dearness allowance of Rs. 60 per month. The provident fund contribution both by the employee and the worker is 6¼% each. The worker is entitled to 15 days leave with full wages. His normal working per month is 25 days of 8 hours each.
 - (a) the wages per hour for costing purposes; and
 - (b) the amount to be paid to him for a week in which he puts in 52 hours of work.
4. The following particulars are available to you in respect of a worker:

Job No.	Time Allowed	Time Taken
1844	26 hours	20 hours
1826	30 hours	20 hours
Idle time (waiting)		<u>8 hours</u>
		<u>48 hours</u>



The basic rate is Rs. 2 per day of 8 hours in addition there is a dearness allowance of Rs. 12 per week of 48 hours. Calculate the wage of the worker on (1) Time Basis (2) Piece Rate Basis (3) Halsey Plan Basis and (4) Rowan Plan Basis.

5. A worker is paid 10% bonus on the hourly rate if he completes his work in the time allotted for it and a further 1% on hourly rate for each 1% in excess of 100% efficiency. His hourly rate is Rs. 5 per hour and he completed a job in 45 hours whereas the time allowed for it was 50 hours. Ascertain the wages earned by this worker.
6. From the following data, calculate the labour turnover rate by applying :
 - (i) Separation method
 - (ii) Accession method
 - (iii) Flux method

Number of workers on the payroll

At the beginning of the month	1,800
At the end of the month	2,200

During the month 20 workers left, 80 workers were discharged and 500 workers were recruited. Of these 50 workers were recruited in the vacancies of those separated, while the rest were engaged due to expansion.

7. The company has a suggestion of box scheme and an award equivalent to one and a half months saving in labour cost is passed on to the employee whose suggestion is accepted. Suggestion of an employee to use a Jig for a manufacturing operation of a component is accepted. The cost of the Jig which has a life of one year is Rs. 1,000 and the use of the Jig will reduce the standard time by 8 minutes.
Compute from the following data the amount of award payable to the employee who has given the suggestion.
 - (i) Number of pieces to be produced in the year : 15,000
 - (ii) Standard time per piece before use of Jig : 80 minutes
 - (iii) Average wage rate of workmen Rs. 160 per day of 8 hours.
 - (iv) Average efficiency of workmen: 80%.
8. The existing incentive system of a certain factory is :

Normal working week	:	5 days of 9 hours each <i>plus</i> Resorting to overtime of 3 hours for 3 days.
Rate of payment	:	For day work - Rs. 20 per hour. For overtime - Rs. 30 per hour.



Cost Accounting

Additional bonus payable : Rs. 25 per day if worker is not resorting to overtime.
Rs. 40 per day if worker resorts to overtime.

Average output per operative :
for 54 hour week, *i.e.*, normal
working hours *plus* 3 hours
late sitting for 3 days 120 articles

In order to increase output and eliminate overtime it was decided to switch on to a system of payment by results. The factory considering the introduction of some incentive scheme or to make payment on piece work basis. Assuming that 135 articles are produced in a 45 hour week and the additional bonus under the existing system will be discontinued in the proposed incentive scheme. You are required to calculate :

- (i) Weekly earnings; (ii) labour cost per article for an operative under the following systems:
- (a) Existing time-rate system
 - (b) Straight piece-work system
 - (c) Rowan system
 - (d) Halsey system

The following information is obtained.

Time rate (as usual) : Rs. 20 per hour
Basic time allowed : for 15 articles 5 hours
Piece work rate : Add 20% to price
Premium bonus : Add 50% to time

9. The unit has a strength of 20 workmen worked for 300 working days of 8 hours each with half an hour break based on the earlier years trend, it is forecast that average absenteeism per workman would be 8 days, in addition to the eligibility of 30 days annual leave.

The following details regarding actual working of the unit are available for the year ending on 31st March, 1998.

- (i) The factory worked 2 extra days to meet the production targets, but one additional paid holiday had to be declared.
- (ii) There was a severe breakdown of a major equipment leading to a loss of 300 man hours.
- (iii) Total overtime hours (in addition to 2 extra days worked) amounted to 650 hours.
- (iv) The actual average absenteeism per workman was 8 days.



- (v) Basic rate is Rs. 10 per hour and overtime is paid at double rate. You are required to calculate.
- (a) Actual working hours of the unit.
- (b) In Cost Accounting how would you treat the wages of workmen for (ii) & (iii) above ?
10. A job can be executed either through workman A or B. A takes 32 hours to complete the job while B finishes it in 30 hours. The standard time to finish the job is 40 hours. The hourly wage rate is same for both the workers. In addition workman A is entitled to receive bonus according to Halsey plan (50%) sharing while B is paid bonus as per Rowan plan. The works overheads are absorbed on the job at Rs. 7.50 per labour hour worked. The factory cost of the job comes to Rs. 2,600 irrespective of the workman engaged.
- Find out the hourly wage rate and cost of raw materials input. Also show cost against each element of cost included in factory cost.

Answers to Numerical Questions.

1. Ram 1 hour; Shyam 2 hours
2. A. Rs. 45; B. Rs. 75; C. Rs. 33.
3. Rs. 0.895 per hour for costing purposes, Rs. 42.40
(amount to be paid, deducting Rs. 2.40 for PF).
4. (1) Rs. 24; (2) Rs. 28; (3) Rs. 26; (4) Rs. 26-86.
5. Rs. 270
6. (i) 5%; (ii) 25%; (iii) 30%.
7. Rs. 6,250
8. (a) (i) Rs. 1,340 (ii) Rs. 11.17
(b) (i) Rs. 1,080 (ii) Rs. 8.00
(c) (i) Rs. 1,200 (ii) Rs. 8.88
(d) (i) Rs. 1,125 (ii) Rs. 8.33.
9. (a) Rs. 39,800 (b) The wages of workmen for (ii) should be charged to Costing Profit and Loss A/c and for (iii) should be charged to factory overheads.
10. Hourly wage rate is Rs. 10 and cost of raw material input is Rs. 2,000.

CHAPTER 4

OVERHEADS

Learning Objectives

When you have finished studying this chapter, you should be able to

- ◆ Differentiate between direct costs and overheads.
- ◆ Understand the meaning of allocation, apportionment and absorption of overheads.
- ◆ Identify, whether overheads are under absorbed or over absorbed
- ◆ Understand the accounting and control of administrative, selling and distribution overheads.

4.1 INTRODUCTION

Besides direct expenditure, *i.e.*, expenditure which can be conveniently traced to or identified with any particular unit of production, *e.g.*, direct materials, direct wages and direct expenses, every form of production involves expenses that cannot be conveniently traced to or identified with the articles produced or services provided. Such expenses are incurred for output generally and not for a particular work order *e.g.*, wages paid to watch and ward staff, heating and lighting expenses of factory etc. Expenses of these nature are known as overhead or indirect expenses. Often in a manufacturing concern, overheads exceed direct wages or direct materials and at times even both put together. On this account, it would be a grave mistake to ignore overheads either for the purpose of arriving at the cost of a job or a product or for controlling total expenditure.

Overheads also represent expenses that have been incurred in providing certain ancillary facilities or services which facilitate or make possible the carrying out of the production process; by themselves these services are not of any use. For instance, a boiler house produces steam so that machines may run and, without the generation of steam, production would be seriously hampered. But if machines do not run or do not require steam, the boiler house would be useless and the expenses incurred would be a waste.

Apart from the overheads incurred in the factory, overheads also arise on account of administration, selling and distribution.



4.2 CLASSIFICATION OF OVERHEADS

4.2.1 Classification of overheads by function : Overheads principally are of four types: (i) Factory or Manufacturing Overheads; (ii) Office and Administrative Overheads; (iii) Selling and Distribution Overheads; (iv) Research and Development.

Whether an expense belongs to one class or another depends entirely on the benefit derived from it. For instance, salaries of clerks will be (i) factory or manufacturing expenses, when the clerks concerned work in the factory office; (ii) office and administrative expense when the clerks work in the general office; and (iii) selling and distribution expense when the clerks work in the sales office.

Small concerns may not distinguish between office and selling expenses and still smaller concerns may treat all overhead, of whatever class, together. Big concerns may have even a more detailed classification to be able to exercise better control. A detailed classification of such expenses is given below:

- (i) *Factory or Manufacturing Expenses:*
 - (a) Stores overheads (expenses connected with purchasing and handling of materials);
 - (b) Labour overheads (expenses connected with labour); and
 - (c) Factory administration overheads (expenses connected with administration of the factory).
- (ii) *Office and Administration Expenses:*
 - (a) Administrative expenses (expenses incurred on managerial personnel - their salaries, costs of facilities provided to them and salaries of their personal staff); and
 - (b) Office expenses (expenses on the routine office work).
- (iii) *Selling and Distribution Expenses :*
 - (a) Selling expenses (expenses incurred to persuade customers to purchase the firm's products and, or engage its services, that is to maintain and expand the market); and
 - (b) Distribution expenses are those which are incurred to execute orders. One should note that many people use the two terms "selling" and "distribution" as synonymous.

Following are the definitions given by the Institute of Cost and Management Accountants of England.



Overheads

Production Cost - The cost of the sequence of operations which begins with supplying materials, labour and service and ends with the primary packing of the product.

Selling Cost - The cost of seeking to create and stimulate demand sometimes termed (marketing) and of securing orders.

Distribution Cost - The cost of the 'sequence' of operations which begins with making the packed product available for despatch and ends with making the reconditioned returned empty package, if any, available for re-use. As well as including expenditure incurred in moving articles to central or local storage, distribution cost includes expenditure incurred in moving articles to and from prospective customers as in the case of goods on sale or return basis. In the gas, electricity and water industries 'Distribution' means pipes, mains and services which may be regarded as equivalent to packing and transportation.

Administration cost - The cost of formulating the policy, directing the organisation and controlling the operations of an undertaking which is not related directly to production, selling, distribution, research or development activity or function.

Research and Development Expenses : The Terminology defines research expenses as "the expenses of searching for new or improved products, new application of materials, or new or improved methods." Similarly, development expenses is defined as "the expenses of the process which begins with the implementation of the decision to produce a new or improved product."

If research is conducted in the methods of production, the research expenses should be charged to the production overhead; while the expenditure becomes a part of the administration overhead if research relates to administration. Similarly, market research expenses are charged to the selling and distribution overhead. Development costs incurred in connection with a particular product should be charged directly to that product. Such expenses are usually treated as "deferred revenue expenses," and recovered as a cost per unit of the product when production is fully established.

General research expenses of a routine nature incurred on new or improved methods of manufacture or the improvement of the existing products should be charged to the general overhead.

Even in this case, if the amount involved is substantial it may be treated as a deferred revenue expenditure, and spread over the period during which the benefit would accrue. Expenses on fundamental research, not relating to any specific product, are treated as a part of the administration overhead. Where research proves a failure, the cost associated with it should be excluded from costs and charged to the costing Profit and Loss Account.

A list (not exhaustive) of various items under three principal classes of overheads is presented on the next page.



Cost Accounting

	<i>Factory Expenses</i>		<i>Office and Administration Expenses</i>	<i>Selling and Distribution Expenses</i>
Buildings	: Rent, repairs, depreciation and insurance of factory premises, lighting of factory premises.	Administration : Fees to Directors' Salary to General Manager, Managing Director, Finance Manager, Chief Accountant, Secretary, their immediate personal staff and other expenses like air conditioning of office;	Selling: Fees to Director who looks after sale and marketing salary of Sales Manager; salesmen and sales office clerks; commission to agents, advertising catalogues, price lists. samples, show room expenses; entertainment of customers; stationery, postage etc., used in the office.	
Machinery	: Depreciation, repairs and maintenance and insurance of plant and equipment; power used for machines.		Distribution: Finished goods godown expenses-salary, rent, insurance lighting etc.	
Labour	: Wages of indirect workers; normal idle time (unless wage rates are inflated suitably); Employees' State Insurance premium; Provident Fund contribution, leave pay, maternity pay; etc.		packing; carriage outwards; insurance, in transit; delivery expenses;	
Supervision	: Salaries to foremen, departmental superintendents and Works Manager; Technical Director's fees.	Office : Salaries paid to other people working in the office; stationery, postage, etc. lighting of office, rent, rates, and taxes on office premises.	expenses on receiving and reconditioning, returnable empties.	
Materials	: Purchasing and store keeping expenses, cost of consumable stores and supplies, normal losses of materials unless prices are suitably inflated, etc.	Depreciation, power, insurance repairs and maintenance of office equipment, etc.		
Misc	: Factory office telephone, stationery, factory office clerks' salaries, etc.			



Overheads

Expenses that are not taken into account - The undermentioned expenses are usually not included in overheads or, for that matter in cost :

- (a) Expenses or income of purely financial nature like dividends received, rent received, cash discount allowed, etc.
- (b) Expenses or profits of capital nature like profit or loss on sale of investments, plant and equipment, etc.
- (c) Items not representing actual costs but dependent on arbitrary decisions of the management, e.g., an unreasonably high salary to the managing director, providing for depreciation at a rate exceeding the economic rate.
- (d) Appropriation of profits for dividends, payment of income tax and transfers to reserves.

4.2.2 Classification of overheads by nature : On a change in the level of activity different expenses behave differently. On this consideration, expenses are classified under the following three categories:

- (i) *Fixed or Constant* : These are expenses that are not affected by any variation in the volume of activity, e.g., managerial remuneration, rent, that part of depreciation which is dependent purely on efflux of time, etc. Fixed or constant expenses remain the same from one period to another except when they are deliberately changed, e.g., on increments being granted to staff or additional staff being engaged.
- (ii) *Variable* : Expenses that change in proportion to the change in the volume of activity; when output goes up by 10% the variable expenses also go up by 10%. Correspondingly, on a decline of the output, these expenses also decline proportionately e.g., power consumed; consumable stores; repairs and maintenance and depreciation are dependent on the use of assets.

Variable expenses are generally constant per unit of output or activity.

Suppose variable expenses amount to Rs. 10,000 for a production of 2,000 units *i.e.*, Rs. 5 per unit. When output goes upto 2,200 units, *i.e.*, an increase of 10% the variable expenses amount to Rs. 11,000. *i.e.*, 10,000 *plus* 10%. The cost per unit will be the same as before.

- (iii) *Semi variable* : The expenses that either (a) do not change when there is a small change in the level of activity but change whenever there is a slightly big change. In other words, they change by small steps; or (b) change in the same direction as change in the level of activity but not in the same proportion. An expense for example, may not change if output goes up or comes down by 5% but may change by 3% when there is an increase in production between 5% and 10%. Similarly, another item of expense may change by 1% for every 2% change in activity. Examples of such expenses are : delivery van expenses,

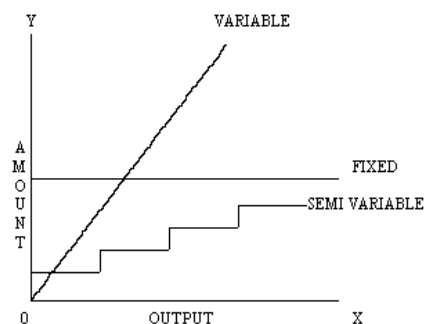


Cost Accounting

telephone charges, depreciation as a whole.

Semi-variable expenses usually have two parts—fixed and variable. For instance, the amount of depreciation usually depends on two factors—one on time (fixed) and the other on wear and tear (variable). The two together make depreciation (as a whole) semi-variable. A careful study can make it possible for all semi-variable expenses to split up into two parts. Fundamentally, therefore, there are only two type of expenses—fixed and variable.

Graphically the three type of expenses may be shown as below:



One must note that fixed expenses remain unchanged upto the limit of the present capacity. If output goes beyond the capacity limit, fixed expenses will record a jump. Suppose a factory works one shift and produces 10,000 units in the shift. For all levels of output of 10,000 units, fixed expenses will remain unchanged; if the output goes beyond 10,000 units, a second shift will become necessary and this will mean a big increase in fixed expenses such as salary for foremen, lighting etc.

Methods of segregating Semi-variable costs into fixed and variable costs – For a detailed understanding please refer to chapter 1.

Advantages of Classification of Overheads into Fixed and Variable : The primary objective of segregating semi-variable expenses into fixed and variable is to ascertain marginal costs. Besides this, it has the following advantages also.

(a) *Controlling expenses* : The classification of expenses into fixed and variable components helps in controlling expenses. Fixed costs are generally policy costs, which cannot be easily reduced. They are incurred irrespective of the output and hence are more or less non controllable. Variable expenses vary with the volume of activity and the responsibility for incurring such an expenditure is determined in relation to the output. The management can control these costs by giving proper allowances in accordance with the



Overheads

output achieved.

(b) *Preparation of budget estimates* : The segregation of overheads into fixed and variable part helps in the preparation of flexible budget. It enables a firm to estimate costs at different levels of activity and make comparison with the actual expenses incurred.

Suppose in October, 2005 the output of a factory was 1,000 units and the expenses were:

	Rs.
Fixed	5,000
Variable	4,000
Semi-variable (40% fixed)	<u>6,000</u>
	<u>15,000</u>

In November, 2005 the output was likely to increase to 1,200 units. In that case the budget or estimate of expenses will be :

	Rs.
<i>Fixed</i>	5,000
<i>Variable</i>	4,800
$\left(\frac{\text{Rs.4,000} \times 1,200 \text{ units}}{1,000 \text{ units}} \right)$	
<i>Semi-variable</i>	
Fixed, 40% of Rs. 6,000	2,400
Variable : $\left[\frac{\text{Rs.3,600} \times 1,200 \text{ units}}{1,000 \text{ units}} \right]$ 4,320	<u>6,720</u>
	<u>16,520</u>

It would be a mistake to think that with the output going up from 1,000 units to 1,200 units the expenses would increase proportionately to Rs. 18,000. This would be wrong budgeting.

(c) *Decision making* : The segregation of semi variable cost between fixed and variable overhead also helps the management to take many important decisions. For example, decisions regarding the price to be charged during depression or recession or for export market. Likewise, decisions on make or buy, shut down or continue, etc., are also taken after separating fixed costs from variable costs. In fact, when any change is contemplated, say, increase or decrease in production, change in the process of manufacture or distribution, it is necessary to know the total effect on cost (or revenue) and that would be



impossible without a correct segregation of fixed and variable costs. The technique of marginal costing, cost volume profit relationship and break-even analysis are all based on such a segregation.

4.3 ACCOUNTING AND CONTROL OF MANUFACTURING OVERHEADS

We have already seen that overheads are by nature those costs which cannot be directly related to a product or to any other cost unit. Yet for working out the total cost of a product or a unit of service, the overheads must be included. Thus we have to find out a way by which the overheads can be distributed over the various units of production.

One method of working out the distribution of overheads over the various products could be to ascertain the amount of actual overheads and distribute them over the products. This however, creates a problem since the actual amount of overheads can be known only after the financial accounts are closed. If we wait that long, the cost sheets lose their main advantages and utility to the management. All the decisions for which cost sheets are prepared are immediate decisions and cannot be postponed till the actual overheads are known. Therefore, some method has to be found by which overheads can be included in the cost of the products, as soon as prime cost, the cost of raw materials, labour and other direct expenses, is ascertained. One method is to work out pre-determined rates for absorbing overheads. These rates are worked out before an accounting period begins by estimating the amount of overheads and the level of activity in the ensuing period. Thus, as soon as the prime cost of a product or a job is available, the various overheads are charged by these rates. Of course, this implies that the overheads are charged on an estimated basis. Later, when the actual overheads are known, the difference between the overheads charged to the products and actual overheads is worked out and adjusted.

Manufacturing Overheads : Generally manufacturing overheads form a substantial portion of the total overheads. It is important, that such overheads should be properly absorbed over the cost of production. The following procedure may be adopted in this regard. The steps given below shows how factory overhead rates are estimated and overheads absorbed on that basis and the last one shows how actuals are compared with the absorbed amount.

(Students should carefully note the distinction between the various terms used).

1. *Estimation and collection of manufacturing overheads* : The first stage is to estimate the amount of overheads, keeping in view the past figures and adjusting them for known future changes. There are four main sources available for the collection of factory overheads viz., (a) Invoices; (b) Stores requisition ; (c) Wage analysis book ; (d) Journal entries.

2. *Cost allocation* : The term 'allocation' implies relating overheads directly to the various departments. The estimated amount of various items of manufacturing overheads



should be allocated to various cost centres or departments. The salary of the works manager cannot be directly allocated to any one department since he looks after the whole factory. It is, therefore, obvious that many overhead items will remain unallocated after this step.

3. *Cost apportionment* : At this stage, those items of estimated overheads (like the salary of the works manager) which cannot be directly allocated to the various departments and cost centres are apportioned. Apportionment implies “the allotment of proportions of items of cost to cost centres or departments”. It implies that the unallocable expenses are to be spread over the various departments or cost centres on an equitable basis. After this stage, all the overhead costs would have been either allocated to or apportioned over the various departments.

4. *Re-apportionment* : The next stage is to re-apportion the overhead costs of service departments over production departments. Service departments are those departments which do not directly take part in the production of goods. Such departments provide ancillary services. Examples of such departments are boiler house, canteen, stores, time office, dispensary etc. The overheads of these departments are to be re-apportioned over the production departments since service departments operate primarily for the purpose of providing services to production departments. At this stage, all the factory overheads are collected under production departments.

5. *Absorption* : The production department overheads are absorbed over production units. The overhead expenses can be absorbed by estimating the overhead expenses and then working out an absorption rate. When overheads are estimated, their absorption is carried out by adopting a pre-determined overhead absorption rate. This rate can be calculated by using any one method as discussed in this chapter at the end.

As the actual accounting period begins, each unit of production automatically absorbs a certain amount of factory overheads through pre-determined rates. During the year a certain amount will be absorbed over the various products. This is known as the total amount of absorbed overheads.

6. *Treatment of over and under absorption of overheads* : After the year end the total amount of actual factory overheads is known. There is bound to be some difference between the actual amount of overheads and the absorbed amount of overheads. The difference has to be adjusted keeping in view of such differences and the reasons therefor.

Students will thus see that the whole discussion as above is meant to serve the following two purposes :

- (a) to charge various products and services with an equitable portion of the total amount of factory overheads ; and



- (b) to charge factory overheads immediately as the product or the job is completed without waiting for the figures of actual factory overheads.

4.4 STEPS FOR THE DISTRIBUTION OF OVERHEADS

The various steps for the distribution of overheads have been discussed in detail as below:

4.4.1 Estimation and Collection of Manufacturing Overheads : The amount of factory overheads is required to be estimated. The estimation is usually done with reference to past data adjusted for known future changes. The overhead expenses are usually collected through a system of standing orders.

Standing Orders : In every manufacturing business, expenses are incurred on direct materials and direct labour in respect of several jobs or other units of production, manufacture of which is undertaken. The incurring of these expenses is authorised by production orders or work orders. The work order numbers are not ordinarily fixed or permanent. They are generally allotted in a serial order according to the number of manufacturing jobs undertaken by the business. In addition, indirect expenses are incurred in connection with the rendering of services to the production departments, or to the manufacturing process. The term "Standing Order" denotes sanction for indirect expenses under various heads of expenditure.

In large factories, usually the classification of indirect expenditures is combined with a system of Standing Orders (sometimes also referred as Service "Orders"). It is a system under which a number is allotted to each item of expense for the purpose of identification, and the same is continued from year to year. All the indirect expenditure in such a case, is charged to one or the other of the Standing Orders and periodical summaries, giving total of each Standing Order, are prepared for comparison with budgets, as well as for apportioning them among the various departments. The extent of such analysis and the nomenclature adopted are settled by the management according to the needs of the industry.

4.4.2 Allocation of overheads over various Departments or Departmentalisation of Overheads : Most of the manufacturing processes functionally are different and are performed by different departments in the factory. Where such a division of functions had been made, some of the departments should be engaged in actual production of goods, and others in providing services ancillary thereto. At this stage, the factory overheads which can be directly related to the various production or service departments are allocated in this manner.

It may, sometime, become necessary to sub-divide a manufacturing organisation into several cost centres, so that a closer distribution of expenses and a more detailed control is practicable.



It is thus obvious that the principal object of setting up cost centres is to collect data, in respect of similar activities more conveniently. This avoids a great deal of cost analysis. When costs are collected by setting up cost centres, several items can be ascertained definitely and the element of estimation is reduced considerably. For instance, the allowance of the normal idle time or the amount to be spent on consumable stores, etc. There are two main type of cost centres - machine or personal - depending on whether the process of manufacture is carried on at a centre by man or machine. For the convenience of recording of expenditure, cost centres are sometimes allotted a code number.

Advantages of Departmentalisation : The collection of overheads departmentwise gives rise to the following advantages :

- (a) Some expenses which relate to the departments will be estimated almost on an exact basis and, to that extent, the accuracy of estimation of overheads will be higher.
- (b) For the purpose of controlling expenses in a department, it is obviously necessary that the figures in relation to each department should be separately available. It is one of the main principles of control that one should know for each activity how much should have been spent and how much is actually spent. If information about expenses is available only for factory as a whole, it will not be possible to know which department has been over spending.
- (c) From the point of view of ascertaining the cost of each job, the expenses incurred in the departments through which the job or the product has passed should be known. It is only then that the cost of the job or the product can be charged with the appropriate share of indirect expenses. It is not necessary that a job must pass through all the departments or that the work required in each department should be the same for all jobs. It is, therefore, necessary that only appropriate charge in respect of the work done in the department is made. This can be done only if overheads for each department are known separately.
- (d) A suitable method of costing can be followed differently for each department e.g., batch costing when a part is manufactured, but single or output costing when the product is assembled.

4.4.3 & 4.4.4 Apportioning overhead expenses over various departments and re-apportioning service department overheads over production department : After the allocable overheads are related to the departments, expenses incurred for several departments have to be apportioned over each department, e.g. rent, power, lighting, insurance and depreciation. For distributing these overheads over different departments benefiting thereby, it is necessary at first to determine the proportion of benefit received by each department and then distribute the total expenditure proportionately on that basis. But the same basis of apportionment cannot be followed for different items of overheads



Cost Accounting

since the benefit of service to a department in each case has to be measured differently. Some of the basis that are generally adopted for the apportionment of expenses are stated below :

Basis	Expense items
Area or cubic measurement of department	Rent, rates, lighting and building maintenance
Direct labour hours or, where wage rates are more or less uniform, total direct wages of department.	Supervision
Number of employees in departments	Supervision
Cost of material used by departments	Material handling charges
Value of assets	Depreciation and insurance
Horse power of machines	Power

Other basis of apportioning overhead costs : We have considered already that the benefit received by the department generally is the principal criterion on which the costs of service departments or common expenses are apportioned. But other criteria are equally valid. Three of them are mentioned below :

- (a) Analysis or survey of existing conditions.
- (b) Ability to pay.
- (c) Efficiency or incentive.

A single concern may have only one criterion under consideration predominantly or may use all (including the service or benefit criterion) for different phases of its activity.

Analysis or Survey of existing conditions : At times it may not be possible to determine the advantage of an item of expenses without undertaking an analysis of expenditure. For example, lighting expenses can be distributed over departments only on the basis of the number of light points fixed in each department.

Ability to pay : It is a principle of taxation which has been applied in cost accounting as well for distributing the expenditure on the basis of income of the paying department, on a proportionate basis. For example, if a company is selling three different products in a territory, it may decide to distribute the expenses of the sales organisation to the amount of sales of different articles in these territories. This basis, though simple to apply, may be inequitable since the expenditure charged to an article may have no relation to the actual effort involved in selling it. Easy selling lines thus may have to bear the largest proportion of expenses while, on the other hand, these should bear the lowest charge.

Efficiency or Incentives : Under this method, the distribution of overheads is made on the



Overheads

basis of pre-determined levels of production or sales. When distribution of overhead cost is made on this basis and if the level of production exceeds the pre-determined level of production the incidence of overhead cost gets reduced and the total cost per unit of production or of sales, lowered. The opposite is the effect if the assumed levels are not reached.

Thus the department whose sales are increasing is able to show a greater profit and thereby is able to earn greater goodwill and appreciation of the management than it would have if the distribution of overheads was made otherwise.

Inter-departmental service costs : At first, expenses of all departments are compiled without making a distinction between production and service departments. Then the expenses of the service departments are apportioned among the production departments on a suitable basis. This is because ultimately the overheads are to be absorbed over goods produced or jobs completed in the production departments.

The re-apportionment of service department expenses over the production departments may be carried out by using any one of the following methods :

- (i) Direct re-distribution method.
- (ii) Step method of secondary distribution or non-reciprocal method.
- (iii) Reciprocal Service method.

Direct re-distribution method: Service department costs under this method are apportioned over the production departments only, ignoring the services rendered by one service department to the other. To understand the application of this method go through the illustration which follows.

Illustration

XL Ltd., has three production departments and four service departments. The expenses for these departments as per Primary Distribution Summary are as follows :

Production Departments :	Rs.	Rs;
A 30,000		
B 26,000		
C 24,000	80,000	
<i>Service Departments :</i>	Rs.	Rs.
Stores	<u>4,000</u>	_____
Time-keeping and Accounts	3,000	
Power	1,600	
Canteen	1,000	9,600



Cost Accounting

The following information is also available in respect of the production departments :

	Dept. A	Dept. B	Dept. C
Horse power of Machine	<u>300</u>	<u>300</u>	200
Number of workers	20	15	15
Value of stores requisition in (Rs.)	2,500	1,500	1,000

Apportion the costs of service departments over the production departments.

Solution

Secondary Overhead Distribution Statement

Item of cost (as per primary distribution summary)	Basis of apportionment	Total Rs.	Production Depts		
			A Rs.	B Rs.	C Rs.
Cost as per primary distribution summary		80,000	30,000	26,000	24,000
Stores Value of stores re- quisition :					
(5:3:2)		4,000	2,000	1,200	800
Time-keeping and Accounts	No. of workers				
(4:3:3)		3,000	1,200	900	900
Power	H.P. of M/c's				
(3:3:2)		1,600	600	600	400
Canteen	No. of workers				
(4:3:3)		<u>1,000</u>	<u>400</u>	<u>300</u>	<u>300</u>
		<u>89,600</u>	<u>34,200</u>	<u>29,000</u>	<u>26,400</u>

(ii) *Step Method or Non-reciprocal method* : This method gives cognizance to the service rendered by service department to another service department. Therefore, as



Overheads

compared to previous method, this method is more complicated because a sequence of apportionments has to be selected here. The sequence here begins with the department that renders service to the maximum number of other service departments. In other words the cost of the service department which serves the largest number of other service and production departments, is distributed first. After this, the cost of service department serving the next largest number of departments is apportioned.

This process continues till the cost of last service department is apportioned. The cost of last service department is apportioned among production departments only.

Some authors are of the view that the cost of service department with largest amount of cost should be distributed first. Refer to the illustration which follows to understand this method.

Illustration

Suppose the expenses of two production departments A and B and two service departments X and Y are as under :

	<i>Amount</i>		<i>Apportionment Basis</i>	
	<i>Rs.</i>	<i>Y</i>	<i>A</i>	<i>B</i>
X	2,000	25%	40%	35%
Y	1,500	—	40%	60%
A	3,000			
B	3,200			

Solution

Summary of Overhead Distribution

Departments	X	Y	A	B
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Amount as given above	2,000	1,500	3,000	3,200
Expenses of X Dept. apportioned over Y,A and B Dept. in the ratio (5:8:7)	—2,000	500	800	700
Expenses of Y Dept. apportioned over A				



Cost Accounting

and B Dept. in the
ratio (2:3)

	<u>-</u>	<u>-2,000</u>	<u>800</u>	<u>1,200</u>
Total	<u>Nil</u>	<u>Nil</u>	<u>4,600</u>	<u>5,100</u>

(iii) *Reciprocal Service Method* : This method recognises the fact that where there are two or more service departments they may render services to each other and, therefore, these inter-departmental services are to be given due weight while re-distributing the expenses of the service departments.

The methods available for dealing with reciprocal services are :

- (a) Simultaneous equation method ;
- (b) Repeated distribution method ;
- (c) Trial and error method.

(a) *Simultaneous equation method* : According to this method firstly, the costs of service departments are ascertained. These costs are then re-distributed to production departments on the basis of given percentages. (Refer to the following illustration to understand the method)

Illustration

Service departments expenses

	Rs.
Boiler House	3,000
Pump Room	<u>600</u>
	<u>3,600</u>

The allocation is :

	<i>Production Departments</i>		<i>Boiler House</i>	<i>Pump Room</i>
	<i>A</i>	<i>B</i>		
Boiler House	60%	35%	-	5%
Pump Room	10%	40%	50%	-

Solution

The total expenses of the two service departments will be determined as follows :

Let B stand for Boiler House expenses and P for Pump Room expenses.

Then



Overheads

$$B = 3,000 + 1/2 P$$

$$P = 600 + 1/20 B$$

Substituting the value of B,

$$P = 600 + 1/20 (3,000 + 1/2 P)$$

$$= 600 + 150 + 1/40 P$$

$$= 750 + 1/40 P$$

$$40 P = 30,000 + P$$

$$39 P = 30,000$$

$$P = \text{Rs. } 769 \text{ (approx.)}$$

The total of expenses of the Pump Room are Rs. 769 and that of the Boiler House is Rs. 3,385 *i.e.*, Rs. 3,000 + 1/2 × Rs. 769.

The expenses will be allocated to the production departments as under :

<i>Production departments :</i>	<i>A</i>	<i>B</i>
	<i>Rs.</i>	<i>Rs.</i>
Boiler House (60% and 35% of Rs. 3,385)	2,031	1,185
Pump Room (10% and 40% of Rs. 769)	<u>77</u>	<u>307</u>
Total	<u>2,108</u>	<u>1,492</u>

The total of expenses apportioned to A and B is Rs. 3,600.

(b) *Repeated distribution method* : Under this method, service departments costs are distributed to other service and production departments on agreed percentages and this process continues to be repeated, till the figures of service departments are either exhausted or reduced to too small a figure. (Refer to the following illustration to understand this method)

Illustration

PH Ltd., is a manufacturing company having three production departments, 'A', 'B' and 'C' and two service departments 'X' and 'Y'. The following is the budget for December 2005 :-

	<i>Total</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>X</i>	<i>Y</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Direct material		1,000	2,000	4,000	2,000	1,000
Direct wages		5,000	2,000	8,000	1,000	2,000
Factory rent	4,000					



Cost Accounting

Power	2,500
Depreciation	1,000
Other overheads	9,000

Additional information :

Area (Sq. ft.)	500	250	500	250	500
Capital value (Rs. lacs) of assets	20	40	20	10	10
Machine hours	1,000	2,000	4,000	1,000	1,000
Horse power of machines	50	40	20	15	25

A technical assessment of the apportionment of expenses of service departments is as under :

	A	B	C	X	Y
	%	%	%	%	%
Service Dept. 'X'	45	15	30	–	10
Service Dept. 'Y'	60	35	–	5	–

Required :

- A statement showing distribution of overheads to various departments.
- A statement showing re-distribution of service departments expenses to production departments.
- Machine hour rates of the production departments 'A', 'B' and 'C'.

Solution

(i) Overhead Distribution Summary

	Basis	Total Rs.	A Rs.	B Rs.	C Rs.	X Rs.	Y Rs.
Direct materials	<i>Direct</i>	–	–	–	–	2,000	1,000
Direct wages	<i>Direct</i>	–	–	–	–	1,000	2,000
Factory rent	<i>Area</i>	4,000	1,000	500	1,000	500	1,000
Power	<i>H.P. × M/c Hrs.</i>	2,500	500	800	800	150	250
Depreciation	<i>Cap., value</i>	1,000	200	400	200	100	100
Other overheads	<i>M/c hrs.</i>	9,000	1,000	2,000	4,000	1,000	1,000
			2,700	3,700	6,000	4,750	5,350



Overheads

(ii) Redistribution of Service Department's expenses :

	A	B	C	X	Y
	Rs.	Rs.	Rs.	Rs.	Rs.
Total overheads	2,700	3,700	6,000	4,750	5,350
Dept. X overhead apportioned in the ratio (45:15:30:—:10)	2,138	712	1,425	-4,750	475
Dept. Y overhead apportioned in the ratio (60:—35:—:5)	3,495	2,039	—	291	-5,825
Dept. X overhead apportioned in the ratio (45:15:30:—:10)	131	44	87	-291	29
Dept. Y overhead apportioned in the ratio (60:35:—:5:—)	17	10	—	2	-29
Dept. X overhead apportioned in the ratio (45:15:30:—:10)	1	—	1	-2	—
	8,482	6,505	7,513	—	—

(iii) Machine hour rate :

Machine hours	1,000	2,000	4,000
Machine hour rate (Rs.)	8.48	3.25	1.88

(Rs. 8,482/1,000 hrs) (Rs. 6,505/2,000 hrs.) (Rs. 7,513/4,000 hrs.)

(c) *Trial and error method* - According to this method the cost of one service Cost Centre is apportioned to another service Cost Centre. The cost of another service centre plus the share received from the first Cost Centre is again apportioned to the first cost centre. This process is repeated till the amount to be apportioned becomes negligible. (Refer to the following illustration to understand this method.)



Cost Accounting

Illustration

The ABC Company has the following account balances and distribution of direct charges on 31st March, 2005.

	<i>Total</i>	<i>Production Depts.</i>		<i>Service Depts.</i>	
		<i>Machine Shop</i>	<i>Packing</i>	<i>Gen. Plant</i>	<i>Store & Maintenance</i>
<i>Allocated Overheads :</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Indirect labour	14,650	4,000	3,000	2,000	5,650
Maintenance material	5,020	1,800	700	1,020	1,500
Misc. supplies	1,750	400	1,000	150	200
Superintendent's salary	4,000 –	–	4,000	–	–
Cost & payroll salary	10,000	–	–	10,000	–
<i>Overheads to be apportioned :</i>					
Power	8,000				
Rent	12,000				
Fuel and heat	6,000				
Insurance	1,000				
Taxes	2,000				
Depreciation	1,00,000				
	1,64,420	6,200	4,700	17,170	7,350

The following data were compiled by means of the factory survey made in the previous year :

	<i>Floor Space</i>	<i>Radiator Sections</i>	<i>No. of Employees</i>	<i>Investment Rs.</i>	<i>H.P. hours</i>
Machine Shop	2,000 Sq. ft.	45	20	6,40,000	3,500
Packing	800 " "	90	10	2,00,000	500
General Plant	400 " "	30	3	10,000	–
Store & Maint.	1,600 " "	60	5	1,50,000	1,000
	4,800 " "	225	38	10,00,000	5,000



Overheads

Expenses charged to the stores and maintenance departments are to be distributed to the other departments by the following percentages :

Machine shop 50%; Packing 20%; General Plant 30% ; General Plant overheads is distributed on the basis of number of employees :

(a) Prepare an overhead distribution statement with supporting schedules to show computations and basis of distribution including distribution of the service department expenses to producing department.

(b) Determine the service department distribution by the method of continued distribution. Carry through 3 cycles. Show all calculations to the nearest rupee.

Solution

(a)

Overhead Distribution Statement

	<u>Production Departments</u>		<u>Service Departments</u>	
	<i>Machine Shop</i>	<i>Packing</i>	<i>General Plant</i>	<i>Stores & Maintenance</i>
<i>Allocated Expenses:</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Indirect labour	4,000	3,000	2,000	5,650
Maintenance material	1,800	700	1,020	1,500
Superintendent's salary	—	—	4,000	—
Misc. supplies	400	1,000	150	200
Cost & payroll salaries	—	—	10,000	—
Total	6,200	4,700	17,170	7,350
Apportioned expenses (See schedule below)	77,720	25,800	2,830	22,650
Total	83,920	30,500	20,000	30,000

Schedule of Apportioned Expenses

<i>Item</i>	<i>Basis</i>	<i>Machine Shop</i>	<i>Packing</i>	<i>General Plant</i>	<i>Stores & Maintenance</i>
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Power	Horse Power Hrs.	5,600	800	—	1,600
Rent	Floor Space	5,000	2,000	1,000	4,000
Fuel & Heat	Radiator Secs.	1,200	2,400	800	1,600



Cost Accounting

Insurance	Investment	640	200	10	150
Taxes	Investment	1,280	400	20	300
Depreciation	Investment	64,000	20,000	1,000	15,000
Total		77,720	25,800	2,830	22,650

(b)

Distribution of Service Department Expenses

	<i>Production Departments</i>		<i>Service Departments</i>	
	<i>Machine</i>	<i>Packing</i>	<i>General Plant</i>	<i>Stores & Maintenance</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Total Expense [as per (a)]	83,920	30,500	20,000	30,000
Transfer from Stores & Maintenance	15,000	6,000	9,000	-30,000
Transfer from General Plant	16,571	8,286	-29,000	4,143
Transfer from Stores & Maintenance	2,072	829	1,242	-4,143
Transfer from General Plant	710	355	-1,242	177
Transfer from Stores & Maintenance	88	36	53	-177
Transfer from General Plant	35	18	-53	—
Total	1,18,396	46,024	—	—

Illustration

Modern Manufactures Ltd. have three Production Departments P_1 , P_2 , P_3 and two Service Departments S_1 and S_2 details pertaining to which are as under :

	P_1	P_2	P_3	S_1	S_2
Direct wages (Rs.)	3,000	2,000	3,000	1,500	195
Working hours	3,070	4,475	2,419	-	-
Value of machines (Rs.)	60,000	80,000	1,00,000	5,000	5,000
H.P. of machines	60	30	50	10	-
Light points	10	15	20	10	5
Floor space (sq. ft.)	2,000	2,500	3,000	2,000	500



Overheads

The following figures extracted from the Accounting records are relevant:

	Rs.
Rent and Rates	5,000
General Lighting	600
Indirect Wages	1,939
Power	1,500
Depreciation on Machines	10,000
Sundries	9,695

The expenses of the Service Departments are allocated as under :

	<i>P₁</i>	<i>P₂</i>	<i>P₃</i>	<i>S₁</i>	<i>S₂</i>
<i>S₁</i>	20%	30%	40%	-	10%
<i>S₂</i>	40%	20%	30%	10%	-

Find out the total cost of product X which is processed for manufacture in Departments *P₁*, *P₂* and *P₃* for 4, 5 and 3 hours respectively, given that its Direct Material Cost is Rs. 50 and Direct Labour Cost is Rs. 30.

Solution

Statement Showing Distribution of Overheads of Modern Manufacturers Ltd.

<i>Particulars</i>	<i>Basis</i>	<i>Total</i>	<i>Production Depts</i>			<i>Service Depts.</i>	
			<i>P₁</i>	<i>P₂</i>	<i>P₃</i>	<i>S₁</i>	<i>S₂</i>
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Rent & Rates	Area	5,000	1,000	1,250	1,500	1,000	250
General lighting	Light points	600	100	150	200	100	50
Indirect wages	Direct wages	1,939	600	400	600	300	39
Power	H.P.	1,500	600	300	500	100	-
Depreciation of machines	Value of machines	10,000	2,400	3,200	4,000	200	200
Sundries	Direct Wages	9,695	3,000	2,000	3,000	1,500	195
		<u>28,734</u>	<u>7,700</u>	<u>7,300</u>	<u>9,800</u>	<u>3,200</u>	<u>734</u>



Cost Accounting

Redistribution of Service Department's Expenses Over Production Departments

	Total Rs.	Production Depts.			Service Depts.	
		P ₁ Rs.	P ₂ Rs.	P ₃ Rs.	S ₁ Rs.	S ₂ Rs.
Total Overheads	28,734	7,700	7,300	9,800	3,200	734
Dept. S ₁ Overheads apportioned	3,200	640	960	1,280	-3,200	320
in the ratio (20:30:40:—:10)						
Dept. S ₂ Overheads apportioned	1,054.00	421.60	210.80	316.20	105.40	-1,054
in the ratio (40:20:30:10:—)						
Dept. S ₁ Overheads apportioned	105.40	21.08	31.62	42.16	-105.40	10.54
in the ratio (20:30:40:—:10)						
Dept. S ₂ Overheads apportioned	10.54	4.22	2.11	3.16	1.05	-10.54
in the ratio (40:20:30:10:—)						
Dept. S ₁ Overheads apportioned	1.05	0.21	0.32	0.42	-1.0	50.10
in the ratio (20:30:40:—:10)						
Dept. S ₂ Overheads apportioned	0.10	0.05	0.02	0.03	-	-0.10
in the ratio (40:20:30:10:—)						
Total		8,787.16	8,504.87	11,441.79		
Working hours		3,075.00	4,475.00	2,419.00		
Rate per hour		2.86	1.90	4.73		

(See Working Note 1)

Cost of the product 'X'	Rs.
Direct material cost	50.00
Direct labour cost	30.00
Overhead cost	<u>35.13</u>
	<u>115.13</u>

Working Note :

- Working rate per hour for production department

$$P_1 = \frac{\text{Rs. } 8,787.16}{3,075} = \text{Rs. } 2.86$$



Overheads

Similarly production rate for production departments P₂ and P₃ are Rs. 1.90 and Rs. 4.73.

2. Overhead cost

$$\begin{aligned} & \text{Rs. } 2.86 \times 4 \text{ hrs.} + \text{Rs. } 1.90 \times 5 \text{ hrs.} + \text{Rs. } 4.73 \times 3 \text{ hrs.} \\ & = \text{Rs. } 11.44 + \text{Rs. } 9.50 + \text{Rs. } 14.19 = \text{Rs. } 35.13 \end{aligned}$$

Note

The service departments have only indirect costs which are to be absorbed by production departments. However if the direct wages appearing in the question are assumed to be incurred on the service departments only, which have not been accounted for, by any other activity carried on in the service departments, then total expenses of the service departments including the aforesaid direct wages should be charged in the respective production departments. If this assumption holds good the alternative solution can appear as under.

Alternative Solution Statement Showing Distribution of Overheads of Modern Manufactures Ltd.

Particulars	Basis	Total	Production Departments			Service Departments	
			P ₁	P ₂	P ₃	S ₁	S ₂
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Direct wages	Actual	1,695	-	-	-	1,500	195
Rent & rates	Area	5,000	1,000	1,250	1,500	1,000	250
General lighting	Light points	600	100	150	200	100	50
Indirect wages	Direct wages	1,939	600	400	600	300	39
Power	H.P.	1,500	600	300	500	100	-
Depreciation of machines	Value of machines	10,000	2,400	3,200	4,000	200	200
Sundries	Direct wages	9,695	3,000	2,000	3,000	1,500	195
		30,429	7,700	7,300	9,800	4,700	929



Cost Accounting

Redistribution of Service Department's Expenses over Production Departments

	Total	P ₁	P ₂	P ₃	S ₁	S ₂
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Total Overheads	30,429	7,700	7,300	9,800	4,700	929
Dept. S ₁ Overheads apportioned	4,700	940	1,410	1,880	-4,700	470
in the ratio: (20:30:40:—:10)						
Dept. S ₂ overheads apportioned	1,399.00	559.60	279.80	419.70	139.90	-1,399.00
in the ratio: (40:20:30:10:—)						
Dept. S ₁ overheads apportioned	139.90	27.98	41.97	55.96	-139.90	13.99
in the ratio (20:30:40:—:10)						
Dept. S ₂ overheads apportioned	13.99	5.60	2.80	4.20	1.40	-13.99
in the ratio (40:20:30:10:—)						
Dept. S ₁ overheads apportioned	1.40	0.28	0.42	0.56	-1.40	0.14
in the ratio (20:30:40:—:10)						
Dept. S ₂ overheads apportioned	0.14	0.06	0.03	0.05		-0.14
in the ratio (40:20:30:10:—)						
Total		9,233.52	9,035.02	12,160.47		
Working hours		3,070.00	4,475.00	2,419.00		
Working rate per hour		3.00	2.02	5.03		

Cost of the Product 'X'

	<i>Rs. P.</i>
Direct material cost	50.00
Direct labour cost	30.00
Overhead cost (See working note)	<u>37.19</u>
	<u>117.25</u>

Working note :

Overhead cost :

Rs. 3 × 4 hrs. + Rs. 2.02 × 5 hrs. + Rs. 5.03 × 3 hrs.

= Rs. 12 + Rs. 10.10 + Rs. 15.09 = Rs. 37.19

Illustration :

Deccan Manufacturing Ltd., have three departments which are regarded as



Overheads

production departments. Service departments' costs are distributed to these production departments using the "Step Ladder Method" of distribution. Estimates of factory overhead costs to be incurred by each department in the forthcoming year are as follows. Data required for distribution is also shown against each department:

<i>Department</i>	<i>Factory overhead Rs.</i>	<i>Direct labour hours</i>	<i>No. of employees</i>	<i>Area in sq.m.</i>
Production:				
X	1,93,000	4,000	100	3,000
Y	64,000	3,000	125	1,500
Z	83,000	4,000	85	1,500
Service:				
P	45,000	1,000	10	500
Q	75,000	5,000	50	1,500
R	1,05,000	6,000	40	1,000
S	30,000	3,000	50	1,000

The overhead costs of the four service departments are distributed in the same order, viz., P,Q,R and S respectively on the following basis.

<i>Department</i>	<i>Basis</i>
P	Number of employees
Q	Direct labour hours
R	Area in square metres
S	Direct labour hours

You are required to :

- Prepare a schedule showing the distribution of overhead costs of the four service departments to the three production departments; and
- Calculate the overhead recovery rate per direct labour hour for each of the three production departments.



Cost Accounting

Solution

(a)

Deccan Manufacturing Limited
Schedule Showing the Distribution of Overhead Costs among Departments

	Service				Production		
	P	Q	R	S	X	Y	Z
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Overhead costs	45,000	75,000	1,05,000	30,000	1,93,000	64,000	83,000
Distribution of overhead cost of Dept. 'P'	(45,000)	5,000	4,000	5,000	10,000	12,500	8,500
Distribution of overhead costs of Dept. 'Q'	-	(80,000)	24,000	12,000	16,000	12,000	16,000
Distribution of overhead cost of Dept. 'R'	-	-	(1,33,000)	19,000	57,000	28,500	28,500
Distribution of overhead costs of Dept. 'S'	-	-	-	(66,000)	24,000	18,000	24,000
Total (A)					3,00,000	1,35,000,	1,60,000

(b)

Direct labour hours (B)		4,000	3,000	4,000
Overhead recovery rate per hour	$\frac{(A)}{(B)}$	Rs. 75	Rs. 45	Rs. 40

Illustration

A Ltd., manufactures two products A and B. The manufacturing division consists of two production departments P₁ and P₂ and two service departments S₁ and S₂.

Budgeted overhead rates are used in the production departments to absorb factory overheads to the products. The rate of Department P₁ is based on direct machine hours, while the rate of Department P₂ is based on direct labour hours. In applying overheads, the pre-determined rates are multiplied by actual hours.

For allocating the service department costs to production departments, the basis adopted is as follows :

- (i) Cost of Department S₁ to Department P₁ and P₂ equally, and
- (ii) Cost of Department S₂ to Department P₁ and P₂ in the ratio of 2 : 1 respectively.



Overheads

The following budgeted and actual data are available:

Annual profit plan data :

Factory overheads budgeted for the year:

		Rs.		Rs.
Departments	P ₁	25,50,000	S ₁	6,00,000
	P ₂	21,75,000	S ₂	4,50,000

Budgeted output in units :

Product A 50,000; B 30,000.

Budgeted raw-material cost per unit :

Product A Rs. 120; Product B Rs. 150.

Budgeted time required for production per unit :

Department P₁ : Product A : 1.5 machine hours

Product B : 1.0 machine hour

Department P₂ : Product A : 2 Direct labour hours

Product B : 2.5 Direct labour hours

Average wage rates budgeted in Department P₂ are :

Product A - Rs. 72 per hour and Product B – Rs. 75 per hour.

All materials are used in Department P₁ only.

Actual data : (for the month of July, 2005)

Units actually produced : Product A : 4,000 units

Product B : 3,000 units

Actual direct machine hours worked in Department P₁ :

On product A 6,100 hours, Product B 4,150 hours.

Actual direct labour hours worked in Department P₂ :

on product A 8,200 hours, Product B 7,400 hours.



Cost Accounting

Costs actually incurred:

	<i>Product A</i>		<i>Product B</i>	
	Rs.		Rs.	
Raw materials	4,89,000		4,56,000	
Wages	5,91,900		5,52,000	
	Rs.		Rs.	
Overheads : Department	P ₁	2,31,000	S ₁	60,000
	P ₂	2,04,000	S ₂	48,000

You are required to :

- Compute the pre-determined overhead rate for each production department.
- Prepare a performance report for July, 2005 that will reflect the budgeted costs and actual costs.

Solution :

(i)

Computation of predetermined overhead rate for each production department from budgeted data

	<i>Production Deptts.</i>		<i>Service Deptts.</i>	
	<i>P₁</i>	<i>P₂</i>	<i>S₁</i>	<i>S₂</i>
Budgeted factory overheads for the year in (Rs.)	25,50,000	21,75,000	6,00,000	4,50,000
Allocation of service department S ₁ 's costs to production departments				
P ₁ and P ₂ equally in (Rs.)	3,00,000	3,00,000	-6,00,000	-
Allocation of service department S ₂ 's costs to production departments				
P ₁ and P ₂ in the ratio of 2:1 in (Rs.)	3,00,000	1,50,000	-	-4,50,000
Total (Rs.)	31,50,000	26,25,000	<i>Nil</i>	<i>Nil</i>
Budgeted machine hours in department P ₁	1,05,000			

(Refer to working note 1)



Overheads

Budgeted labour hours in
department P₂ 1,75,000

(Refer to working note 2)

Budgeted machine hour rate
(Rs. 31,50,000/1,05,000) Rs. 30

Budgeted labour hour rate
(Rs. 26,25,000/1,75,000) Rs. 15

(ii) **Performance report for July, 2005**

(When 4,000 and 3,000 units of products A and B respectively were actually produced)

	Budgeted Rs.	Actual Rs.
Raw materials used in department P₁		
A : 4,000 units × Rs. 120	4,80,000	4,89,000
B : 3,000 units × Rs. 150	4,50,000	4,56,000
Direct labour		
Cost on the basis of labour hours worked in department P ₂		
A : 4,000 units × 2 hrs. × Rs. 72	5,76,000	5,91,900
B : 3,000 units × 2.5 hrs. × Rs. 75	5,62,500	5,52,000
Overhead absorbed on machine hour basis in department P₁		
A : 4,000 units × 1.5 hrs. × Rs. 30	1,80,000	1,74,400*
B : 3,000 units × 1 hr. × Rs. 30	90,000	1,18,649
Overhead absorbed on labour hour basis in department P₂		
A : 4,000 units × 2 hrs. × Rs. 15	1,20,000	1,31,364 **
B : 3,000 units × 2.5 hrs. × Rs. 15	<u>1,12,500</u>	<u>1,18,548</u>
	25,71,000	<u>26,31,861</u>

* (Refer to working note 4)

** (Refer to working note 5)



Cost Accounting

Working notes :

	<i>Product A</i>	<i>Product B</i>	<i>Total</i>
1. Budgeted output	50,000	30,000	
(in units) Budgeted machine hours	75,000	30,000	1,05,000
in department P ₁	(50,000×1.5 hrs.)	(40,000×1 hr.)	
Budgeted labour hours	1,00,000	75,000	1,75,000
in department P ₂	(50,000×2 hrs.)	(30,000×2.5 hrs.)	

	<i>Product A</i>	<i>Product B</i>	<i>Total</i>
2. Actual output (in units)	4,000	3,000	
Actual machine hours			
utilised in department P ₁	6,100	4,150	10,250
Actual labour hours			
utilised in department P ₂	8,200	7,400	15,600

3. *Computation of actual overhead rates for each production department from actual data*

	<i>Production Deptts.</i>		<i>Service Deptts.</i>	
	<i>P₁</i>	<i>P₂</i>	<i>S₁</i>	<i>S₂</i>
Actual factory overheads for the month of July, 2005 in (Rs.)	2,31,000	2,04,000	60,000	48,000
Allocation of service department S ₁ 's costs in (Rs.) over production departments P ₁ and P ₂ equally	30,000	30,000	-60,000	—
Allocation of service department S ₂ 's costs in (Rs.) over production departments P ₁ and P ₂ in the ratio 2 : 1	32,000	16,000	—	-48,000
Total (Rs.)	2,93,000	2,50,000	<i>Nil</i>	<i>Nil</i>



Overheads

Actual machine hours in department P ₁	10,250	–	–	–
(Refer to working note 2)				
Actual labour hours in department P ₂	–	15,600	–	–
(Refer to working note 2)				
Machine hour rate (Rs. 2,93,000/10,250)	Rs. 28.59	–	–	–
Labour hour/rate (Rs. 2,50,000/15,600)	–	Rs. 16.02	–	–

4. Actual overheads absorbed (based on machine hours)

$$A : 6,100 \text{ hrs} \times \text{Rs. } 28.59 = \text{Rs. } 1,74,400 \text{ (say)}$$

$$B : 4,150 \text{ hrs} \times \text{Rs. } 28.59 = \text{Rs. } 1,18,649 \text{ (say)}$$

5. Actual overheads absorbed (based on labour hours)

$$A : 8,200 \text{ hrs} \times \text{Rs. } 16.02 = \text{Rs. } 1,31,364$$

$$B : 7,400 \text{ hrs} \times \text{Rs. } 16.02 = \text{Rs. } 1,18,548$$

4.4.5 Absorbing overheads over cost units, products, etc.: Collection of the figure of overheads for the factory as a whole or for various departments is not enough. It is clearly necessary to ascertain how much of the overheads is debitable to the cost of the various jobs, products etc. This process is called absorbing the overhead to cost units. We take up below the various implications of this process. However, if only one uniform type of work is done, the task is easy and under such a situation the overhead expenses to be absorbed may be calculated by dividing actual overheads by the number of units of work done or estimated overheads by the estimated output.

Normal and pre-determined overhead rates : Various items of overhead expenses generally are not incurred uniformly throughout the accounting period e.g., insurance premium are paid annually, rates and taxes quarterly, etc. The monthly total of overhead expenses for each department or cost centre, therefore, may fluctuate from month to month. As such, monthly totals cannot be regarded as satisfactory. It being necessary to absorb the overhead costs in the cost of production of each lot or batch of production, as soon as its manufacture is complete an estimate of the total amounts of annual overhead expenses must be made in advance. Likewise, an advance estimate of the annual volume of production (in terms of the amount of direct wages, number of direct labour hours, etc.) must be made and, on that basis, a pre-determined overhead rate is calculated.



Cost Accounting

The overhead rate of expenses for absorbing them to production may be estimated on the following three basis.

- (1) The figure of the previous year or period may be adopted as the overhead rate to be charged to production in the current year. The assumption is that the value of production as well as overheads will remain constant or that the two will change, proportionately.
- (2) The overhead rate for the year may be determined on the basis of estimated expenses and anticipated volume of production activity.

For instance, if expenses are estimated at Rs. 10,000 and output at 4,000 units, the overhead rate will be Rs. 250 per unit.

- (3) The overhead rate for a year may be fixed on the basis of the normal volume of the business.

If, in the example given above, the normal capacity is 5,000 units, the overhead rate will be Rs. 2.

The first method is rather crude and is not likely to yield satisfactory results unless the undertaking is small and output and expenses are fairly constant over the period. In large concerns, conditions are rarely static and, hence, expenses fluctuate from one period to another. Therefore, so far as a large enterprise is concerned, the overhead rates of the past periods may not have much relevance for the purpose of arriving at the cost of production in the current period.

The second method is based on the assumption that all expenses shall have to be recovered irrespective of the volume of output. From such an assumption, it follows that, if in any period there is a large idle or unused capacity, the entire amount of the overhead expenses shall have to be absorbed over the reduced volume of the output. A sizeable portion of the overhead expenses is made up of the fixed charges; if those fixed charges have to be included in the costs of the reduced output the incidence of overheads per unit of production would necessarily be high. Similarly, if the volume of output in any period exceeds the normal level, the incidence of fixed overheads per unit will be comparatively lower. The effect of this method is that during periods of falling production (and perhaps of falling prices), the cost of production would be higher and, correspondingly, during a period of rising production and perhaps rising prices), the cost of production would be low. This would be illogical idleness or a level of activity above the normal capacity is abnormal and should not affect costs; the Costing Profit and Loss Account is the place where the effect of such abnormal factors should be shown. It is also possible that when output falls and total cost per unit goes up (if expenses are absorbed over actual output), the firm may demand a price above the market price and may find itself without customers. On this consideration, the most appropriate basis for the computation of



predetermined rate of overhead cost is the normal capacity of production.

Estimation on this basis as suggested in the third method, has many advantages over the other two methods. It enables not only the computation of correct costs but also true cost to be recovered. In a competitive economy, the concept of costs is essentially that of normal costs. Normal costs should be the yard stick against which the efficiency or otherwise, of the competing unit should be measured. A cost that is correct need not necessarily be true. True costs are in a sense notional cost and the term "normal" is derived from the concept of normal costs. Hence, the use of normal overhead rates has a two fold advantage. It enables the true as well as correct costs to be calculated; at the same time by highlighting differences between the amount of overhead expenses actually incurred and those absorbed in production it provides useful guidance to the management in taking decisions as regards production and sales.

Blanket and departmental overhead rates: Blanket overhead rate refers to the computation of one single overhead rate for the whole factory. It is to be distinguished from the departmental overhead rate which refers to a separate rate for each individual cost centre or department. The use of blanket rate may be proper in certain factories producing only one major product in a continuous process (e.g., chemical factories) or where the work performed in every department is fairly uniform or standardised. Where, however, the product lines are varied or machinery is used to a varying degree in the different departments, that is, where conditions throughout the factory are not uniform, the use of departmental rates is to be preferred. The working condition in the last mentioned case would be such that varying amount of expenses would be continually incurred by the several service departments and hence, the incidence of overhead cost of each department would be different. Since not all products would ordinarily undergo the same type or of different type of operations in different departments, the charging of a single overhead rate in such a case would give misleading results.

It may therefore, be concluded that a blanket rate should be applied.

- (1) where only one major product is being produced.
- (2) where several products are produced, but
 - (a) all products pass through all departments; and
 - (b) all products are processed for the same length of time in each department.

Where these conditions do not exist, departmental rates should be used.

4.5 METHODS OF ABSORBING OVERHEADS TO VARIOUS PRODUCTS OR JOBS

Before we describe various methods, it would be better to know how to judge whether a method will give good results or not. The method selected for charging overheads to



Cost Accounting

products or jobs should be such as will ensure :

- (i) that the total amount charged (or recovered) in a period does not differ materially from the actual expenses incurred in the period. In other words, there should not be any significant over or under recovery of overhead; and
- (ii) that the amount charged to individual jobs or products is equitable. In case of factory overhead, this means :
 - (a) that the time spent on completion of each job should be taken into consideration;
 - (b) that a distinction should be made between jobs done by skilled workers and those done by unskilled workers. Usually, the latter class of workers needs more supervision, causes greater wear and tear of machines and tools and waste a larger quantity of materials. Hence jobs done by such workers should bear a correspondingly higher burden for overheads; and
 - (c) that jobs done by manual labour and those done by machines should be distinguished. It stands to reason that no machine expenses should be charged to jobs done by manual labour.

In addition, the methods should

- (i) be capable of being used conveniently; and
- (ii) yield uniform result from period to period as far as possible; any change that is apparent should reflect a change in the underlying situation such as substitution of human labour by machines.

Several methods are commonly employed either individually or jointly for computing the appropriate overhead rate to be employed. The more common of these are :

- (1) Percentage of direct materials.
- (2) Percentage of prime cost.
- (3) Percentage of direct labour cost.
- (4) Labour hour rate.
- (5) Machine hour rate.

4.5.1 & 4.5.2 Percentage of direct material and prime cost

Suppose for a given period, actual figures are estimated as follows :

	<i>Rs.</i>
Direct materials	2,00,000



Overheads

Direct labour	1,00,000
Factory overheads	90,000

The percentage of factory overheads to direct materials will be 45%, to prime cost 30% and to direct labour 90%. If, on a job, material cost is Rs. 10,000 and direct labour is Rs. 7,000 the cost, after absorbing factory overhead, will be as follows :

- (i) Rs. 17,000 + 45% Rs. 10,000 or Rs. 21,500,
- (ii) Rs. 17,000 + 30% Rs. 17,000 or Rs. 22,100, and
- (iii) Rs. 17,000 + 90% Rs. 7,000 or Rs. 23,300.

One can see how, with a different method, the works cost comes out to be different. Of these methods, the first and second are generally considered to be unsuitable on account of the following reasons :

(i) Manufacturing overhead expenses are mostly a function of time i.e., time is the determining factor for the incurrence and application of manufacturing overhead expenses. That they are so would be clear if we recall that overhead expenses, specially manufacturing expenses, can in the ultimate analysis be regarded as expenditure incurred in providing the necessary facilities and service to workers employed in the productive process. The question of facilities and service made available to workers naturally is dependent on the length of time during which workers make use of the facilities. It may, therefore, be said that the job or product on which more time has been spent would entail larger manufacturing expenses than the job requiring less time. The factor is ignored altogether by the first method and largely by the second method.

(ii) Overheads are neither related to the prime cost nor to direct material cost except to a very small extent. Thus, if the percentage of material cost is used when there are two jobs requiring the same operational time but using material having varying prices, their manufacturing overhead cost would be different whereas this should not normally be so.

The method of absorbing overhead costs on the basis of prime cost also does not take into consideration the time factor. The fact that the amount includes labour cost in addition to material cost does not render the prime cost to be more suitable; infact, the results are liable to be more misleading because of the cumulative error of using both the labour and material cost as the basis of allocation of overhead expenses, on neither of which they are already dependent.

(iii) Since material prices are prone to frequent and wide fluctuations, the manufacturing overheads, if based on material cost or prime cost, also would fluctuate violently from period to period.

(iv) The skill of the workers involved and whether machines were used or not, are



ignored when these methods are used.

Percentage of materials cost may, however, be used for the limited purpose of absorbing material handling and store overheads.

4.5.3 Percentage of direct labour cost : This method also fails to give full recognition to the element of the time which is of prime importance in the accounting for and treatment of manufacturing overhead expenses except in so far as the amount of wages is a product of the rate factor multiplied by the time factor. Thus, the time factor is taken into consideration only indirectly or partially in the computation of the overhead percentage rate. This method therefore, cannot be depended upon to produce very accurate results where the same type of work is performed in the same time by different type of workers, skilled and unskilled, with varying rates of pay. Also no distinction is made between jobs done by manual labour and those done by machines.

In spite of the inaccuracies which may arise under this method it is widely used in actual practice because it is simple and does not involve much calculation. If on the other hand, a more scientific method is employed e.g., the direct labour hour rate or the machine hour rate, more complexities in the overhead accounting procedure would be introduced, though the selected method will give proper allowance to time element. Thus, the advantage of elimination of a small error in practice may involve a heavy price on account of introduction of complexities.

Advantages:

- (i) The method is simple and economical to apply.
- (ii) The time factor is given recognition even if indirectly.
- (iii) Total expenses recovered will not differ much from the estimated figure since total wages paid are not likely to fluctuate much.

Disadvantages:

- (i) It gives rise to certain inaccuracies due to the time factor not being given full importance.
- (ii) Where machinery is used to some extent in the process of manufacture, an allowance for such a factor is not made.
- (iii) It does not provide for varying skills of workers.

4.5.4 Labour hour rate: This method is an improvement on the percentage of direct wage basis, as it fully recognises the significance of the element of time in the incurring and absorption of manufacturing overhead expenses. This method is admirably suited to operations which do not involve any large use of machinery. To calculate labour hour rate, the amount of factory overheads is divided by the total number of direct labour hours.



Suppose factory overheads are estimated at Rs. 90,000 and labour hours at 1,50,000. The overhead absorption rate will be Re. 0.60. If 795 direct labour hours are spent on a job, Rs. 477 will be absorbed as overhead. It can be calculated for each category of workers.

4.5.5 Machine hour rate : By the machine hour rate method, manufacturing overhead expenses are charged to production on the basis of number of hours machines are used on jobs or work orders. There is a basic similarity between the machine hour and the direct labour hour rate method insofar as both are based on the time factor. The choice of one or the other method is conditioned by the actual circumstance of the individual case. In respect of departments or operations in which machines predominate and the operators perform relatively a passive part, the machine hour rate is more appropriate. This is generally the case for operations or processes performed by costly machines, which are automatic or semi-automatic and where operators are essential merely for feeding them rather than for regulating the quantity of the output. In such case, the machine hour rate method alone can be depended on to correctly absorb the manufacturing overhead expenses to different items of production. What is needed for computing the machine hour rate is to divide overhead expenses for a specific machine or group of machines for a period by the operating hours of the machine or the group of machines for the period.

Usually, the computation is made on the basis of the estimated expenses or the normal expenses for the coming period. Thus the machine hour rate usually is a predetermined rate. It is desirable to work out a rate for each individual machine; where a number of similar machines are working in a group, there may be single rate for the whole group.

There are two methods of computing the machine hour rate. According to the first method, only the expenses directly or immediately connected with the operation of the machine are taken into account e.g., power, depreciation, repairs and maintenance, insurance, etc. The rate is calculated by dividing the estimated total of these expenses for a period by the estimated number of operational hours of the machines during the period.

It will be obvious, however, that in addition to the expenses stated above there may still be other manufacturing expenses such as supervision charges, shop cleaning and lighting, consumable stores and shop supplies, shop general labour, rent and rates, etc. incurred for the department as a whole and, hence, not charged to any particular machine or group of machines. In order to see that such expenses are not left out of production costs, one should include a portion of such expenses to compute the machine hour rate. Alternatively, the overheads not directly related to machines may be absorbed on the basis of Productive Labour Hour Rate Method or any other suitable method.



Illustration

A machine costing Rs. 10,000 is expected to run for 10 years. At the end of this period its scrap value is likely to be Rs. 900. Repairs during the whole life of the machine are expected to be Rs. 18,000 and the machine is expected to run 4,380 hours per year on the average. Its electricity consumption is 15 units per hour, the rate per unit being 5 paise. The machine occupies one-fourth of the area of the department and has two points out of a total of ten for lighting. The foreman has to devote about one sixth of his time to the machine. The monthly rent of the department is Rs. 300 and the lighting charges amount to Rs. 80 per month. The foreman is paid a monthly salary of Rs. 960. Find out the machine hour rate, assuming insurance is @ 1% p.a. and the expenses on oil, etc., are Rs. 9 per month.

Solution

Fixed expenses per month

		Rs.
Rent (one fourth of the total)		75.00
Lighting (one fifth of the total)		16.00
Foreman's salary (one sixth of the total)		160.00
Sundry expenses—oil, waste etc.		9.00
Insurance (1% on the value of the machine per year)		8.33
Total constant expenses per month		268.33
Total number of hours per annum	4,380	
Total number of hours per month	365	
		Rs. Rs.
Fixed expenses per hour	$\frac{\text{Rs. } 268.33}{365 \text{ hrs.}}$	0.735

Variable expenses per hour :

Depreciation :		
Cost of the machine	10,000	
Less: Scrap value	<u>900</u>	
	9,100	
Depreciation per annum	910	
Depreciation per hour:	$\frac{910}{4,380 \text{ hrs.}}$	0.208



Overheads

Repairs for the whole life	18,000	
for one hour $\frac{\text{Rs. 18,000}}{4,380 \times 10 \text{ years}}$		0.411
Electricity for one hour : 15 units @ 0.05 P		<u>0.750</u>
Machine hour rate :		<u>2.104</u>

Illustration

Gemini Enterprises undertakes three different jobs A, B and C. All of them require the use of a special machine and also the use of a computer. The computer is hired and the hire charges work out to Rs. 4,20,000 per annum. The expenses regarding the machine are estimated as follows :

	Rs.
Rent for the quarter	17,500
Depreciation per annum	2,00,000
Indirect charges per annum	1,50,000

During the first month of operation the following details were taken from the job register:

	Job		
	A	B	C
Number of hours the machine was used :			
(a) Without the use of the computer	600	900	—
(b) With the use of the computer	400	600	1,000

You are required to compute the machine hour rate :

- For the firm as a whole for the month when the computer was used and when the computer was not used.
- For the individual jobs A, B and C.

Solution**Working notes:**

- Total machine hours used 3,500
(600 + 900 + 400 + 600 + 1,000)
- Total machine hours without the use of computers 1,500
(600 + 900)



Cost Accounting

(iii) Total machine hours with the use of computer 2,000
 (400 + 600 + 1,000)

Rs.

(iv) Total overheads of the machine per month

Rent (Rs. 17,500 ÷ 3 months)	5,833.33
Depreciation (Rs. 2,00,000 ÷ 12 months)	16,666.67
Indirect Charges (Rs. 1,50,000 ÷ 12 months)	<u>12,500.00</u>
Total	<u>35,000.00</u>

(v) Computer hire charges for a month = Rs. 35,000
 (Rs. 4,20,000 ÷ 12 months)

(vi) Overheads for using machines without computer

$$= \frac{\text{Rs. } 35,000}{3,500 \text{ hrs.}} \times 1,500 \text{ hrs.} = \text{Rs. } 15,000$$

(vii) Overheads for using machines with computer

$$= \frac{\text{Rs. } 35,000}{3,500 \text{ hrs.}} \times 2,000 \text{ hrs.} + \text{Rs. } 35,000 = \text{Rs. } 55,000$$

(a) Machine hour rate of Gemini Enterprises for the firm as a whole for a month.

(1) When the Computer was used : $\frac{\text{Rs. } 55,000}{2,000 \text{ hours}} = \text{Rs. } 27.50 \text{ per hour}$

(2) When the computer was not used : $\frac{\text{Rs. } 35,000}{3,500 \text{ hrs.}} = \text{Rs. } 10 \text{ per hour}$

(b) Machine hour rate for individual job

	Rs.	Rate per hr.		Job		Rate per hr.	
		Hrs.	Rs.	Hrs.	Rs.	Hrs.	Rs.
Overheads							
Without Computer	10.00	600	6,000	900	9,000	—	—
With computer	27.50	<u>400</u>	<u>11,000</u>	<u>600</u>	<u>16,500</u>	<u>1,000</u>	<u>27,500</u>
		1,000	17,000	1,500	25,500	1,000	27,500
Machine hour rate			Rs. 17		Rs. 17		Rs. 27.50



Overheads

Illustration

A machine shop has 8 identical Drilling machines manned by 6 operators. The machine cannot be worked without an operator wholly engaged on it. The original cost of all these machines works out to Rs. 8 lakhs. These particulars are furnished for a 6 months period:

Normal available hours per month	208
Absenteeism (without pay) hours	18
Leave (with pay) hours	20
Normal idle time unavoidable-hours	10
Average rate of wages per worker for 8 hours a day.	Rs. 20
Production bonus estimated	15% on wages
Value of power consumed	Rs. 8,050
Supervision and indirect labour	Rs. 3,300
Lighting and electricity	Rs. 1,200

These particulars are for a year

Repairs and maintenance including consumables 3% of value of machines.

Insurance Rs. 40,000

Depreciation 10% of original cost.

Other sundry works expenses Rs. 12,000

General management expenses allocated Rs. 54,530.

You are required to work out a comprehensive machine hour rate for the machine shop.

Solution

Computation of comprehensive machine hour rate of machine shop

	Rs.
Operator's wages	17,100
(Refer to working note 2)	
Production bonus	2,565
(15% on wages)	
Power consumed	8,050
Supervision and indirect labour	3,300
Lighting and electricity	1,200



Cost Accounting

Repairs and maintenance	12,000
Insurance	20,000
Depreciation	40,000
Sundry works expenses	6,000
General management expenses	<u>27,265</u>
	<u>1,37,480</u>

$$\begin{aligned}\text{Machine hour rate} &= \frac{\text{Total overheads of machine shop}}{\text{Hours of machines operation}} \\ &= \frac{\text{Rs. 1,37,480}}{5,760 \text{ hours}} \text{ (Refer to working note 1)} \\ &= \text{Rs. 23.87}\end{aligned}$$

Working notes.

1. Computation of hours, for which 6 operators are available for 6 months.

Normal available hours p.m. per operator.	208
Less: Absenteeism hours	18
Less: Leave hours	20
Less: Idle time hours	<u>10</u>
	<u>48</u>
Utilisable hours p.m. per operator	160
Total utilisable hours for 6 operators and for 6 months are = $160 \times 6 \times 6 = 5,760$ hours	

As machines cannot be worked without an operator wholly engaged on them therefore, hours for which 6 operators are available for 6 months are the hours for which machines can be used. Hence 5,760 hours represent total machine hours.

2. Computation of operator's wages

$$\text{Average rate of wages : } \frac{\text{Rs. 20}}{8 \text{ hours}} = \text{Rs. 2.50 per hour}$$



Overheads

Hours per month for which wages are paid to a worker (208 hours – 18 hours)

= 190 hours.

Total wages paid to 6 operators for 6 months

= 190 hours × 6 × 6 × Rs. 2.50

= Rs. 17,100

Advantages of Machine Hour Rate :

- (1) *Where machinery is the main factor of production, it is usually the best method of charging machine operating expenses to production.*
- (2) *The under-absorption of machine overheads would indicate the extent to which the machines have been idle.*
- (3) *It is particularly advantageous where one operator attends to several machines (e.g. automatic screw manufacturing machine), or where several operators are engaged on the machine e.g. the belt press used in making conveyer belts.*

Disadvantages :

- (1) *Additional data concerning the operation time of machines, not otherwise necessary, must be recorded and maintained.*
- (2) *As general department rates for all the machines in a department may be suitable, the computation of a separate machine hour rate for each machine or group of machines would mean further additional work.*

Note: Some people even prefer to add the wages paid to the machine operator in order to get a comprehensive rate of working a machine for one hour.

If all expenses are not allocated to machines, it will be necessary to calculate another rate for charging the general department expenses to production. This second rate can be calculated on the basis of direct labour hours. In effect therefore, both the machine hour and the direct labour hour rate will be applied, though separately.

Illustration

Job No. 198 was commenced on October 10, 2005 and completed on November 1, 2005. Materials used were Rs. 600 and labour charged directly to the job was Rs. 400. Other information is as follows:

Machine No. 215 used for 40 hours, the machine hour rate being Rs. 3.50.

Machine No. 160 used for 30 hours, the machine hour rate being Rs. 4.00. 6 welders worked on the job for five days of 8 hours each : the Direct labour hour per welder is 20P.

Expenses not included for calculating the machine hour or direct labour hour rate totalled



Cost Accounting

Rs. 2,000, total direct wages for the period being Rs. 20,000. Ascertain the works costs of job No. 198.

Solution

		Rs.
Materials		600.00
Direct labour		<u>400.00</u>
		1,000.00
Factory overheads :	Rs.	
Machine No. 215 : 40 hours @ Rs. 3.50	140.00	
Machine No. 160 : 30 hours @ Rs. 4.00	120.00	
240 ¹ hours of welders @ 20 P. per hr.	48.00	
General ² 10% of wages	<u>40.00</u>	<u>348.00</u>
Works cost		<u>1,348.00</u>
1. $6 \times 5 \times 8 = 240$		
2. Unapportioned expenses Rs. 2,000 which works out at 10% of direct wages.		

4.6 TREATMENT OF UNDER-ABSORBED AND OVER-ABSORBED OVERHEADS IN COST ACCOUNTING :

Overhead expenses are usually applied to production on the basis of pre-determined rates. Production overheads are to be determined in advance as follows for fixing selling price, quote tender price and to formulate budgets etc.

$$\text{Pre-determined overhead rate} = \frac{\text{Estimated/Normal overheads for the period}}{\text{Budgeted Number of units during the period}}$$

The actual overhead rate will rarely coincide with the pre-determined overhead rate, due to variation in pre-determined overhead rate and actual overhead rate. Such a variation may arise due to any one of the following situations:

- Estimated overheads for the period under consideration may remain the same or they coincide with actual overheads but the number of units produced during the period is either more or less in comparison with budgeted figure. In the former case actual overhead rate will be less and in the latter case, actual overhead rate will be more than the pre-determined overhead rate, hence over-absorption and under-absorption will occur respectively.
- Similarly, if the number of units actually produced during the period remains the



Overheads

same as budgeted figure but the actual overheads incurred are more or less than the estimated overheads for the period, then a situation of under-absorption or over-absorption will arise respectively.

- (iii) If changes occur in different proportion both in the actual overheads and in the number of units produced during the period, then a situation of under or over-absorption (depending upon the situation) will arise.
- (iv) If the changes in the numerator (i.e. in actual overheads) and denominator (i.e. in number of units produced) occur uniformly (without changing the proportion between the two) then a situation of neither under nor of over-absorption will arise.

Such over or under-absorption as arrived at under different situations may also be termed as overhead variance. The amount of over-absorption being represented by a credit balance in the account and conversely, the amount of under-absorption being a debit balance.

As regards the treatment of such debit or credit balances, the general view is that if the balances are small they should be transferred to the Costing Profit and Loss Account and the cost of individual products should not be increased or reduced as these would be representing normal cost.

Where, however the difference is large and due to wrong estimation, it would be desirable to adjust the cost of products manufactured, as otherwise the cost figures would convey a misleading impression. Such adjustments usually take the form of supplementary rates where there is a debit balance in the overhead account and a credit in the other case.

Now, the production of any period can be identified in three forms, goods finished and sold, goods finished but held in stock (not yet sold) and semi-finished goods (work in progress). So far as the first category of goods is concerned, it is arguable that the post-mortem of the costs of individual products long after they have been sold may have some academic utility but it is frequently devoid of any practical significance. Therefore, it is suggested that the total variance concerning goods finished and sold should be adjusted by transferring the amount to the Cost of Sale Account, the costs of the individual items of such goods not being affected. As regards the variance pertaining to goods finished and held in stock (*i.e.* not yet sold), it would be necessary to adjust the value of the stock; similarly the value of work-in-progress should be adjusted.

However, over or under recovery of overheads due to abnormal reasons (such as abnormal over or under capacity utilisation) should be transferred to the Costing Profit and Loss Account.



Cost Accounting

Illustration

A light engineering factory fabricates machine parts to customers. The factory commenced fabrication of 12 Nos. machine parts to customers' specifications and the expenditure incurred on the job for the week ending 21st August, 2005 is given below:

	Rs.	Rs.
Direct materials (all items)		78.00
Direct labour (manual) 20 hours @ Rs. 1.50 per hour		30.00
Machine facilities :		
Machine No. I : 4 hours @ Rs. 4.50	18.00	
Machine No. II : 6 hours @ Rs. 6.50	<u>39.00</u>	<u>57.00</u>
Total		165.00
Overheads @ Rs. 0.80 per hour on 20 manual hours		<u>16.00</u>
Total cost		<u>181.00</u>

The overhead rate of Re. 0.80 per hour is based on 3,000 man hours per week; similarly, the machine hour rates are based on the normal working of Machine Nos. I and II for 40 hours out of 45 hours per week.

After the close of each week, the factory levies a supplementary rate for the recovery of full overhead expenses on the basis of actual hours worked during the week. During the week ending 21st August, 2005, the total labour hours worked was 2,400 and Machine Nos. I and II had worked for 30 hours and 32½ hours respectively.

Prepare a Cost Sheet for the job for the fabrication of 12 Nos. machine parts duly levying the supplementary rates.

Solution

*Fabrication of 12 Nos. machine parts (job No.....) Date of commencement : 16 August, 2005
Date of Completion. Cost sheet for the week ending, August 21, 2005 :*

	Rs.	Rs.
Materials		78.00
Labour 20 hours @ Rs. 1.50		30.00
Machine facilities :	Rs.	
Machine No. I : 4 hours @ Rs. 4.50	18.00	
Machine No. II : 6 hours @ Rs. 6.50	<u>39.00</u>	<u>57.00</u>



Overheads

Overheads 20 hours @ 0.80 P. per hour	<u>16.00</u>
	181.00

Supplementary Rates

Overheads 20 hours @ 20. P. per hour	4.00	
Machine facilities :		
Machine No. I - 4 hours @ Re. 1.50	6.00	
Machine No. II - 6 hours @ Re. 1.50	<u>9.00</u>	<u>19.00</u>
Cost Rs.		<u>200.00</u>

Working notes:

Overheads budgeted : 3,000 hours @ 80 P. or Rs. 2,400

Actual hours : 2,400

Actual rate per hour Rs. 2,400/2,400 hours = Re. 1

Supplementary charge Re. 1 less 80 P, or 20 P per hour

Machine facilities :

	Machine No. I	Machine No. II
Budgeted	(40 × Rs. 4.50) = Rs. 180	(40 × Rs. 6.50) = Rs. 260
Actual number of hours	30	32½
Actual rate per hour	Rs. 6	Rs. 8
Supplementary rate per hour	(Rs. 6.00 – Rs. 4.50)	(Rs. 8.00 – Rs. 6.50)

Illustration

In a factory, overheads of a particular department are recovered on the basis of Rs. 5 per machine hour. The total expenses incurred and the actual machine hours for the department for the month of August were Rs. 80,000 and 10,000 hours respectively. Of the amount of Rs. 80,000, Rs. 15,000 became payable due to an award of the Labour Court and Rs. 5,000 was in respect of expenses of the previous year booked in the current month (August). Actual production was 40,000 units, of which 30,000 units were sold. On analysing the reasons, it was found that 60% of the under-absorbed overhead was due to defective planning and the rest was attributed to normal cost increase. How would you treat the under-absorbed overhead in the cost accounts?



Cost Accounting

Solution

Under-absorbed overhead expenses during the month of August

Total expenses incurred in the month of August :		Rs.	
			80,000
Less: The amount paid according to labour			
court award (Assumed to be non-recurring)	Rs. 15,000		
Expenses of previous year	<u>Rs. 5,000</u>		<u>20,000</u>
Net overhead expenses incurred for the month			60,000
Overhead recovered for 10,000 hours @ Rs. 5 per hour			<u>50,000</u>
Under-absorbed overheads			<u>10,000</u>

Treatment of under-absorbed overhead in the Cost Accounts

It is given in the question that 40,000 units were produced out of which 30,000 units were sold. It is also given that 60% of the under-absorbed overhead was due to defective planning and the rest was attributed to normal cost increase.

		Rs.	
1. 60 percent of under-absorbed overhead is due to defective planning. This being abnormal, should be debited to Profit and Loss A/c			
(60% of Rs. 10,000)			6,000
2. Balance 40 percent of under-absorbed overhead should be distributed over, Finished Goods and Cost of Sales by supplementary rate (40% of Rs. 10,000)			
			<u>4,000</u>
			<u>10,000</u>

Rs. 4,000 may be distributed over Finished Goods and Cost of Sales as follows :

Finished Goods *Rs. 1,000

Cost of Sales *Rs. 3,000

*Working notes

Under-absorbed overhead : Rs. 4,000

Units produced : 40,000

Rate of under-absorbed overhead recover Re. 0.10 per unit



Overheads

Amount of under-absorbed overheads charged to finished goods (10,000 × 0.10P)	Rs. 1,000
Amount of under-absorbed overheads charged to cost of sales : (30,000 × 0.10P)	Rs. 3,000

Illustration

In a manufacturing unit, factory overhead was recovered at a pre-determined rate of Rs. 25 per man-day. The total factory overhead expenses incurred and the man-days actually worked were Rs. 41.50 lakhs and 1.5 lakh man-days respectively. Out of the 40,000 units produced during a period, 30,000 were sold.

On analysing the reasons, it was found that 60% of the unabsorbed overheads were due to defective planning and the rest were attributable to increase in overhead costs.

How would unabsorbed overheads be treated in Cost Accounts ?

Solution

Computation of unabsorbed overheads

Man-days worked	1,50,000
	Rs.
Overhead actually incurred	41,50,000
Less: Overhead absorbed @ Rs. 25 per man-day (Rs. 25 × 1,50,000)	37,50,000
Unabsorbed overheads	4,00,000
Unabsorbed overheads due to defective planning (<i>i.e.</i> 60% of Rs. 4,00,000)	<u>2,40,000</u>
Balance of unabsorbed overhead	<u>1,60,000</u>

Treatment of unabsorbed overheads in Cost Accounts

- The unabsorbed overheads of Rs. 2,40,000 due to defective planning to be treated as abnormal and therefore be charged to Costing Profit and Loss Account.
- The balance unabsorbed overheads of Rs. 1,60,000 be charged to production *i.e.*, 40,000 units at the supplementary overhead absorption rate *i.e.*, Rs. 4 per unit (*Refer to Working Note*)



Cost Accounting

	Rs.
Charge to Costing Profit and Loss Account as part of the cost of unit sold (30,000 units @ Rs. 4 p.u.)	1,20,000
Add: To closing stock of finished goods (10,000 units @ Rs. 4 p.u.)	40,000
Total	1,60,000

Working note :

$$\text{Supplementary overhead absorption rate} = \frac{\text{Rs. 1,60,000}}{40,000 \text{ units}} = \text{Rs. 4 p.u.}$$

Illustration

A factory has three production departments. The policy of the factory is to recover the production overheads of the entire factory by adopting a single blanket rate based on the percentage of total factory overheads to total factory wages. The relevant data for a month are given below :

<i>Department</i>	<i>Direct materials</i>	<i>Direct wages</i>	<i>Factory overheads</i>	<i>Direct labour</i>	<i>Machine hours</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Hour</i>	
<i>Budget</i>					
Machining	6,50,000	80,000	3,60,000	20,000	80,000
Assembly	1,70,000	5,50,000	1,40,000	1,00,000	10,000
Packing	1,00,000	70,000	1,25,000	50,000	—
<i>Actuals</i>					
Machining	7,80,000	96,000	3,90,000	24,000	96,000
Assembly	1,36,000	2,70,000	84,000	90,000	11,000
Packing	1,20,000	90,000	1,35,000	60,000	—



Overheads

The details of one of the representative jobs produced during the month are as under:

Job No. CW 7083 :

<i>Department</i>	<i>Direct materials</i>	<i>Direct wages</i>	<i>Direct labour hours</i>	<i>Machine hours</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>hours</i>	
Machining	1,200	240	60	180
Assembly	600	360	120	30
Packing	300	60	40	–

The factory adds 30% on the factory cost to cover administration and selling overheads and profit.

Required :

- Calculate the overhead absorption rate as per the current policy of the company and determine the selling price of the Job No. CW 7083.
- Suggest any suitable alternative method(s) of absorption of the factory overheads and calculate the overhead recovery rates based on the method(s) so recommended by you.
- Determine the selling price of Job CW 7083 based on the overhead application rates calculated in (ii) above.
- Calculate the departmentwise and total under or over recovery of overheads based on the company's current policy and the method(s) recommended by you.

Solution

- (i) **Computation of overhead absorption rate
(as per the current policy of the company)**

<i>Department</i>	<i>Budgeted factory overheads</i>	<i>Budgeted direct wages</i>
	<i>Rs.</i>	<i>Rs.</i>
Machinery	3,60,000	80,000
Assembly	1,40,000	3,50,000
Packing	<u>1,25,000</u>	<u>70,000</u>
Total	6,25,000	5,00,000

$$\text{Overhead absorption rate} = \frac{\text{Budgeted factory overheads}}{\text{Budgeted direct wages}} \times 100$$



Cost Accounting

$$= \frac{\text{Rs. } 6,25,000}{\text{Rs. } 5,00,000} \times 100$$

$$= 125\% \text{ of Direct wages}$$

Selling Price of the Job No. CW-7083

	Rs.
Direct materials (Rs. 1,200 + Rs. 600 + Rs. 300)	2,100.00
Direct wages (Rs. 240 + Rs. 360 + Rs. 60)	660.00
Overheads (125% × Rs. 660)	<u>825.00</u>
Total factory cost	3,585.00
Add: Mark-up (30% × Rs. 3,585)	<u>1,075.50</u>
Selling price	<u>4,660.50</u>

(ii) Methods available for absorbing factory overheads and their overhead recovery rates in different departments

1. *Machining Department*

In the machining department, the use of machine time is the predominant factor of production. Hence machine hour rate should be used to recover overheads in this department. The overhead recovery rate based on machine hours has been calculated as under:—

$$\begin{aligned} \text{Machine hour rate} &= \frac{\text{Budgeted factory overheads}}{\text{Budgeted machine hours}} \\ &= \frac{\text{Rs. } 3,60,000}{80,000 \text{ hours}} = \text{Rs. } 4.50 \text{ per hour} \end{aligned}$$

2. *Assembly Department*

In this department direct labour hours is the main factor of production. Hence direct labour hour rate method should be used to recover overheads in this department. The overheads recovery rate in this case is:

$$\text{Direct labour hour rate} = \frac{\text{Budgeted factory overheads}}{\text{Budgeted direct labour hours}}$$



Overheads

$$= \frac{\text{Rs. } 1,40,000}{1,00,000 \text{ hours}} = \text{Rs. } 1.40 \text{ per hour}$$

3. Packing Department :

Labour is the most important factor of production in this department. Hence direct labour hour rate method should be used to recover overheads in this department.

The overhead recovery rate in this case comes to:

Budgeted factory overhead

$$\begin{aligned} \text{Direct labour hour rate} &= \frac{\text{Budgeted factory overheads}}{\text{Direct labour hours}} \\ &= \frac{\text{Rs. } 1,25,000}{50,000 \text{ hours}} = \text{Rs. } 2.50 \text{ per hour} \end{aligned}$$

(iii)

Selling Price of Job CW-7083

[based on the overhead application rates calculated in (ii) above]

	(Rs.)
Direct materials	2,100.00
Direct wages	660.00
Overheads (<i>Refer to Working note</i>)	<u>1,078.00</u>
Factory cost	3,838.00
Add: Mark up (30% of Rs. 3,838)	<u>1,151.40</u>
Selling price	<u>4,989.40</u>

Working note :

Overhead Summary Statement

Dept.	Basis	Hours	Rate	Overheads
			Rs.	Rs.
Machining	Machine hour	180	4.50	810
Assembly	Direct labour hour	120	1.40	168
Packing	Direct labour hour	40	2.50	<u>100</u>
			Total	<u>1,078</u>



Cost Accounting

(iv) Departmentwise statement of total under or over recovery of overheads

(a) Under current policy

	Departments			Total Rs.
	Machining Rs.	Assembly Rs.	Packing Rs.	
Direct wages (Actual)	96,000	2,70,000	90,000	
Overheads recovered @ 125% of Direct wages: (A)	1,20,000	3,37,500	1,12,500	5,70,000
Actual overheads: (B)	3,90,000	84,000	1,35,000	6,09,000
(Under)/Over recovery of overheads : (A—B)	(2,70,000)	2,53,500	(22,500)	(39,000)

(b) As per methods suggested

	Basis of overhead recovery			Total Rs.
	Machine hours	Direct labour hours	Direct labour hours	
Hours worked	96,000	90,000	60,000	
Rate/hour (Rs.)	4.50	1.40	2.50	
Overhead recovered (Rs.): (A)	4,32,000	1,26,000	1,50,000	7,08,000
Actual overheads (Rs.) : (B)	3,90,000	84,000	1,35,000	6,09,000
(Under)/Over recovery: (A—B)	42,000	42,000	15,000	99,000

Illustration

The total overhead expenses of a factory are Rs. 4,46,380. Taking into account the normal working of the factory, overhead was recovered in production at Rs. 1.25 per hour. The actual hours worked were 2,93,104. How would you proceed to close the books of accounts, assuming that besides 7,800 units produced of which 7,000 were sold, there were 200 equivalent units in work-in-progress ?

On investigation, it was found that 50% of the unabsorbed overhead was on account of increase in the cost of indirect materials and indirect labour and the remaining 50% was due to factory inefficiency. Also give the profit implication of the method suggested.



Overheads

Solution

	Rs.
Actual factory overhead expenses incurred	4,46,380
Less : Overheads recovered from production (2,93,104 hours × Rs. 1.25)	3,66,380
Unabsorbed overheads	<u>80,000</u>
Reasons for unabsorbed overheads	
(i) 50% of the unabsorbed overhead was on account of increased in the cost of indirect materials and indirect labour	40,000
(ii) 50% of the unabsorbed overhead was due to factory inefficiency.	40,000

Treatment of unabsorbed overheads in Cost Accounting

1. Unabsorbed overhead amounting to Rs. 40,000, which were due to increase in the cost of indirect material and labour should be charged to units produced by using a supplementary rate.

$$\text{Supplementary rate} = \frac{\text{Rs. } 40,000}{(7,800 + 200) \text{ units}} = \text{Rs. } 5 \text{ per unit}$$

The sum of Rs. 40,000 (unabsorbed overhead) should be distributed by using a supplementary rate among cost of sales, finished goods and work-in progress as below :

	Rs.
Cost of sales (7,000 units × Rs. 5)	35,000
Finished goods (800 units × Rs. 5)	4,000
Work-in progress (200 units × Rs. 5)	1,000
	<u>40,000</u>

The use of cost of sales figure, would reduce the profit for the period by Rs. 35,000 and will increase the value of stock of finished goods and work-in-progress by Rs. 4,000 and Rs. 1,000 respectively.



Cost Accounting

2. The balance amount of unabsorbed overheads viz. of Rs. 40,000 due to factory inefficiency should be charged to Costing Profit & Loss Account, as this is an abnormal loss.

Illustration

ABC Ltd. manufactures a single product and absorbs the production overheads at a pre-determined rate of Rs. 10 per machine hour.

At the end of financial year 2005-06, it has been found that actual production overheads incurred were Rs. 6,00,000. It included Rs. 45,000 on account of 'written off' obsolete stores and Rs. 30,000 being the wages paid for the strike period under an award.

The production and sales data for the year 2005-06 is as under :

Production :

Finished goods	20,000 units
Work-in-progress	8,000 units
<i>(50% complete in all respects)</i>	

Sales :

Finished goods	18,000 units
----------------	--------------

The actual machine hours worked during the period were 48,000. It has been found that one-third of the under-absorption of production overheads was due to lack of production planning and the rest was attributable to normal increase in costs.

- Calculate the amount of under-absorption of production overheads during the year 2005-06; and
- Show the accounting treatment of under-absorption of production overheads.

Solution

(i) Amount of under-absorption of production overheads during the year 2005-06

		Rs.
Total production overheads actually incurred during the year 2005-06		6,00,000
Less : 'Written off' obsolete stores	Rs. 45,000	
Wages paid for strike period	<u>Rs. 30,000</u>	<u>75,000</u>
Net production overheads actually incurred : (A)		5,25,000
Production overheads absorbed by 48,000 machine		



Overheads

hours @ Rs. 10 per hour : (B)	<u>4,80,000</u>
Amount of under – absorption of production overheads : [(A) – (B)]	45,000

(ii) Accounting treatment of under absorption of production overheads

It is given in the statement of the question that 20,000 units were completely finished and 8,000 units were 50% complete, one third of the under-absorbed overheads were due to lack of production planning and the rest were attributable to normal increase in costs.

	Rs.
1. (33 – 1/3% of Rs. 45,000) i.e., Rs. 15,000 of under-absorbed overheads were due to lack of production planning. This being abnormal, should be debited to the Profit and Loss A/c.	15,000
2. Balance (66–2/3% of Rs. 45,000) i.e., Rs. 30,000 of under-absorbed overheads should be distributed over work-in-progress, finished goods and cost of sales by using supplementary rate.	<u>30,000</u>
Total under-absorbed overheads	<u>45,000</u>

Apportionment of unabsorbed overheads of Rs. 30,000 over, work-in progress, finished goods and cost of sales

	<i>Equivalent</i>	Rs.
	<i>Completed Units</i>	
Work-in-Progress (4,000 units × Rs. 1.25) (Refer to working note)	4,000	5,000
Finished goods (2,000 units × Rs. 1.25)	2,000	2,500
Cost of sales (18,000 units × Rs. 1.25)	18,000	22,500
	<u>24,000</u>	<u>30,000</u>

Working Note:

$$\text{Supplementary rate per unit} = \frac{\text{Rs. } 30,000}{24,000} = \text{Rs. } 1.25$$

4.7 ACCOUNTING AND CONTROL OF ADMINISTRATIVE OVERHEADS

Definition - According to I.C.M.A. Terminology, Administrative overhead is defined as “The sum of those costs of general management and of secretarial accounting and



Cost Accounting

administrative services, which cannot be directly related to the production, marketing, research or development functions of the enterprise.” According to this definition, administrative overhead constitutes the expenses incurred in connection with the formulation of policy directing the organisation and controlling the operations of an undertaking. These overheads are also collected and classified in the same way as the factory overheads.

4.7.1 Accounting of Administrative overheads : There are three distinct methods of accounting of administrative overheads, which are briefly discussed below :

(a) **Apportioning Administrative Overheads between Production and Sales Departments :** According to this method administrative overheads are apportioned over production and sales departments. The reason for the apportionment of overhead expenses over these departments, recognises the fact that administrative overheads are incurred for the benefit of both of these departments. Therefore each department should be charged with the proportionate share of the same. When this method is adopted, administrative overheads lose their identity and get merged with production and selling and distribution overheads.

Disadvantages :

- (1) It is difficult to find suitable bases of administrative overhead apportionment over production and sales departments.
- (2) Lot of clerical work is involved in apportioning overheads.
- (3) It is not justified to apportion total administrative overheads only over production and sales departments when other equally important department like finance is also there.

(b) **Charging to Profit and Loss Account -** According to this method administrative overheads are charged to Costing Profit & Loss Account. The reason for charging to Costing Profit & Loss are firstly, the administrative overheads are concerned with the formulation of policies and thus are not directly concerned with either the production or the selling and distribution functions. Secondly, it is difficult to determine a suitable basis for apportioning administrative overheads over production and sales departments. Lastly, these overheads are the fixed costs. In view of these arguments, administrative overheads should be charged to Profit and Loss Account.

Disadvantages :

- (1) Cost of products are understated as administrative overheads are not charged to costs.
- (2) The exclusion of administrative overheads from cost of products is against sound accounting principle.



(c) **Treating Administrative Overheads as a separate addition to Cost of Production/Sales** : This method considers administration as a separate function like production and sales and, as such costs relating to formulating the policy, directing the organisation and controlling the operations are taken as a separate charge to the cost of the jobs or a product, sold along with the cost of other functions. The basis which are generally used for apportionment are :

- (i) Works cost
- (ii) Sales value or quantity
- (iii) Gross profit on sales
- (iv) Quantity produced
- (v) Conversion cost, etc.

4.7.2 Control of Administrative Overheads - Mostly administrative overheads are of fixed nature, and they arise as a result of management policies. These fixed overheads are generally non-controllable. But at the same time these overheads should not be allowed to grow disproportionately. Some degree of control has to be exercised over them. The methods usually adopted for controlling administrative overheads are as follows :

(i) Classification and analysis of overheads by administrative departments according to their functions, and a comparison with the accomplished results: According to this method the expenses incurred by each administrative department are collected under standing order numbers for each class of expenditure. These are compared with similar figures of the previous period in relation to accomplishment. Such a comparison will reveal efficiency or inefficiency of the concerned department. However, this method provides only a limited degree of control and comparison does not give useful results if the level of activity is not constant during the periods under comparison. To overcome this difficulty, overhead absorption rates may also be compared from period to period; the extent of over or under absorption will reveal the efficiency or otherwise of the department. It may be possible to compare the cost of a service department with that of similar services obtainable from outside and a decision may be taken whether it is economical to continue the department or entrust the work to outsiders.

(ii) *Control through Budgets* - According to this method, administration budgets (monthly or annually) are prepared for each department. The budgeted figures are compared with actual ones to determine variances. The variances are analysed and responsibility assigned to the concerned department to control these variances.

(iii) *Control through Standard* - Under this method, standards of performance are fixed for each administrative activity, and the actual performance is compared with the standards set. In this way, standards serve not only as yardstick of performance but also facilitate control of costs.



Cost Accounting

Illustration

In an engineering company, the factory overheads are recovered on a fixed percentage basis on direct wages and the administrative overheads are absorbed on a fixed percentage basis on factory cost.

The company has furnished the following data relating to two jobs undertaken by it in a period:

	Job 101 Rs.	Job 102 Rs.
Direct materials	54,000	37,500
Direct wages	42,000	30,000
Selling price	1,66,650	1,28,250
Profit percentage on Total Cost	10%	20%

Required :

- Computation of percentage recovery rates of factory overheads and administrative overheads.
- Calculation of the amount of factory overheads, administrative overheads and profit for each of the two jobs.
- Using the above recovery rates fix the selling price of job 103. The additional data being:

Direct materials	Rs. 24,000
Direct wages	Rs. 20,000
Profit percentage on selling price	12-½%

Solution

- Let factory overhead recovery rate, as percentage of direct wages be F and administrative overheads recovery rate, as percentage of factory cost be A.

Factory Cost of Jobs :

$$\text{Job 101} = \text{Rs. } 96,000 + \text{Rs. } 42,000F$$

$$\text{Job 102} = \text{Rs. } 67,500 + \text{Rs. } 30,000F$$

Total Cost of Production of Jobs :

$$\text{Job 101} = (\text{Rs. } 96,000 + \text{Rs. } 42,000F) + (\text{Rs. } 96,000 + \text{Rs. } 42,000F)A = \text{Rs. } 1,51,500$$

$$\text{Job-102} = \text{Rs. } 67,500 + \text{Rs. } 30,000F + (\text{Rs. } 67,500 + \text{Rs. } 30,000F)A = \text{Rs. } 1,06,875$$

(Refer to working note)



Overheads

On solving above relations:

$$F = 0.60 \text{ and } A = 0.25$$

Hence, percentage recovery rates of factory overheads and administrative overheads are 60% and 25% respectively.

Working note:

	Job 101	Job 102
Total cost of production (Rs.)	1,51,500	1,06,875
<u>Selling price</u> (100% + Percentage of profit)	(Rs. 1,66,650/110%)	(Rs. 1,28,250/120%)

(ii) **Statement of jobs, showing amount of factory overheads, administrative overheads and profit**

	Job 101	Job 102
	Rs.	Rs.
Direct materials	54,000	37,500
Direct wages	<u>42,000</u>	<u>30,000</u>
Prime cost	<u>96,000</u>	<u>67,500</u>
<i>Factory overheads</i>		
60% of direct wages	25,200	18,000
Factory cost	<u>1,21,200</u>	<u>85,200</u>
<i>Administrative overheads</i>		
25% of factory cost	<u>30,300</u>	<u>21,375</u>
Total cost	1,51,500	1,06,875
<i>Profit (balancing figure)</i>	<u>15,150</u>	<u>21,375</u>
Selling price	<u>1,66,650</u>	<u>1,28,250</u>

(iii) **Selling price of Job 103**

	Rs.
Direct materials	24,000
Direct wages	<u>20,000</u>
Prime cost	44,000
Factory overheads (60% of Direct Wages)	<u>12,000</u>



Cost Accounting

Factory cost	56,000
Administrative overheads (25% of factory cost)	14,000
Total cost	70,000
Profit margin (balancing figure)	10,000
Selling price	$\frac{\text{Total Cost}}{87.5\%}$
	<u>80,000</u>

4.8 ACCOUNTING AND CONTROL OF SELLING AND DISTRIBUTION OVERHEADS

Selling cost or overhead expenses are the expenses incurred for the purpose of promoting the marketing and sales of different products. Distribution expenses, on the other hand, are expenses relating to delivery and despatch of goods sold. Examples of selling and distribution expenses have been considered earlier in this booklet. From the definitions it is clear that the two type of expenses represent two distinct type of functions. Some concerns group together these two type of overhead expenses into one composite class, namely, selling and distribution overhead, for the purpose of Cost Accounting.

4.8.1 Accounting of selling and distribution overheads: The collection and accumulation of each expense is made by means of appropriate standing order numbers in the usual way. Where it is decided to apportion a part of the administrative overhead to the selling division the same should also be collected through appropriate standing order numbers.

As in the case of administrative overheads, it is not easy to determine an entirely satisfactory basis for computing the overhead rate for absorbing selling overheads. The bases usually adopted are : (a) Sales value of goods; (b) Cost of goods sold; (c) Gross Profit on sales; and (d) Number of orders or units sold. It is considered that the sale value is ordinarily the most logical basis, there being some connection between the amount of sales and the amount of expenses incurred to achieve them. The cost of production, however, is not so satisfactory on basis as it is difficult to conceive of any relationship even remote, between the cost of production of any article and its selling cost. Articles having a high cost of production may require little effort in their sale and vice versa.

The basis of gross profit on sales results in a larger share of the selling overhead being applied to goods yielding a large margin of profit and vice versa. The basis therefore follows the principle of 'ability to pay', it may not reflect costs or incurred efforts.

An estimated amount per unit - The best method for absorbing selling and distributing expenses over various products is to separate fixed expenses from variable expenses. Apportion the fixed expenses according to the benefit derived by each product and thus



Overheads

ascertaining the fixed expenses per unit. We give below some of the fixed expenses and the basis of apportionment :

Expenses	Basis
Salaries in the Sales Department and of the sales men.	Estimated time devoted to the sale of various products.
Advertisement	Actual amount incurred for each product since these days it is usual to advertise each product separately; common expenses, such as in an exhibition, should be apportioned on the basis of advertisement expenditure on each product.
Show Room expenses	Average space occupied by each product.
Rent of finished goods godowns and Expenses on own delivery vans	Average quantities delivered during a period.

If a suitable basis for apportioning expenses does not exist it may be apportioned in the proportion of sales of various products.

The total of fixed expenses apportioned in this manner, divided by the number of units sold or likely to be sold, will give the fixed expenses per unit. To this should be added the variable expenses which will be different for each product. These expenses are, packaging, freight outwards, insurance in transit, commission payable to salesmen, rebate allowed to customers, etc. All these items will be worked out per unit for each product separately. These items added to fixed expenses per unit will give an estimated amount of the selling and distribution expenses per unit.

4.8.2 Control of Selling & Distribution Overheads - Control of selling and distribution expenses is a difficult task. The reasons for this are as follows :

1. The incidence of selling and distribution overheads depends mainly on external factors, such as distance of market, extent and nature of competition, terms of sales, etc. which are beyond the control of management.
2. These overheads are dependent upon the customers, behaviour, their liking and disliking, tastes etc. Therefore, as such control over the overheads may result in loss of customers.
3. These expenses being of the nature of policy costs, are not amenable to control.

In spite of the above difficulties, the following methods may be used for controlling them.

- (a) Comparison with past performance - According to this method, selling and



Cost Accounting

distribution overheads are compared with the figures of the previous period. Alternatively, the expenses may be expressed as a percentage of sales, and the percentages may be compared with those of the past period. This method is suitable for small concerns.

(b) Budgetary Control - A budget is set up for selling and distribution expenses. The expenses are classified into fixed and variable. If necessary, a flexible budget may be prepared indicating the expenses at different levels of sales. The actual expenses are compared with the budgeted figures and in the case of variances suitable actions are taken.

(c) Standard Costing - Under this method standards are set up in relation to the standard sales volume. Standards may be set up for salesmen, territories, products etc. Once the standards are set up, comparison is made between the actuals and standards : variances are enquired into and suitable action taken.

Illustration

A company which sells four products, some of them unprofitable, proposes discontinuing the sale of one of them. The following information is available regarding income, costs and activity for the year ended 31st March, 2006.

	Products			
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
Sales (Rs.)	3,00,000	5,00,000	2,50,000	4,50,000
Cost of sales (Rs.)	2,00,000	4,50,000	2,10,000	2,25,000
Area of storage (Sq.ft.)	50,000	40,000	80,000	30,000
Number of parcels sent	1,00,000	1,50,000	75,000	1,75,000
Number of invoices sent	80,000	1,40,000	60,000	1,20,000

Selling and Distribution overheads and the basis of allocation are :

	<i>Basis of allocation</i>	<i>Rs. to products</i>
<i>Fixed Costs</i>		
Rent & Insurance	30,000	Sq.Ft.
Depreciation	10,000	Parcel
Salesmen's salaries & expenses	50,000	Sales Volume
Administrative wages and salaries	50,000	No. of invoices
<i>Variable Costs :</i>		
Packing wages & materials	20 paise per parcel	



Overheads

Commission	4% of sales
Stationery	10 P. per invoice

You are required to prepare Profit & Loss Statement, showing the percentage of profit or loss to sales for each product.

Solution

Statement of Profit or Loss on Various Products during the year ended March 31, 2006.

	<i>Products</i>				
	<i>Total</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Sales	15,00,000	3,00,000	5,00,000	2,50,000	4,50,000
<i>Variable costs</i>					
Cost of sales	10,85,000	2,00,000	4,50,000	2,10,000	2,25,000
Commissions 4% of sales	60,000	12,000	20,000	10,000	18,000
Packing wages & materials @ 20 P. per parcel	1,00,000	20,000	30,000	15,000	35,000
Stationery @ 10 P. per invoice	<u>40,000</u>	<u>8,000</u>	<u>14,000</u>	<u>6,000</u>	<u>12,000</u>
Total variable costs	12,85,000	2,40,000	5,14,000	2,41,000	2,90,000
Contribution (Sales– variable cost)	2,15,000	60,000	–14,000	9,000	1,60,000
<i>Fixed Costs</i>					
Rent & Insurance	30,000	7,500	6,000	12,000	4,500
Depreciation	10,000	2,000	3,000	1,500	3,500
Salesmen's salaries & expenses	60,000	12,000	20,000	10,000	18,000
Administrative wages & salaries	<u>50,000</u>	<u>10,000</u>	<u>17,500</u>	<u>7,500</u>	<u>15,000</u>
Total Fixed costs	1,50,000	31,500	46,500	31,000	41,000
Profit or Loss (Contribution–fixed Costs)	65,000	28,500	–60,500	–22,000	1,19,000
Percentage of profit or Loss on sales	4.3	9.5	–12.1	–8.8	26.4



4.9 CONCEPTS RELATED TO CAPACITY

- (i) *Rated capacity* : It refers to the capacity of a machine or a plant as indicated by its manufacturer. In fact this capacity is the maximum possible productive capacity of a plant. It is also known as installed capacity of a plant. Due to the loss of operating time of a plant it is difficult to achieve this rated capacity. In other words, it is only a theoretical capacity and is therefore, seldom achieved.
- (ii) *Practical capacity* : It is defined as actually utilised capacity of a plant. It is also known as operating capacity. This capacity takes into account loss of time due to repairs, maintenance, minor breakdown, idle time, set up time, normal delays, Sundays and holidays, stock taking etc. Generally, practical capacity is taken between 80 to 90% of the rated capacity. It is also used as a base for determining overhead rates. Practical capacity is also called net capacity or available capacity.
- (iii) *Normal capacity* : It is the capacity of a plant which is expected to be utilised over a long period based on sales expectancy. The determination of this capacity considers the average utilisation of plant capacity during one full business cycle which may extend over 2 to 3 years. It is also known as average capacity and is used to compute overhead recovery rate.
- (iv) *Capacity based on sales expectancy* : It is the capacity of a plant utilised based on sales expectancy.
- (v) *Actual capacity* : It is the capacity actually achieved during a given period. This capacity may lie between practical capacity and capacity based on sales expectancy.
- (vi) *Idle capacity* : It is that part of the capacity of a plant, machine or equipment which cannot be effectively utilised in production. In other words, it is the difference between the practical or normal capacity and capacity utilisation based on expected sales. For example, if the practical capacity of production of a machine is to the tune of 10,000 units in a month, but is used only to produce 8,000 units, because of market demand of the product, then in such a case, 2,000 units will be treated as idle capacity of the machine.

The idle capacity may arise due to lack of product demand, non-availability of raw material, shortage of skilled labour, absenteeism, shortage of power fuel or supplies, seasonal nature of product etc.

Idle capacity cost : Costs associated with idle capacity are mostly fixed in nature. These include depreciation, repairs and maintenance charges, insurance premium, rent, rates, management and supervisory costs. These costs remain unabsorbed or unrecovered due to under-utilisation of plant and service capacity. Idle capacity cost can be calculated as follows :



$$\text{Idle capacity cost} = \frac{\text{Aggregate overhead related to plant}}{\text{Normal plant capacity}}$$

Treatment of Idle capacity costs : Idle capacity costs can be treated in product costing, in the following ways :

- (a) If the idle capacity cost is due to unavoidable reasons such as repairs, maintenance, change over of job etc. a supplementary overhead rate may be used to recover the idle capacity cost. In this case, the costs are charged to the production capacity utilised.
- (b) If the idle capacity cost is due to avoidable reasons such as faulty planning, power failure etc.; the cost should be charged to profit and loss account.
- (c) If the idle capacity cost is due to seasonal factors, then, the cost should be charged to the cost of production by inflating overhead rates.

(vii) *Idle facility* : The term 'facility' has a wider connotation which may also include production capacity. Facilities may be provided by fixed assets such as building space, plants equipment capacity, etc. or by various service functions such as material services, production services, personal services etc. If a firm fails to make full use of the facilities of its disposal, the firm may be said to have idle facilities. Thus idle facilities refer to that part of total facilities which remains unutilised due to any reason such as non-availability of raw material, power, lack of demand etc. In Cost Accounting idle facilities are treated in the same way as those of idle capacity.

4.10 TREATMENT OF CERTAIN ITEMS IN COSTING

4.10.1 Treatment of interest and financial charges : There is controversy whether financial charges, specially interest, should be included in the costs or not. The following arguments are generally advanced in favour of interest to be included in overhead expenses.

- (1) Computation of total cost is impossible unless interest is taken into account. Interest is an element of cost and therefore, should be included in cost. This is specially true in business where raw materials in different stages can be used. Thus a timber merchant, if he buys standing trees and seasons the timber himself, would incur a large amount of costs as interest. Another merchant who buys his timber already seasoned would automatically have to pay a higher price; obviously, this price includes interest.
- (2) Interest is the cost to be paid for the use of capital; capital is also a factor of production just as labour. Thus, if wages are included in cost of production, why not interest ?



Cost Accounting

- (3) If interest is not included in cost calculation, a number of managerial decisions may be taken wrongly. Thus, where a decision involves replacement of labour with expensive machinery, the question of interest assumes importance, since, if interest is not included, the cost accountant may conclude that machinery is cheaper.
- (4) Inclusion of interest also allows comparison of profit on different jobs. Thus, if a job takes 3 months and another takes 6 months the cost of the jobs must include a charge by way of interest before profit can be compared.
- (5) In inventory control, interest is an important item to be considered. Where large stocks are kept, the advantage of one time purchase is offset by increase in interest charges.
- (6) While submitting tenders for cost *plus* contracts, etc., interest must be taken into account.

However, many cost accountants argue that interest should not be included in cost accounts since it is not an item of cost and would vary with different methods of financing. Some of the arguments are listed below :

- (1) Payment of interest depends entirely on the financing policies and financing pattern. A firm working with proprietor's capital only will have no interest to pay whereas a firm working with borrowed capital will have to pay a large amount of interest. In reality, whether a firm raises a certain sum of money from the proprietor or borrows from the outside does not make any difference as far as production efficiencies are concerned. If we compare the two firms and include interest as an item of cost, the firm, which works on the proprietor's capital will show very favourable results. Actually, this is a wrong conclusion.

However, this argument can be met by including a notional amount of interest, irrespective of the fact whether the funds belong to the owners or to the outsiders. Thus, an amount of notional interest may be charged on the total capital whether it is borrowed or not.

- (2) Another practical difficulty arises in the calculation of the amount of capital on which interest should be worked out. While the fixed capital is readily ascertainable, working capital keeps on changing. Again, the difficulty becomes pronounced since the working capital would be used by different departments, and allocation of the total interest charges will have to be made over various departments at different points of time.

If notional interest is to be charged, the problem of determining a proper rate of interest also arises. In the money and capital markets, there is a large number of rates depending upon different factors like risk, period of maturity, bank rate, etc.



- (3) By including interest on the proprietor's capital and by taking that figure in the cost of production, we would obviously be including profit since the closing stock will be valued at a higher figure.

It appears that there are practical difficulties in including interest as part of the normal cost. However, excluding it altogether may lead to wrong managerial decisions which is not desirable. It is therefore, suggested that while interest may be excluded from the regular cost sheet, cost calculations for other purposes for decision making should include a proper amount of notional interest where the interest will be material.

4.10.2 Depreciation : Depreciation "is the diminution in the intrinsic value of an asset due to use and/or the lapse of time." Depreciation is thus the result of two factors *viz.*, the use, and the lapse of time. We know that each fixed asset loses its intrinsic value due to their continuous use and as such the greater the use the higher is the amount of depreciation. The loss in the intrinsic value may also arise even if the asset in question is not in service.

In Cost Accounting depreciation is charged to the cost of production.

The various reasons for including the depreciation charge in Cost Accounting are as follows :

- (a) To show a true and fair picture of Balance Sheet.
- (b) To ascertain the true cost of production.
- (c) To keep the asset intact by distributing losses in its value over a number of years.
- (d) To keep the capital intact and to make a provision of the resources for the replacement of asset in future.
- (e) To provide for depreciation before distribution of profit as required under the Companies Act.

4.10.3 Packing expenses : Cost of primary packing necessary for protecting the product or for convenient handling, should become a part of the prime cost. The cost of packing to facilitate the transportation of the product from the factory to the customer should become a part of the distribution cost. If the cost of special packing is at the request of the customer, the same should be charged to the specific work order or the job. The cost of fancy packing necessary to attract customers is an advertising expenditure. Hence, it is to be treated as a selling overhead.

4.10.4 Fringe benefits : These are the additional payments or facilities provided to the workers apart from their salary and direct cost-allowances like house rent, dearness and city compensatory allowances. These benefits are given in the form of overtime, extra



shift duty allowance, holiday pay, pension facilities etc.

These indirect benefits stand to improve the morale, loyalty and stability of employees towards the organisation. If the amount of fringe benefit is considerably large, it may be recovered as direct charge by means of a supplementary wage or labour rate; otherwise these may be collected as part of production overheads.

4.10.5 Expenses on removal and re-erection of machines : Expenses are sometime incurred on removal and re-erection of machinery in factories. Such expenses may be incurred due to factors like change in the method of production; an addition or alteration in the factory building, change in the flow of production, etc. All such expenses are treated as production overheads. When amount of such expenses is large, it may be spread over a period of time.

If such expenses are incurred due to faulty planning or some other abnormal factor, then they may be charged to costing Profit and Loss Account.

4.10.6 Bad debts : There is no unanimity among different authors of Cost Accounting about the treatment of bad debts. One view is that 'bad debts' should be excluded from cost. According to this view bad debts are financial losses and therefore, they should not be included in the cost of a particular job or product.

According to another view it should form part of selling and distribution overheads, especially when they arise in the normal course of trading. Therefore bad debts should be treated in cost accounting in the same way as any other selling and distribution cost. However extra ordinarily large bad debts should not be included in cost accounts.

4.10.7 Training expenses : Training is an essential input for industrial workers. Training expenses in fact includes wages of workers, costs incurred in running training department, loss arising from the initial lower production, extra spoilage etc. Training expenses of factory workers are treated as part of the cost of production. The training expenses of office; sales or distribution workers should be treated as office; sales or distribution overhead as the case may be. These expenses can be spread over various departments of the concern on the basis of the number of workers on roll.

Training expenses would be abnormally high in the case of high labour turnover such expenses should be excluded from costs and charged to the costing profit and loss account.

4.10.8 Canteen expenses : The loss incurred by the firm in running the canteen should be regarded as a production overhead. If the canteen is meant only for factory workers therefore this loss should be apportioned on the basis of the number of workers employed in each department. If office workers also take advantage of the canteen facility, a suitable share of the loss should be treated as office overhead.



4.10.9 Carriage and cartage expenses : It includes the expenses incurred on the movement (inward and outwards) and transportation of materials and goods. Transportation expenses related to direct material may be included in the cost of direct material and those relating to indirect material (stores) may be treated as factory overheads. Expenses related to the transportation of finished goods may be treated as distribution overhead.

4.10.10 Expenses for welfare activities : All expenses incurred on the welfare activities of employees in a company are part of general overheads. Such expenses should be apportioned between factory, office, selling and distribution overheads on the basis of number of persons involved.

4.10.11 Night shift allowance : Workers in the factories, which operate during night time are paid some extra amount known as 'night shift allowance'. This extra amount is generally incurred due to the general pressure of work beyond normal capacity level and is treated as production overhead and recovered as such.

If this allowance is treated as part of direct wages, the jobs/production carried at night will be costlier than jobs/production performed during the day. However, if additional expenditure on night shift is incurred to meet some specific customer order, such expenditure may be charged directly to the order concerned. If night shifts are run due to abnormal circumstances, the additional expenditure should be charged to the costing profit and loss account.

4.11 Self Examination Questions

Multiple Choice Questions

1. Director's remuneration and expenses form a part of :
 - (a) Production overhead
 - (b) Administration overhead
 - (c) Selling overhead
 - (d) Distribution overhead.
2. Salary of a foreman should be classified as a:
 - (a) fixed overhead
 - (b) 'variable overhead'
 - (c) semi-fixed or semi-variable overhead
 - (d) None of the above.



Cost Accounting

3. Absorption means :
 - (a) charging of overheads to cost centres
 - (b) charging of overheads to cost unit
 - (c) charging of overheads to cost centres or cost units
 - (d) none of the above.
4. Which of the following is a service department?
 - (a) Refining department
 - (b) Machining department
 - (c) Receiving department
 - (d) Finishing department.
5. Which method of absorption of factory overheads do you suggest in a concern which produces only one uniform item of product?
 - (a) Percentage of direct wage basis
 - (b) Direct labour hour rate
 - (c) Machine hour rate
 - (d) A rate per unit of output
 - (e) Any of the above.
6. When the amount of under-or-over-absorption is significant, it should be disposed off by
 - (a) Transferring to Costing Profit and Loss A/c
 - (b) The use of supplementary rates
 - (c) Carrying over as a deferred charge to the next accounting year
 - (d) Either of the three.
7. Maximum possible productive capacity of a plant when no operating time is lost is its :
 - (a) Practical capacity
 - (b) Normal capacity
 - (c) Theoretical capacity
 - (d) Capacity based on sales expectancy.
8. When the amount of overhead absorbed is less than the amount of overhead incurred, its is called :
 - (a) Under-absorption of overhead
 - (b) Over-absorption of overhead



- (c) Proper absorption of overhead
 - (d) None of the above.
9. Factory overhead should be absorbed on the basis of :
- (a) Relationship to cost incurred
 - (b) Direct labour hours
 - (c) Direct labour cost
 - (d) Machine hours.
10. What is the basis for distribution of indirect material cost to various departments?
- (a) Direct allocation
 - (b) Cost of direct materials consumed
 - (c) Machine hours worked
 - (d) Either of the three.

Answers to Multiple Choice Questions

1.(b); 2.(c); 3.(b); 4.(c); 5.(d); 6.(b); 7.(c); 8.(a); 9.(a); 10(c)

Short Answer Type Questions

1. What do you understand by classification, allocation and apportionment in relation to overhead expenses.
2. Define Overhead. Explain various classifications of overheads according to functions.
3. How you would treat the following items in cost accounts:
 - (i) Idle capacity costs.
 - (ii) Research and development costs.
 - (iii) Bad debts.
 - (iv) Fringe benefits.
 - (v) Training expenses.
4. A factory produces three products A, B and C. Which of the following costs are prime costs and which are overheads? In case of overheads classify them by function;
 - (i) Salary of the accountant.
 - (ii) Temporary labour employed to increase production in order to meet unusual demand of product C.
 - (iii) Uniforms of sanitary workers.



Cost Accounting

- (iv) Raw Material, Godown, Chowkidar salary.
 - (v) Dividends received on investments.
 - (vi) Freight on purchase of raw material.
 - (vii) Remuneration for legal advice.
 - (viii) Consultation fee of advertisement designer.
 - (ix) Rent of godown for storing finished goods.
 - (x) Rent of godown for storing raw materials.
 - (xi) Salary paid to the wife of the managing director. She is designated as whole time director but does not come to the factory at all.
 - (xii) Loss due to accidental falling of the roof of a section of the factory.
 - (xiii) Primary packing to keep the product crisp.
 - (xiv) Secondary packing with the name of the company, etc.
 - (xv) Packing of boxes of finished product in wooden crates for transportation.
 - (xvi) Income from sale of bags in which raw materials were procured.
 - (xvii) Depreciation of patterns and dies.
 - (xviii) Bad debts.
 - (xix) Cost of stolen materials.
 - (xx) Commission paid to salesman as a percentage of sale price.
 - (xxi) Expenses incurred for repairs and maintenance of water supply lines, sewage pipes etc.
 - (xxii) Royalties paid on the basis of sales.
 - (xxiii) Amount paid to lawyer for appearing before a Labour Tribunal.
 - (xxiv) Allowance made to customers for late deliveries of goods.
 - (xxv) Carriage Inward.
5. Classify the following costs into fixed, semi-variable and variable costs :
- (a) Salary of the managing director
 - (b) Salary of foreman
 - (c) Raw material cost
 - (d) Wages of permanent workers
 - (e) Commission to salesman as a percentage of sales
 - (f) Depreciation of plant



- (g) Rent of factory
- (h) Power consumption in the production process
- (i) Canteen expenses
- (j) Salary of the store keeper.

Answers

- 4. Prime cost: ii, vi, xvi, xxv.
Factory overheads : - iii, iv, x, xvii, xxi.
Administration overheads :- i, vii, xxiii.
Selling overheads : - viii, xiv, xviii, xx, xxii.
Distribution overheads : -ix, xv.
Costing Profit & Loss items : - v, xi, xii, xix, xxiv.
- 5. Fixed - (a), (b), (g), (i) and (j)
Semi Fixed :- Partly (d), (f).
Variable :- (c), partly (d), (e), (h).

Long Answer Type Questions

- 1. What do you understand by absorption of overheads? Describe the various methods of absorption of factory overheads. Which of these methods do you consider most scientific and why?
- 2. Explain the various methods of distribution of Semi-variable expenses into fixed and variable expenses.
- 3. (a) Explain the different methods of apportionment of service department costs over production departments ?
(b) What are the methods of secondary distribution of overheads? Explain in detail three methods available for dealing with reciprocal services, giving examples for each.
- 4. What do you mean by under/over absorption of overheads? How does it arise? How it is treated in cost accounts.

Numerical Questions

- 1. Two service departments, A and B, show expenses of Rs. 5,000 and Rs. 8,000 respectively. $\frac{1}{10}$ expenses of department A are chargeable to department B, whereas $\frac{1}{4}$ of the expenses of the latter are chargeable to department A. Ascertain



Cost Accounting

the overheads of the departments to be apportioned to production departments of the two departments.

2. Three machines A, B and C are in use, involving the undermentioned expenditure for a period:

A Rs. 639; B Rs. 697; C Rs. 951.

The machines sometimes require the use of a crane also for which Rs. 570 has to be spent. The number of hours for the machines are:

	A	B	C
With the use of crane	160	130	480
Without the use of crane	428	577	

Calculate the rates for recovery of overheads.

3. The actual figures relating to production for a period in a factory were as follows:

Material used	Rs. 5,00,000
Direct labour (Total 1,20,000)	Rs. 4,00,000
Factory expenses	Rs. 3,00,000
Machine hours totalled	1,00,000

A job requires Rs. 20,000 in material, and 4,000 hours of labour @ Rs. 3 per hour (on the average) of which 2,800 were machine hours. Ascertain the cost of the job using different methods of absorbing overheads.

4. Suppose in the factory mentioned in Question 3, administrative expenses total Rs. 2,50,000 and assume 1/5 of goods produced remained unsold. What is the value that should be put on inventory with alternative treatments of administrative expenses?
5. The products of a factory pass through two departments, though the output emerging from the first department is also saleable. The direct labour in the two processes per period is Rs. 60,000 and Rs. 40,000 and the indirect expenses are Rs. 45,000 and Rs. 40,000. The rate for recovery of the overheads is 85%. Do you think the method followed is proper?

Answers to Numerical Questions.

- Rs. 7,180 and Rs. 8,718
- Rs. 1.09, Re. 0.99, Rs. 1.98 plus Re. 0.74 when crane is used.
- Rs. 44,000, Rs. 41,000, Rs. 42,667, Rs. 42,000 and Rs. 40,400 respectively on the basis of materials, labour, prime cost, productive labour hours and machine hours.
- Rs. 2,90,000 and Rs. 2,40,000.
- There should be separate rates for the two departments.

CHAPTER 5

NON-INTEGRATED ACCOUNTS

Learning Objectives

When you have finished studying this chapter, you should be able to

- ◆ Differentiate between integrated and non-integrated systems of accounting.
- ◆ Write the various journal entries for both integrated and non-integrated systems of accounting.
- ◆ Understand the reasons for differences between financial and cost accounts and prepare a reconciliation statement accordingly.

5.1 INTRODUCTION

To operate business operations efficiently and successfully, it is necessary to make use of an appropriate accounting system. Such a system should state in clear terms whether cost and financial transactions should be integrated or kept separately. Where cost and financial accounting records are integrated, the system so evolved is known as integrated or integral accounting. In case cost and financial transactions are kept separately, the system is called Non-Integrated Accounting System.

5.2 NON-INTEGRATED ACCOUNTING SYSTEM

It is a system of accounting under which separate ledgers are maintained for cost and financial accounts by Accountants. Under such a system the cost accounts restricts itself to recording only those transactions which relate to the product or service being provided. Hence items of expenses which have a bearing with sales or, production or for that matter any other items which are under the factory management are the ones dealt with in such accounts. This leads to the exclusion of certain expenses like interest and, bad debts and revenue/income from 'other than the sale of product or service'.

A special feature of the non-integrated system of accounts is its ability to deal with notional expenses like rent or interest on capital tied up in the stock. The accounting of notional rent facilitates comparisons amongst factories (some owned and some rented). Similarly, recognition of interest on capital tied up in stock could help make the stores and works managers aware of the money being blocked because of holding stock.



Cost Accounting

Non Integrated Accounting Systems contain fewer accounts when compared with financial accounting because of the exclusion of purchases, expenses and also Balance Sheet items like fixed assets, debtors and creditors. Items of accounts which are excluded are represented by an account known as cost ledger control account.

The important ledgers to be maintained under non-integrated accounting system in the Cost Accounting department are the following:

- (a) *Cost Ledger* - This is the principle ledger of the cost department in which impersonal accounts are recorded. This ledger also contains a Control Account for each subsidiary ledger.
- (b) *Stores Ledger* - It contains an account for each item of stores. The entries in each account maintained in this ledger are made from the invoice, goods received note, material requisitions, material received note etc. Accounts in respect of each item of stores show receipt, issue and balance in physical as well as monetary terms.
- (c) *Work-in-Progress Ledger* - This ledger is also known as job ledger, it contains accounts of unfinished jobs and processes. Each job account is debited with direct and indirect costs related with the job and credited with the amount of finished goods completed and transferred. The balance in a job account represents total balance of job/work-in-progress, as shown by the job account.
- (d) *Finished Goods Ledger* - It contains an account for each item of finished product manufactured or the completed job. If the finished product is transferred to stores, a credit entry is made in the work-in-progress ledger and a corresponding debit entry is made in this ledger.

5.2.1 Principle Accounts : The main accounts which are usually prepared when a separate Cost Ledger is maintained are as follows :

- (1) *Cost Ledger Control Account* - This account is also known as General Ledger Adjustment Account. This account is made to complete double entry. All items of expenditure are credited to this account. Sales are debited to this account and net profit/loss is transferred to this account. The balance in this account represents the net total of all the balances of the impersonal accounts.
- (2) *Stores Ledger Control Account* - Total of material purchases are debited to this account. Whereas issues of material are credited. The balance in this account indicates the total balance of all the individual stores accounts. Abnormal losses or gains if any in this account, are transferred to Costing Profit & Loss Account.



Non-Integrated Accounts

(3) *Work-in-Progress Control Account* - This account is debited with the total cost of production, which includes—direct materials, direct labour, direct expenses, production overhead recovered, and is credited with the amount of finished goods completed and transferred. The balance in this account represents total balances of jobs/works-in-progress, as shown by several job accounts.

(4) *Finished Goods Control Accounts* - This account is debited to the tune of “value of goods” transferred from work-in-progress account, administration costs recovered. This account is credited with the cost of goods sold and Cost of Sales Account is debited. The balance of this account represents the value of goods lying at hand.

(5) *Wage Control Account* - This account is debited with total wages paid (direct and indirect). Direct wages are further transferred to Work-in-Progress Account and indirect wages to Production Overhead; Administration Overhead or Selling & Distribution Overhead Account, as the case may be. Wages paid for abnormal idle time are transferred to Costing Profit & Loss Account either directly or through Abnormal Loss Account.

(6) *Manufacturing/Production/Works Overhead Account* - This account is debited with Indirect costs of production such as indirect material, indirect labour, indirect expenses (carriage inward etc.). Overhead recovered is credited to this Account. The difference between overhead incurred and overhead recovered is transferred to Overhead Adjustment Account.

(7) *Administrative Overhead Account* - This account is debited with overhead incurred and credited with Overhead recovered. The Overhead recovered are debited to Finished Goods Account. The difference between Administrative Overhead incurred and recovered are transferred to Overhead Adjustment Account.

(8) *Selling and Distribution Overhead Account* - This account is debited with Selling and Distribution Overhead incurred and credited with the recovered Overhead. The difference between incurred and recovered overhead is transferred usually to Overhead Adjustment Account.

(9) *Cost of Sales Account* - This account is debited with the cost of finished goods transferred from Finished Goods Account for sale as well as with the amount of selling and distribution overhead costs recovered. The balance of this account is ultimately transferred to Sales Account or Costing Profit & Loss Account.

(10) *Costing Profit & Loss Account* - The net profit or loss in this account is transferred to Cost Ledger Control Account.



Cost Accounting

(11) *Overhead Adjustment Account* - This account is to be debited for under-recovery of overhead and credited with over-recovery of overhead amount. The net balance in this account is transferred to Costing Profit & Loss Account.

Sometimes, Overhead Adjustment Account is dispensed with and under/over absorbed overheads is directly transferred to Costing Profit & Loss Account from the respective overhead accounts.

5.2.2 Scheme of Entries: The manner in which the Cost Ledger, when maintained on a double entry basis, would operate is illustrated by the following statements of various journal entries as would appear in the cost books.

Material:

(a)	<i>Purchase—Rs. 5,000 (credit or cash)</i>	Rs.
	(i) Dr. Material Control A/c	5,000
	Cr. Cost Ledger Control A/c	5,000
	(ii) Dr. Stores Ledger Control A/c	5,000
	Cr. Material Control A/c	5,000

Note: Sometimes Material Control Account is dispensed with and entries are directly made into Stores Ledger Control A/c, giving a credit to Cost Ledger Control A/c.

(b)	<i>Purchases worth Rs. 500 for special job</i>	Rs.
	Dr. Work-in-Progress Ledger Control A/c	500
	Cr. Cost Ledger Control A/c	500
(c)	<i>Material returned to vendor—Rs. 500</i>	
	Dr. Cost Ledger Control A/c	500
	Cr. Stores Ledger Control A/c	500
(d)	(i) <i>Material (Direct) issued to production—Rs. 1,000</i>	
	Dr. Work-in-Progress Control A/c	1,000
	Cr. Stores Ledger Control A/c	1,000
	(ii) <i>Material 'Indirect' issued to production—Rs. 200</i>	
	Dr. Manufacturing Overhead A/c	200
	Cr. Stores Ledger Control A/c	200



Non-Integrated Accounts

- (e) (i) *Material worth Rs. 200 returned from shop to stores:*
- | | |
|----------------------------------|-----|
| Dr. Stores Ledger Control A/c | 200 |
| Cr. Work-in-Progress Control A/c | 200 |
- (ii) *Material worth Rs. 100 is transferred from Job 1 to Job 2*
- | | |
|---------------|-----|
| Dr. Job 2 A/c | 100 |
| Cr. Job 1 A/c | 100 |
- (f) *Material worth Rs. 100 is issued from stores for repairs*
- | | |
|--------------------------------|-----|
| Dr. Manufacturing Overhead A/c | 100 |
| Cr. Stores Ledger Control A/c | 100 |

Labour:

- (i) *Direct wages paid to workers Rs. 1,000* Rs.
- | | |
|-----------------------------|-------|
| (a) Dr. Wage Control A/c | 1,000 |
| Cr. Cost Ledger Control A/c | 1,000 |
| (b) Dr. WIP A/c | 1,000 |
| Cr. Wage Control A/c | 1,000 |
- (ii) *Indirect wages paid to workers in the production (Rs. 700), administration (Rs. 500), selling and distribution departments (Rs. 300).*
- | | |
|----------------------------------|-------|
| (a) Dr. Wage Control A/c | 1,500 |
| Cr. Cost Ledger Control A/c | 1,500 |
| (b) Dr. Production Overhead A/c | 700 |
| Dr. Administrative Overhead A/c | 500 |
| Dr. Selling & Dist. Overhead A/c | 300 |
| Cr. Wage Control A/c | 1,500 |

Direct Expenses:

- Rs. 500 for Job No. 12* Rs.
- | | |
|--------------------------------------|-----|
| Dr. Job No. 12 A/c (WIP Control A/c) | 500 |
| Cr. Cost Ledger Control A/c | 500 |



Cost Accounting

Overhead:

(i) *Overhead expenses incurred Rs. 500*

	Rs.	Rs.
Production	150	
Administrative	150	
Selling and Distribution	200	500

Dr. Production Overhead A/c	150
Dr. Administrative Overhead A/c	150
Dr. Selling & Distribution Overhead A/c	200
Cr. Cost Ledger Control A/c	500

(ii) *Carriage Inward—Rs. 100*

Dr. Manufacturing Overhead A/c	100
Cr. Cost Ledger Control A/c	100

(iii) *Production overhead recovered—Rs. 1,000*

Dr. Work-in-Progress Control A/c	1,000
Cr. Production Overhead A/c	1,000

(iv) *Administrative Overhead recovered Rs. 500 from finished goods*

Dr. Finished Goods Ledger Control A/c	500
Cr. Administrative Overhead A/c	500

(v) *Selling and Distribution Overhead Rs. 100 recovered from sales*

Dr. Cost of Sales A/c	100
Cr. Selling & Distribution Overhead A/c	100

The under/over absorbed overheads are transferred to Costing Profit & Loss Account

(i) Dr. Production Overhead A/c

Cr. Costing Profit & Loss A/c

(For over recovery)



Non-Integrated Accounts

- (ii) Dr. Costing Profit & Loss Account
 Cr. Administrative Overhead A/c
 (For under recovery)

Sales : The entry when sales are effected is as follows:

- Dr. Cost Ledger Control A/c
 Cr. Costing Profit & Loss Account

Profit/Loss : The entry made in this case (after adjusting over/under absorbed overhead and other items of profit or loss) is as follows:

- Dr. Costing Profit & Loss A/c
 Cr. Cost Ledger Control A/c

Note : Reverse the above entry in the case of loss.

Illustration :

As on 31st March, 2006, the following balances existed in a firm's Cost Ledger :

	<i>Dr.</i>	<i>Cr.</i>
	<i>Rs.</i>	<i>Rs.</i>
Stores Ledger Control A/c	3,01,435	
Work-in-Progress Control A/c	1,22,365	
Finished Stock Ledger Control A/c	2,51,945	
Manufacturing Overhead Control A/c		10,525
Cost Ledger Control A/c	<u> </u>	<u>6,65,220</u>
	<u>6,75,745</u>	<u>6,75,745</u>

During the next three months the following items arose:

	<i>Rs.</i>
Finished product (at cost)	2,10,835
Manufacturing overhead incurred	91,510
Raw materials purchased	1,23,000
	<i>Rs.</i>
Factory Wages	50,530
Indirect Labour	21,665
Cost of Sales	1,85,890
Material issued to production	1,27,315
Sales returned at Cost	5,380



Cost Accounting

Material returned to suppliers 2,900
Manufacturing overhead charged to production 77,200

You are required to pass the Journal Entries; write up the accounts and schedule the balances, stating what each balance represents.

Solution:

Journal entries are as follows:

		<i>Dr.</i>	<i>Cr.</i>
		<i>Rs.</i>	<i>Rs.</i>
1. Finished stock ledger Control A/c	Dr.	2,10,835	
To Work-in-Progress Control A/c			2,10,835
2. Manufacturing Overhead Control A/c	Dr.	91,510	
To Cost Ledger Control A/c			91,510
3. Stores Ledger Control A/c	Dr.	1,23,000	
To Cost Ledger Control A/c			1,23,000
4.(i) Wage Control A/c	Dr.	72,195	
To Cost Ledger Control A/c			72,195
(ii) Work-in-progress Control A/c	Dr.	50,530	
To Wage Control A/c			50,530
(iii) Manufacturing Overhead Control A/c	Dr.	21,665	
To Wage Control A/c			21,665
5. Cost of Sales A/c	Dr.	1,85,890	
To Finished Stock Ledger A/c			1,85,890
6. Work-in-Progress Control A/c	Dr.	1,27,315	
To Stores Ledger Control A/c			1,27,315
7. Finished Stock Ledger Control A/c	Dr.	5,380	
To Cost of Sales A/c			5,380
8. Cost Ledger Control A/c	Dr.	2,900	
To Stores Ledger Control A/c			2,900



Non-Integrated Accounts

9. Work-in-Progress Control A/c	Dr.	77,200
To Manufacturing Overhead Control A/c		77,200

COST LEDGER

Cost Ledger Control Account

	Rs.			Rs.
To Stores Ledger Control A/c (return)	2,900	By Balance b/d		6,65,220
" Balance c/d	9,49,025	" Manufacturing Overhead		
		Control A/c		91,510
		" Stores Ledger Control A/c		1,23,000
		" Wage Control A/c		<u>72,195</u>
	<u>9,51,925</u>			<u>9,51,925</u>

Stores Ledger Control Account

	Rs.			Rs.
To Balance b/d	3,01,435	By Work-in-Progress		
" Cost Ledger Control A/c	1,23,000	" Control A/c		1,27,315
		" Cost Ledger Control A/c		2,900
		" Balance c/d		<u>2,94,220</u>
	<u>4,24,435</u>			<u>4,24,435</u>

Work-in-Progress Control Account

	Rs.			Rs.
To Balance b/d	1,22,365	By Finished Stock		
" Wage Control A/c	50,530	Ledger Control A/c		2,10,835
" Stores Ledger Control A/c	1,27,315	" Balance c/d		1,66,575
Manufacturing Overhead				
Control A/c	<u>77,200</u>			
	<u>3,77,410</u>			<u>3,77,410</u>



Cost Accounting

Finished Stock Ledger Control Account

	Rs.		Rs.
To Balance b/d	2,51,945	By Cost of Sales A/c	1,85,890
Work-in-Progress Control A/c	2,10,835	" Balance c/d	2,82,270
" Cost of Sales A/c (return at cost)	<u>5,380</u>		
	<u>4,68,160</u>		<u>4,68,160</u>

Manufacturing Overhead Control Account

	Rs.		Rs.
To Cost Ledger Control A/c	91,510	By Balance b/d	10,525
" Wage Control A/c	21,665	" Work-in-Progress Control A/c	<u>77,200</u>
		Balance c/d (under recovered)	<u>25,450</u>
	<u>1,13,175</u>		<u>1,13,175</u>

Wage Control Account

	Rs.		Rs.
To Cost Ledger Control A/c	72,195	By Work-in-Progress Control A/c	50,530
		" Manufacturing Overhead Control A/c	<u>21,665</u>
	<u>72,195</u>		<u>72,195</u>

Cost of Sales Account

	Rs.		Rs.
To Finished Stock Ledger Control A/c	1,85,890	By Finished Stock Ledger Control A/c (Return)	5,380
		" Balance c/d	<u>1,80,510</u>
	<u>1,85,890</u>		<u>1,85,890</u>

Trial Balance

	Dr.	Cr.
	Rs.	Rs.
Stores Ledger Control A/c	2,94,220	
Work-in-Progress Control A/c	1,66,575	
Finished Stock Ledger Control A/c	2,82,270	



Non-Integrated Accounts

Manufacturing Overhead Control A/c	25,450	
Cost of Sales A/c	1,80,510	
Cost Ledger Control A/c		<u>9,49,025</u>
	<u>9,49,025</u>	<u>9,49,025</u>

Illustration :

The following figures are extracted from the Trial Balance of Gogetter Co. on 30th September, 2005:

	Rs.	Rs.
Inventories:		
Finished Stock	80,000	
Raw Materials	1,40,000	
Work-in-Progress	2,00,000	
Office Appliances	17,400	
Plant & Machinery	4,60,500	
Building	2,00,000	
Sales		7,68,000
Sales Return and Rebates	14,000	
Materials Purchased	3,20,000	
Freight incurred on Materials	16,000	
Purchase Returns		4,800
Direct Labour	1,60,000	
Indirect Labour	18,000	
Factory Supervision	10,000	
Repairs and Upkeep Factory	14,000	
Heat, Light and Power	65,000	
Rates and Taxes	6,300	
Miscellaneous Factory Expenses	18,700	
Sales Commission	33,600	
Sales Travelling	11,000	
Sales Promotion	22,500	
Distribution Deptt.—Salaries and Expenses	18,000	
Office Salaries and Expenses	8,600	
Interest on Borrowed Funds	2,000	

Further details are available as follows:



Cost Accounting

- (i) Closing Inventories:
- | | |
|------------------|----------|
| Finished Goods | 1,15,000 |
| Raw Materials | 1,80,000 |
| Work-in-Progress | 1,92,000 |
- (ii) Accrued expenses on:
- | | |
|----------------------------|-------|
| Direct Labour | 8,000 |
| Indirect Labour | 1,200 |
| Interest on Borrowed Funds | 2,000 |
- (iii) Depreciation to be provided on:
- | | |
|---------------------|-----|
| Office Appliances | 5% |
| Plant and Machinery | 10% |
| Buildings | 4% |
- (iv) Distribution of the following costs:
- Heat, Light and Power to Factory, Office and Distribution in the ratio 8 : 1 : 1.
Rates and Taxes two-thirds to Factory and one-third to Office.
Depreciation on Buildings to Factory, Office and Selling in the ratio 8 : 1 : 1.

With the help of the above information, you are required to prepare a condensed Profit and Loss Statement of Gogetter Co. for the year ended 30th September, 1998 along with supporting schedules of:

- (i) Cost of Sales.
(ii) Selling and Distribution Expenses.
(iii) Administration Expenses.

Solution:

**Profit and Loss Statement of Gogetter Company
for the year ended 30th September, 2005**

	Rs.	Rs.
Gross Sales	7,68,000	
Less: Returns	<u>14,000</u>	7,54,000
Less: Cost of Sales Refer to Schedule (i)		<u>7,14,020</u>
Net Operating Profit:		39,980
Less: Interest on Borrowed funds		<u>4,000</u>
Net Profit		<u>35,980</u>



Non-Integrated Accounts

(i)	Schedule of Cost of Sales	Rs.	Rs.
	Raw Material		1,40,000
	(Inventory op. balance)		
	Add: Material Purchased	3,20,000	
	Add: Freight on Material	16,000	
	Less: Purchase Returns	<u>4,800</u>	<u>3,31,200</u>
			4,71,200
	Less: Closing Raw Material Inventories		<u>1,80,000</u>
	Material used in production		2,91,200
	Direct Labour		1,68,000
	Factory Overheads		
	Indirect Labour	19,200	
	Factory Supervision	10,000	
	Repairs and Factory Upkeep	14,000	
	Heat, Light and Power	52,000	
	Rates and Taxes	4,200	
	Miscellaneous Factory Expenses	18,700	
	Depreciation of Plant	46,050	
	Depreciation of Buildings	<u>6,400</u>	<u>1,70,550</u>
	Gross Works Cost		6,29,750
	Add: Opening Work-in-Process inventory		<u>2,00,000</u>
			8,29,750
	Less: Closing Work-in-Process inventory		1,92,000
	Works Cost		6,37,750
	Add: Administration Expenses [See Schedule (iii)]		<u>18,870</u>
	Total Cost of output		6,56,620
	Add: Opening Finished Goods inventory		<u>80,000</u>
			7,36,620
	Less: Closing Finished Goods inventory		<u>1,15,000</u>
	Cost of Production of goods sold		6,21,620
	Add: Selling and Distribution Expenses [See Schedule (ii)]		<u>92,400</u>
	Cost of Sales		<u>7,14,020</u>



Cost Accounting

(ii) Schedule of Selling and Distribution Expenses		<i>Rs.</i>
Sales Commission		33,600
Sales Travelling		11,000
Sales Promotion		22,500
Distribution Deptt.—Salaries and Expenses		18,000
Heat, Light and Power		6,500
Depreciation of Buildings		<u>800</u>
		<u>92,400</u>

(iii) Schedule of Administration Expenses		<i>Rs.</i>
Office Salaries and Expenses		8,600
Depreciation of Office Appliances		870
Depreciation of Buildings		800
Heat, Light and Power		6,500
Rates and Taxes		<u>2,100</u>
		<u>18,870</u>

Illustration :

In the absence of the Chief Accountant, you have been asked to prepare a month's cost accounts for a company which operates a batch costing system fully integrated with the financial accounts. The following relevant information is provided to you:

		<i>Rs.</i>
<i>Balances at the beginning of the month:</i>		
Stores Ledger Control Account		25,000
Work-in-Progress Control Account		20,000
Finished Goods Control Account		35,000
Prepaid Production Overheads brought forward from previous month		3,000
<i>Transactions during the month:</i>		
Materials Purchased		75,000
Materials Issued:	<i>Rs.</i>	
To Production	30,000	
To Factory Maintenance	<u>4,000</u>	34,000
Materials transferred between batches		5,000



Non-Integrated Accounts

Total wages paid:	Rs.	
To Direct workers	25,000	
To Indirect workers	<u>5,000</u>	30,000
Direct wages charged to batches		20,000
Recorded non-productive time of direct workers		5,000
Selling and Distribution Overheads Incurred		6,000
Other Production Overheads Incurred		12,000
Sales		1,00,000
Cost of Finished Goods Sold		80,000
Cost of Goods completed and transferred into finished goods during the month		65,000
Physical value of work-in-progress at the end of the month		40,000

The production overhead absorption rate is 150% of direct wages charged to work-in-progress.

Required:

Prepare the following accounts for the month:

- Stores Ledger Control Account.
- Work-in-Progress Control Account.
- Finished Goods Control Account.
- Production Overhead Control Account.
- Profit and Loss Account.

Solution:

(a)		Stores Ledger Control Account	
	Rs.		Rs.
To Balance b/d	25,000	By Work in Progress Control A/c	30,000
" Creditors (or bank)	75,000	" Production Overhead Control A/c	4,000
		" Balance c/d	<u>66,000</u>
	<u>1,00,000</u>		<u>1,00,000</u>



Cost Accounting

(b) Work-in-Progress Control Account			
	<i>Rs.</i>		<i>Rs.</i>
To Balance b/d	20,000	By Finished Goods Control A/c	65,000
" Store Ledger Control A/c	30,000	" Balance c/d (Physical value)	40,000
" Wages Control A/c	20,000		
" Production Overhead Control A/c (150% of direct wages)	30,000		
" Profit & Loss A/c (Stock Gains)	<u>5,000</u>		
	<u>1,05,000</u>		<u>1,05,000</u>
(c) Finished Goods Control Account			
	<i>Rs.</i>		<i>Rs.</i>
To Balance b/d	35,000	By Cost of Goods A/c	80,000
" Work-in-Progress Control A/c	65,000	or Profit & Loss A/c	
	<u>1,00,000</u>	By Balance c/d	<u>20,000</u>
			<u>1,00,000</u>
(d) Production Overhead Control Account			
	<i>Rs.</i>		<i>Rs.</i>
To Balance b/d (Prepaid amount)	3,000	By Work-in-Progress Control A/c	30,000
" Stores Ledger Control A/c	4,000	(150% of direct wages)	
" Wages Control A/c:			
Direct Workers	5,000		
Indirect Workers	<u>5,000</u>		
" Bank	12,000		
" Profit & Loss A/c*	1,000		
(Over absorption, balancing figure)	<u>30,000</u>		<u>30,000</u>

* Alternatively the over absorbed overhead may be carried forward.



Non-Integrated Accounts

(e)	Profit & Loss Account	
	Rs.	Rs.
To Finished goods Control A/c		By Sales A/c 1,00,000
or		” Production Overhead Control A/c 1,000
Cost of goods sold A/c	80,000	” Work-in-Progress Control A/c (Stock gain) 5,000
” Selling & Distribution Overhead A/c	6,000	
” Balance c/d	<u>20,000</u>	
	<u>1,06,000</u>	<u>1,06,000</u>

Notes:

- (1) Materials transferred between batches will not affect the Control Accounts.
- (2) Non-production time of direct workers is a production overhead and therefore will not be charged to work-in-progress control A/c.
- (3) Production overheads absorbed in work-in-progress Control A/c will then equal Rs. 30,000 (150% of Rs. 20,000).
- (4) In the work-in-progress Control A/c the excess physical value of stock is taken resulting in stock gain. Stock gain is transferred to Profit & Loss A/c.

Illustration:

From the following details show the necessary accounts in the Cost Ledger

	<i>Materials</i>	<i>Work-in-Progress</i>	<i>Finished Stock</i>
	Rs.	Rs.	Rs.
Opening Balance	8,000	5,000	10,000
Closing Balance	11,000	9,000	12,000
Transactions during the period:			Rs.
Materials purchased			25,000
Wages paid			10,000
		(including Rs. 2,000 indirect)	
Overheads incurred			8,000
Overheads absorbed			9,000
Sales			50,000



Cost Accounting

Solution:

Cost Ledger General Ledger Adjustment Account

<i>Dr.</i>			<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Cost of Sales A/c	50,000	By Balance b/d	23,000
To balance c/d	32,000	By Stores Led. Control A/c	25,000
		By Wages Control A/c	10,000
		By Overheads A/c	8,000
		By Costing P & L A/c (Profit)	<u>16,000</u>
	<u>82,000</u>		<u>82,000</u>

Stores Ledger Control Account

<i>Dr.</i>			<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Balance b/d	8,000	By Work-in-Progress A/c	22,000
To Gen. Led. Adj. A/c	<u>25,000</u>	By Balance c/d	<u>11,000</u>
	<u>33,000</u>		<u>33,000</u>

Work-in-Progress Account

<i>Dr.</i>			<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Balance b/d	5,000	By Finished stock	35,000
To Stores Led. Control A/c	22,000	(Balancing figure)	
To Wages Control A/c	8,000	By Balance c/d	9,000
To Overheads A/c	<u>9,000</u>		
	<u>44,000</u>		<u>44,000</u>

Finished Stock Account

<i>Dr.</i>			<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Balance b/d	10,000	By Cost of Sales A/c	33,000
To W.I.P. A/c	35,000	(Balancing figure)	
		By Balance c/d	<u>12,000</u>
	<u>45,000</u>		<u>45,000</u>



Non-Integrated Accounts

Wages Control Account

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Gen. Led. Adj. A/c	10,000	By Work-in-Progress A/c	8,000
		By Overheads A/c	<u>2,000</u>
	<u>10,000</u>		<u>10,000</u>

Overheads Account

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To General Ledger Adjustment A/c	8,000	By W.I.P. A/c	9,000
To Wages Control A/c	<u>2,000</u>	By Costing P & L A/c	<u>1,000</u>
	<u>10,000</u>		<u>10,000</u>

Cost of Sales Account

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Finished Stock A/c	<u>33,000</u>	By Costing P & L A/c	<u>33,000</u>
	<u>33,000</u>		<u>33,000</u>

Costing P & L Account

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Cost of Sales A/c	33,000	By General Ledger	
To Overheads (Under absorbed)	1,000	Adjustment A/c (Sales A/c)	50,000
To General Ledger			
Adjustment A/c (Profit)	<u>16,000</u>		
	<u>50,000</u>		<u>50,000</u>

Illustration :

On 31st March, 2006 the following balances were extracted from the books of the Supreme Manufacturing Company:

	<i>Dr.</i>	<i>Cr.</i>
	<i>Rs.</i>	<i>Rs.</i>
Stores Ledger Control A/c	35,000	
Work-in-Progress Control A/c	38,000	



Cost Accounting

Finished Goods Control A/c	25,000	
Cost Ledger Control A/c	<u> </u>	<u>98,000</u>
	<u>98,000</u>	<u>98,000</u>

The following transactions took place in April 2006 :

	Rs.
<i>Raw Materials :</i>	
Purchased	95,000
Returned to suppliers	3,000
Issued to Production	98,000
Returned to stores	3,000
Productive wages	40,000
Indirect labour	25,000
Factory overhead expenses incurred	50,000
Selling and Administrative expenses	40,000
Cost of finished goods transferred to warehouse	2,13,000
Cost of Goods sold	2,10,000
Sales	3,00,000

Factory overheads are applied to production at 150% of direct wages, any under/over absorbed overhead being carried forward for adjustment in the subsequent months. All administrative and selling expenses are treated as period costs and charged off to the Profit and Loss Account of the month in which they are incurred.

Show the following Accounts:

- (a) Cost Ledger Control A/c
- (b) Stores Ledger Control A/c
- (c) Work-in-Progress Control A/c
- (d) Finished Goods Stock Control A/c
- (e) Factory Overhead Control A/c
- (f) Costing Profit and Loss A/c
- (g) Trial Balance as at 30th April, 2006.



Non-Integrated Accounts

Solution:

(a) Cost Ledger Control A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Costing Profit & Loss A/c (Sales)	3,00,000	By Balance b/d	98,000
" Stores Ledger Control A/c	3,000	" Stores Ledger Control A/c	95,000
" Balance c/d	95,000	" Wages Control A/c	65,000
		(Productive wages + Indirect wages)	
		" Factory Overhead Control A/c	50,000
		" Selling & Admn. Overhead Expenses	40,000
		" Costing Profit & Loss A/c	<u>50,000</u>
	<u>3,98,000</u>		<u>3,98,000</u>

(b) Stores Ledger Control A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Balance b/d	35,000	By Cost Ledger Control A/c	3,000
" Cost Ledger Control A/c	95,000	" Work-in-Progress Control A/c	98,000
" Work-in-Progress Control A/c	<u>3,000</u>	" Balance c/d	<u>32,000</u>
	<u>1,33,000</u>		<u>1,33,000</u>

(c) Work-in-Progress Control A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Balance b/d	38,000	By Stores Ledger Control A/c	3,000
" Stores Ledger Control A/c	98,000	" Finished Goods A/c	2,13,000
" Wages Control A/c	40,000	" Balance c/d	20,000
" Factory Overhead control A/c	<u>60,000</u>		
	<u>2,36,000</u>		<u>2,36,000</u>

(d) Finished Goods Control A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Balance b/d	25,000	By Cost of goods sold A/c	2,10,000
" Work in Progress Control A/c	<u>2,13,000</u>	" Balance c/d	<u>28,000</u>
	<u>2,38,000</u>		<u>2,38,000</u>



Cost Accounting

(e) Factory Overhead Control A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Wage Control A/c (Indirect Labour)	25,000	By Work-in-Progress A/c	60,000
" Cost Ledger Control A/c	<u>50,000</u>	" Balance c/d	<u>15,000</u>
	<u>75,000</u>		<u>75,000</u>

(f) Costing Profit and Loss A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Cost of Goods Sold A/c	2,10,000	By Cost Ledger Control A/c	
" Selling and Admn. Overhead A/c	40,000	(Sales)	3,00,000
" Cost Ledger Control A/c (Costing profit)	<u>50,000</u>		
	<u>3,00,000</u>		<u>3,00,000</u>

(g) Trial Balance (as at 30th April, 2006)

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Stores Ledger Control A/c	32,000		
" Work-in-Progress Control A/c	20,000		
" Finished Goods Control A/c	28,000		
" Factory Overhead Control A/c	15,000		
" Cost Ledger Control A/c	<u>95,000</u>		<u>95,000</u>
	<u>95,000</u>		<u>95,000</u>

Working Notes:

(1) Wages Control A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Cost Ledger Control A/c	65,000	By Work-in-Progress Control A/c	40,000
	<u>65,000</u>	By Factory Overhead Control A/c	<u>25,000</u>
			<u>65,000</u>



Non-Integrated Accounts

(2) Cost of Goods Sold A/c			
<i>Dr.</i>	<i>Rs.</i>		<i>Cr.</i>
To Finished Goods Control A/c	<u>2,10,000</u>	By Costing Profit & Loss A/c	<u>2,10,000</u>
	<u>2,10,000</u>		<u>2,10,000</u>

(3) Selling & Administrative Expenses A/c			
<i>Dr.</i>	<i>Rs.</i>		<i>Cr.</i>
To Cost Ledger Control A/c	<u>40,000</u>	By Costing Profit & Loss A/c	<u>40,000</u>
	<u>40,000</u>		<u>40,000</u>

Illustration:

Acme Manufacturing Co. Ltd. opens the costing records, with the balances as on 1st July, 2005 as follows :

	<i>Rs.</i>	<i>Rs.</i>
Material control A/c	1,24,000	
Work-in-progress A/c	62,500	
Finished Goods A/c	1,24,000	
Production Overheads A/c	8,400	
Administration Overhead		12,000
Selling and Distribution Overhead A/c	6,250	
General Ledger Control A/c		<u>3,13,150</u>
	<u>3,25,150</u>	<u>3,25,150</u>

The following are the transactions for the quarter ended 30th September 2005 :

	<i>Rs.</i>
Materials purchased	4,80,100
Materials issued to jobs	4,77,400
Materials to works maintenance	41,200
Materials to administration office	3,400
Materials to selling department	7,200
Wages direct	1,49,300
Wages indirect	65,000
Transportation for incoming materials	8,400



Cost Accounting

Production overheads	2,42,250
Absorbed overheads production	3,59,100
Administration overheads	74,000
Administration allocation to production	52,900
Administration allocation to sales	14,800
Sales overheads	64,200
Sales overheads absorbed	82,000
Finished goods produced	9,58,400
Finished goods sold	9,77,300
Sales Realisation	14,43,000

Make up the various accounts as you envisage in the Cost Ledger and prepare a Trial Balance as at 30th September, 2005.

Solution:

Acme Manufacturing Co. Ltd. Cost Ledger Material Control A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Balance b/d	1,24,000	By Work-in-progress	4,77,400
To General ledger control A/c (Purchases)	4,80,100	By Production overheads A/c	41,200
		By Administration overhead A/c	3,400
		By Selling and distribution overhead A/c	7,200
		By Balance c/d	<u>74,900</u>
	<u>6,04,100</u>		<u>6,04,100</u>
To Balance b/d	74,900		

Wages Control A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To General ledger control A/c (Rs. 1,49,300 + Rs. 65,000)	2,14,300	By Work-in-progress	1,49,300
		" Production overheads A/c	<u>65,000</u>
	<u>2,14,300</u>		<u>2,14,300</u>



Non-Integrated Accounts

Production Overhead A/c

<i>Dr.</i>		<i>Rs.</i>		<i>Cr.</i>		<i>Rs.</i>
To Balance b/d		8,400	By Work-in-progress A/c		3,59,100	
To General Ledger control A/c:			" Balance c/d		6,150	
Transportation	8,400					
Production overheads	<u>2,42,250</u>	2,50,650				
To Wages control A/c		65,000				
To Material control A/c		<u>41,200</u>				
		<u>3,65,250</u>				<u>3,65,250</u>
To Balance b/d	6,150					

Administration Overhead A/c

<i>Dr.</i>		<i>Rs.</i>		<i>Cr.</i>		<i>Rs.</i>
To General ledger control A/c		74,000	By Balance b/d		12,000	
To Material control A/c		3,400	" Work-in-progress A/c		52,900	
To Balance c/d		<u>2,300</u>	" Cost of sales A/c		<u>14,800</u>	
		<u>79,700</u>			<u>79,700</u>	
			By Balance b/d		2,300	

Selling and Distribution Overhead A/c

<i>Dr.</i>		<i>Rs.</i>		<i>Cr.</i>		<i>Rs.</i>
To Balance b/d		6,250	By Cost of Sales A/c		82,000	
To General ledger control A/c		64,200				
To Material control A/c		7,200				
To Balance c/d		<u>4,350</u>				
		<u>82,000</u>				<u>82,000</u>
			By balance b/d		4,350	



Cost Accounting

Work-in-Progress A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Balance b/d	62,500	By Finished Goods A/c	9,58,400
" Material control A/c	4,77,400	" Balance c/d	1,42,800
" Wages control A/c	1,49,300		
" Production overheads A/c	3,59,100		
" Administration overhead A/c	<u>52,900</u>		
	<u>11,01,200</u>		<u>11,01,200</u>
To Balance b/d	1,42,800		

Finished Goods A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Balance c/d	1,24,000	By Cost of sales A/c	9,77,300
" Work-in-progress	<u>9,58,400</u>	By Balance c/d	<u>1,05,100</u>
	<u>10,82,400</u>		<u>10,82,400</u>
To Balance b/d	1,05,100		

Cost of Sales A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Finished goods A/c	9,77,300	By Costing profit & loss A/c	10,74,100
" Administration overheads A/c	14,800		
" Selling & distribution overheads A/c	<u>82,000</u>		
	<u>10,74,100</u>		<u>10,74,100</u>

General Ledger Control A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Costing profit and loss A/c	14,43,000	By Balance b/d	3,13,150
To Balance c/d	3,22,300	" Material control A/c	4,80,100
		" Wages Control A/c	2,14,300
		" Production overhead A/c	2,50,650



Non-Integrated Accounts

	" Administration overhead A/c	74,000
	" Selling and distribution overhead A/c	64,200
	" Costing profit & loss A/c	<u>3,68,900</u>
		<u>17,65,300</u>
By Balance b/d	3,22,300	<u>17,65,300</u>

Costing Profit & Loss A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>
To Cost of sales A/c	10,74,100	By General ledger control A/c
" General ledger control A/c (Profit for the period)	3,68,900	(Sales) 14,43,000
	<u>14,43,000</u>	<u>14,43,000</u>

Trial Balance as at 30th September, 2005

	<i>Dr.</i>	<i>Cr.</i>
	<i>Rs.</i>	<i>Rs.</i>
Material control A/c	74,900	
Production overhead A/c	6,150	
Administration overhead A/c		2,300
Selling and distribution overhead A/c		4,350
Work-in-progress A/c	1,42,800	
Finished goods A/c	1,05,100	
General ledger control A/c		<u>3,22,300</u>
	<u>3,28,950</u>	<u>3,28,950</u>

Illustration:

(a) A fire destroyed some accounting records of a company. You have been able to collect the following from the spoilt papers/records and as a result of consultation with accounting staff in respect of January, 2006:



Cost Accounting

(i) Incomplete Ledger Entries:

Raw-Materials A/c

	Rs.	Rs.
Beginning Inventory	32,000	

Work-in-Progress A/c

	Rs.	Rs.
Beginning Inventory	9,200	Finished Stock 1,51,000

Creditors A/c

	Rs.	Rs.
Closing Balance	19,200	Opening Balance 16,400

Manufacturing Overheads A/c

	Rs.	Rs.
Amount Spent	29,600	

Finished Goods A/c

	Rs.	Rs.
Opening Inventory	24,000	Closing Inventory 30,000

(ii) Additional Information:

- (1) The cash-book showed that Rs. 89,200 have been paid to creditors for raw-material.
- (2) Ending inventory of work-in-progress included material Rs. 5,000 on which 300 direct labour hours have been booked against wages and overheads.
- (3) The job card showed that workers have worked for 7,000 hours. The wage rate is Rs. 10 per labour hour.
- (4) Overhead recovery rate was Rs. 4 per direct labour hour.

You are required to complete the above accounts in the cost ledger of the company:



Non-Integrated Accounts

Solution:

(a)

<i>Dr.</i>	Creditors A/c	<i>Cr.</i>
	<i>Rs.</i>	<i>Rs.</i>
To Cash & Bank (1) 89,200		By Balance b/d 16,400
To Balance c/d	<u>19,200</u>	By Purchases (Balancing figure) <u>92,000</u>
	<u>1,08,400</u>	<u>1,08,400</u>

<i>Dr.</i>	Work-in-progress A/c	<i>Cr.</i>
	<i>Rs.</i>	<i>Rs.</i>
To Balance b/d 9,200		By Finished stock 1,51,000
To Raw-materials 53,000		By Balance c/d :
(Balancing figure)		Material (2) : Rs. 5,000
To Wages (3) 70,000		Labour (2) : Rs. 3,000
(7,000 hrs. × Rs. 10)		(300 hrs. × 10 hrs.)
To Overheads (4) 28,000		Overheads (2) : Rs. 1,200 9,200
(7,000 hrs. × Rs. 4)		(300 hrs. × 4 hrs.)
	<u>1,60,200</u>	<u>1,60,200</u>

<i>Dr.</i>	Raw-materials A/c	<i>Cr.</i>
	<i>Rs.</i>	<i>Rs.</i>
To Balance b/d 32,000		By Work-in-progress 53,000
To Purchases 92,000		(As above)
(As above)		By Balance c/d <u>71,000</u>
	<u>1,24,000</u>	<u>1,24,000</u>

<i>Dr.</i>	Finished Goods A/c	<i>Cr.</i>
	<i>Rs.</i>	<i>Rs.</i>
To Balance b/d 24,000		By Cost of sales 1,45,000
To W.I.P. 1,51,000		(Balancing figure)
(As above)		By Balance c/d <u>30,000</u>
	<u>1,75,000</u>	<u>1,75,000</u>



Cost Accounting

Dr.	Manufacturing Overheads A/c		Cr.
	Rs.		Rs.
To Sundries	29,600	By W.I.P. (7000 hrs. × Rs. 4)	28,000
		By Under-absorbed Overheads A/c	<u>1,600</u>
	<u>29,600</u>		<u>29,600</u>

Illustration :

The following incomplete accounts are furnished to you for the month ended 31st October, 2005.

Stores Control Account

1.10.05 To Balance	Rs. 54,000
--------------------	------------

Work in Progress Control Account

1.10.05 To Balance	Rs. 6,000
--------------------	-----------

Finished Goods Control Account

1.10.05 To Balance	Rs. 75,000
--------------------	------------

Factory Overheads Control Account

Total debits for October, 2005	Rs. 45,000
--------------------------------	------------

Factory Overheads Applied Account

--	--

Cost of Goods Sold Account

--	--

Creditors for Purchases Account

	1.10.05 by Balance	Rs. 30,000
--	--------------------	------------



Non-Integrated Accounts

Additional information:

- (i) The factory overheads are applied by using a budgeted rate based on Direct Labour Hours. The budget for overheads for 2005 is Rs. 6,75,000 and the budget of direct labour hours is 4,50,000.
- (ii) The balance in the account of creditors for purchases on 31.10.05 is Rs. 15,000 and the payments made to creditors in October, 2005 amount to Rs. 1,05,000.
- (iii) The finished goods inventory as on 31st October, 2005 is Rs. 66,000.
- (iv) The cost of goods sold during the month was Rs. 1,95,000.
- (v) On 31st October, 2005 there was only one unfinished job in the factory. The cost records show that Rs. 3,000 (1,200 direct labour hours) of Direct Labour Cost and Rs. 6,000 of Direct Material Cost had been charged.
- (vi) A total of 28,200 direct labour hours were worked in October, 2005. All factory workers earn same rate of pay.
- (vii) All actual factory overheads incurred in October, 2005 have been posted.

You are required to find:

- (a) Materials purchased during October, 2005.
- (b) Cost of goods completed in October, 2005.
- (c) Overheads applied to production in October, 2005.
- (d) Balance of work in progress on 31st October, 2005.
- (e) Direct materials consumed during October, 2005.
- (f) Balance of Stores Control Account on 31st October, 2005.
- (g) Overabsorbed or underabsorbed overheads for October, 2005.



Cost Accounting

Solution :

Working Notes :

(i) Overhead recovery rate per direct labour hour :

Budgeted factory overheads : Rs. 6,75,000

Budgeted direct labour hours : 4,50,000

Overhead recovery rate = $\frac{\text{Budgeted factory overheads}}{\text{Budgeted direct labour hours}}$

$$= \frac{\text{Rs.6,75,000}}{4,50,000 \text{ hours}}$$

= Rs. 1.50 per direct labour

(ii) Direct wage rate per hour :

Direct labour cost of WIP : Rs. 3,000

(on 31st October 2005)

Direct labour hours of WIP : 1,200 hours

Direct wage rate per hour = $\frac{\text{Direct labour cost on WIP}}{\text{Direct labour hours on WIP}}$

$$= \frac{\text{Rs.3,000}}{1,200 \text{ hours}} = \text{Rs.2.50}$$

(iii) Total direct wages charged to production:

Total direct labour hours spent on production × Direct wage rate per hour

= 28,200 hours × Rs. 2.50

= Rs. 70,500



Non-Integrated Accounts

(a) Material purchased during October, 2005

	Rs.
Payment made to creditors	1,05,000
Add : Closing balance in the account of creditors for purchase	<u>15,000</u>
	1,20,000
Less : Opening balance	30,000
Material purchased	<u>90,000</u>

(b) Cost of goods completed in October, 2005

	Rs.
The cost of goods sold during the month	1,95,000
Add : Closing finished goods inventory	66,000
	2,61,000
Less : Opening finished goods inventory	75,000
Cost of goods completed during the month	<u>1,86,000</u>

(c) Overhead applied to production in October, 2005

= 28,200 hours × Rs. 1.50 = Rs. 42,300

(d) Balance of Work-in-progress on 31st October, 2005

	Rs.
Direct material cost	6,000
Direct labour cost	3,000
Overheads (1,200 hours × Rs. 1.50)	<u>1,800</u>
	<u>10,800</u>

(e) Direct material consumed during October, 2005

Rs. 75,000

(Refer to following Account)



Cost Accounting

Dr.	Work in progress Control A/c		Cr.
	Rs.		Rs.
1.10.05 To Opening Balance	6,000	By Finished goods	1,86,000
" To Direct wages	70,500	(As per (b) above)	
[Refer to Working Note (iii)]		By Balance of WIP	10,800
To Factory Overheads	42,300	(As per (d) above)	
[As per (c) above]			
To Balancing figure	78,000		
(Material consumed)			
	<u>1,96,800</u>		<u>1,96,800</u>

(f) **Balance of Stores Control Account on 31st October, 2005** Rs. 66,000

(Refer to following Account)

Dr.	Stores Control Account		Cr.
	Rs.		Rs.
1.10.05 To Balance	54,000	31.10.05 By W.I.P. Control A/c	78,000
To Creditors A/c	90,000	(As per (e) above)	
for materials purchased		By Balance c/d	66,000
(As per (a) above)		(Balancing figure)	
	<u>1,44,000</u>		<u>1,44,000</u>

(g) **Over-absorbed or under-absorbed overheads for October, 2005** : Balance in Factory Overhead Account below showing that Rs. 2,700 is underabsorbed.

Dr.	Factory Overhead Account		Cr.
	Rs.		Rs.
To General Ledger Adj. A/c	45,000	31.10.99 By Factory overhead applied	42,300
(Total debits for Oct. 2005)		[Refer to (c) above]	
		Balance (Under-absorbed)	<u>2,700</u>
	<u>45,000</u>		<u>45,000</u>

5.3 INTEGRATED (OR INTEGRAL) ACCOUNTING SYSTEM

Integrated Accounts is the name given to a system of accounting, whereby cost and financial accounts are kept in the same set of books. Obviously, then there will be no separate sets of books for Costing and Financial records. Integrated accounts provide or meet out fully the



Non-Integrated Accounts

information requirement for Costing as well as for Financial Accounts. For Costing it provides information useful for ascertaining the Cost of each product, job, process, operation of any other identifiable activity and for carrying necessary analysis. Integrated accounts provide relevant information which is necessary for preparing profit and loss account and the balance sheets as per the requirement of law and also helps in exercising effective control over the liabilities and assets of its business.

5.3.1 Advantages : The main advantages of Integrated Accounts are as follows :

- (a) The question of reconciling costing profit and financial profit does not arise, as there is one figure of profit only.
- (b) Due to use of one set of books, there is a significant extent of saving in efforts made.
- (c) No delay is caused in obtaining information as it is provided from books of original entry.
- (d) It is economical also as it is based on the concept of "Centralisation of Accounting function".

5.3.2 Essential pre-requisites for Integrated Accounts: The essential pre-requisites for integrated accounts include the following steps:

1. The management's decision about the extent of integration of the two sets of books. Some concerns find it useful to integrate up to the stage of primary cost or factory cost while others prefer full integration of the entire accounting records.
2. A suitable coding system must be made available so as to serve the accounting purposes of financial and cost accounts.
3. An agreed routine, with regard to the treatment of provision for accruals, prepaid expenses, other adjustments necessary for preparation of interim accounts.
4. Perfect coordination should exist between the staff responsible for the financial and cost aspects of the accounts and an efficient processing of accounting documents should be ensured.

Under this system there is no need for a separate cost ledger. Of course, there will be a number of subsidiary ledgers; in addition to the useful Customers' Ledger and the Bought Ledger, there will be: (a) Stores Ledger; (b) Stock Ledger and (c) Job Ledger.

Also, control accounts are maintained in the financial ledger for each one of these. The nature of these will be the same as discussed above. But there will be no General Ledger Adjustment Account and the entries will be passed in the way these are usually passed in the financial books when expenses are incurred. When these are apportioned or allocated to cost units, the



Cost Accounting

entries are made on similar lines as outlined above for the Cost Ledger. If the illustration given below is to be worked out on integrated account basis, the journal entries would be as follows:

Illustration :

Journalise the following transactions assuming that cost and financial transactions are integrated:

	Rs.
Raw materials purchased	2,00,000
Direct materials issued to production	1,50,000
Wages paid (30% indirect)	1,20,000
Wages charged to production	84,000
Manufacturing expenses incurred	84,000
Manufacturing overhead charged to production	92,000
Selling and distribution costs	20,000
Finished products (at cost)	2,00,000
Sales	2,90,000
Closing stock	<i>Nil</i>
Receipts from debtors	69,000
Payments to creditors	1,10,000

Solution:

Journal

	<i>Dr.</i>	<i>Cr.</i>
	<i>Rs.</i>	<i>Rs.</i>
Stores Ledger Control A/c	Dr. 2,00,000	
To Creditors A/c		2,00,000
(Material Purchased)		
Work-in-Progress Control A/c	Dr. 1,50,000	
To Stores Ledger Control A/c		1,50,000
(Materials issued to production)		
Wages Control A/c	Dr. 1,20,000	
To Bank A/c		1,20,000
(Wages paid)		



Non-Integrated Accounts

Factory Overhead Control A/c	Dr.	36,000	
To Wages Control A/c			36,000
(30% of wages paid being indirect charged to overhead)			
Work-in-Progress Control A/c	Dr.	84,000	
To Wages Control A/c			84,000
(Direct wages charged to production)			
Factory Overhead Control A/c	Dr.	84,000	
To Bank A/c			84,000
(Manufacturing overhead incurred)			
Work-in-Progress Control A/c	Dr.	92,000	
To Factory overhead charged A/c			92,000
(Manufacturing overhead charged to production)			
Selling and Distribution Overhead Control A/c	Dr.	20,000	
To Bank A/c			20,000
(Selling and distribution costs incurred)			
Finished Goods Ledger Control A/c	Dr.	2,00,000	
To Work-in-Progress Control A/c			2,00,000
(Cost of goods finished)			
Cost of Sales A/c	Dr.	2,20,000	
To Finished Stock Ledger Control A/c			2,00,000
To Selling and Distribution Control A/c			20,000
(Costs of goods sold)			
Sundry Debtors A/c	Dr.	2,90,000	
To Sales A/c			2,90,000
(Finished stock sold)			
Bank A/c	Dr.	69,000	
To Sundry Debtors A/c			69,000
(Receipts from debtors)			
Sundry (Creditors) A/c	Dr.	1,10,000	



Cost Accounting

To Bank A/c	1,10,000
(Payment made to creditors)	

Illustration :

Dutta Enterprises operates an integral system of accounting. You are required to pass the Journal Entries for the following transactions that took place for the year ended 30th June, 2006.

(Narrations are not required.)

	<i>Rs.</i>
Raw materials purchased (50% on Credit)	6,00,000
Materials issued to production	4,00,000
Wages paid (50% Direct)	2,00,000
Wages charged to production	1,00,000
Factory overheads incurred	80,000
Factory overheads charged to production	1,00,000
Selling and distribution overheads incurred	40,000
Finished goods at cost	5,00,000
Sales (50% Credit)	7,50,000
Closing stock	Nil
Receipts from debtors	2,00,000
Payments to creditors	2,00,000

Solution :

Journal Entries under integrated system of accounting for transactions taking place for the year ended on 30th June, 2006

	<i>Dr.</i>	<i>Cr.</i>
	<i>Rs.</i>	<i>Rs.</i>
Stores Ledger Control A/c	Dr. 6,00,000	
To Sundry Creditors Account		3,00,000
To Cash or Bank Account		3,00,000
Work-in-Progress Control A/c	Dr. 4,00,000	
To Stores Ledger Control A/c		4,00,000
Wages Control A/c	Dr. 2,00,000	
To Cash or Bank Account		2,00,000



Non-Integrated Accounts

Work-in-Progress Control A/c	Dr. 1,00,000	
To Wages Control A/c		1,00,000
Factory Overhead Control A/c	Dr.1,00,000	
To Wages Control A/c		1,00,000
Factory Overhead Control A/c	Dr. 80,000	
To Cash or Bank A/c		80,000
Work-in-Progress Control A/c	Dr.1,00,000	
To Factory Overhead Control A/c		1,00,000
Selling and Distribution Overhead Control A/c	Dr. 40,000	
To Cash or Bank A/c		40,000
Finished Stock Ledger Control A/c	Dr.5,00,000	
To Work-in-Progress Control A/c		5,00,000
Cost of Sales A/c	Dr.5,40,000	
To Finished Stock Ledger Control A/c		5,00,000
To Selling and Distribution Control A/c		40,000
Sundry Debtors Account	Dr.3,75,000	
Cash or Bank Account	Dr.3,75,000	
To Sales Account		7,50,000
Cash or Bank A/c	Dr.2,00,000	
To Sundry Debtors A/c		2,00,000
Sundry Creditors A/c	Dr.2,00,000	
To Cash or Bank A/c		2,00,000



Cost Accounting

Illustration :

Bangalore Petrochemicals Co. keeps books on integrated accounting system. The following balances appear in the books as on 1st January, 2005.

	<i>Dr.</i>	<i>Cr.</i>
	<i>Rs.</i>	<i>Rs.</i>
Stores control A/c	18,000	
Work-in-Progress A/c	17,000	
Finished goods A/c	13,000	
Bank A/c	10,000	
Creditors A/c		8,000
Fixed assets A/c	55,000	
Debtors A/c	12,000	
Share capital A/c		80,000
Depreciation provision A/c		5,000
Profit and loss A/c		<u>32,000</u>
	<u>1,25,000</u>	<u>1,25,000</u>

Transaction for the year ended 31st Dec., 2005 were as given below:

	<i>Rs.</i>	<i>Rs.</i>
Wages-direct	87,000	
Wages-indirect	<u>5,000</u>	92,000
Purchase of materials (on credit)		1,00,000
Materials issued to production		1,10,000
Materials for repairs		2,000
Goods finished during the year (at cost)		2,15,000
Sales (credit)		3,00,000
Cost of goods sold		2,20,000
Production overhead absorbed		48,000
Production overhead incurred		40,000
Administration overhead incurred		12,000
Selling overhead incurred		14,000
Payments of creditors		1,01,000
Payments of debtors		2,90,000
Depreciation of machinery		1,300
Prepaid rent (included in factory overheads)		300



Non-Integrated Accounts

Write up accounts in the integrated ledger and prepare a trial balance.

Solution :

Stores Control Account

<i>Dr.</i>	<i>Cr.</i>
2005	2005
<i>Rs.</i>	<i>Rs.</i>
Jan. 1 To Balance b/d 18,000	Dec. 31 By Work-in-Progress A/c 1,10,000
Dec. 31 " Creditors A/c 1,00,000	" Production overheads A/c 2,000
	" Balance c/d <u>6,000</u>
	<u>1,18,000</u>
2006	
Jan. 1 To Balance b/d 6,000	

Wages Control Account

2005	<i>Rs.</i>	2005	<i>Rs.</i>
Dec. 31 To Bank A/c 92,000		Dec. 31 By Work-in-Progress A/c 87,000	
		" Production overheads A/c 5,000	
	<u>92,000</u>		<u>92,000</u>

Work-in-Progress A/c

2005	<i>Rs.</i>	2005	<i>Rs.</i>
Jan. 1 To Balance b/d 17,000		Dec. 31 By Finished goods A/c 2,15,000	
Dec. 31 " Stores control A/c 1,10,000		" Balance c/d 47,000	
" Wages control A/c 87,000			
" Production overheads A/c 48,000			
	<u>2,62,000</u>		<u>2,62,000</u>
2006			
Jan. 1 To Balance b/d 47,000			

Production Overhead A/c

2005	<i>Rs.</i>	2005	<i>Rs.</i>
Dec. 31 To Wages Control A/c 5,000		Dec. 31 By Work-in-Progress A/c 48,000	
" Stores Control A/c 2,000		" Prepaid Rent A/c 3,00	
" Bank A/c 40,000			
" Depreciation Provision 1,300			
	<u>48,300</u>		<u>48,300</u>



Cost Accounting

Finished Goods A/c

2005		Rs.	2005		Rs.
Jan. 1	To Balance b/d	13,000	Dec. 31	By Cost of Sales A/c	2,20,000
Dec. 31	" Work-in-Progress	2,15,000		" Balance c/d	20,000
	" Admn. Overhead	<u>12,000</u>			
		<u>2,40,000</u>			<u>2,40,000</u>
2006					
Jan. 1	" Balance b/d	20,000			

Administration Overheads A/c

2005		Rs.	2005		Rs.
Dec. 31	To Bank A/c	<u>12,000</u>	Dec. 31	By Finished Goods A/c	<u>12,000</u>
		<u>12,000</u>			<u>12,000</u>

Cost of Sales A/c

2005		Rs.	2005		Rs.
Dec. 31	To Finished Goods A/c	2,20,000	Dec. 31	By Sales A/c	2,34,000
	" Selling and Dist. Overheads A/c	<u>14,000</u>			
		<u>2,34,000</u>			<u>2,34,000</u>

Selling and Distribution Overheads A/c

2005		Rs.	2005		Rs.
Dec. 31	To Bank A/c	14,000	Dec. 31	By Cost of Sales A/c	14,000
		14,000			14,000

Sales A/c

2005		Rs.	2005		Rs.
Dec. 31	To Cost of Sales	2,34,000	Dec. 31	By Debtors A/c	
	" P & L A/c (Profit)	<u>66,000</u>		(Cr. Sales)	<u>3,00,000</u>
		<u>3,00,000</u>			<u>3,00,000</u>



Non-Integrated Accounts

Prepaid Rent A/c

2005	Rs.	2005	Rs.
Dec. 31 To Production Overheads	<u>300</u>	Dec. 31 By Balance c/d	<u>300</u>
	<u>300</u>		<u>300</u>
2006			
Jan. 1 To Balance b/d	300		

Depreciation Provision A/c

2005	Rs.	2005	Rs.
Dec. 31 To Balance c/d	6,300	Jan. 1 By Balance b/d	5,000
	<u>6,300</u>	2005	
		Dec. 31 " Production Overhead A/c	<u>1,300</u>
			<u>6,300</u>
		2006	
		Jan. 1 By Balance b/d	6,300

Profit and Loss A/c

2005	Rs.	2005	Rs.
Dec. 31 To Balance c/d	98,000	Dec. 31 By Sales A/c	66,000
	<u>98,000</u>	" Profit b/d (last year)	<u>32,000</u>
			<u>98,000</u>
		2006	
		Jan. 1 By Balance b/d	98,000

Debtors A/c

2005	Rs.	2005	Rs.
Jan. 1 To Balance b/d	12,000	Dec. 31 By Bank A/c	2,90,000
Dec. 31 To Sales	<u>3,00,000</u>	By Balance c/d	<u>22,000</u>
	<u>3,12,000</u>		<u>3,12,000</u>
2006			
Jan. 1 To Balance b/d	22,000		



Cost Accounting

Creditors A/c

2005		Rs.	2005		Rs.
Dec. 31 To Bank		1,01,000	Jan. 1 By Balance b/d		8,000
	To Balance c/d	<u>7,000</u>	Dec. 31 By Stores Control A/c		<u>1,00,000</u>
		<u>1,08,000</u>			<u>1,08,000</u>
2006					
Jan. 1	By Balance b/d	7,000			

Bank A/c

2005		Rs.	2005		Rs.
Jan. 1 To Balance b/d		10,000	Dec. 31 By Creditors		1,01,000
Dec. 31 " Debtors		2,90,000	" Wages Control A/c		92,000
			" Production Overhead A/c		40,000
			" Admn. Overhead A/c		12,000
			" Selling & Distribution Overhead A/c		14,000
			" Balance c/d		<u>41,000</u>
		<u>3,00,000</u>			<u>3,00,000</u>
2006					
Jan. 1	To Balance b/d	41,000			

Fixed Assets A/c

2005		Rs.	2005		Rs.
Jan. 1 To Balance b/d		<u>55,000</u>	Dec. 31 By Balance c/d		<u>55,000</u>
		<u>55,000</u>			<u>55,000</u>
2006					
Jan. 1	To Balance b/d	55,000			

Share Capital A/c

2005		Rs.	2005		Rs.
Dec. 31 To Balance c/d		<u>80,000</u>	Jan. 1 By Balance b/d		<u>80,000</u>
		<u>80,000</u>			<u>80,000</u>
2006					
Jan. 1	By Balance b/d	80,000			



Non-Integrated Accounts

Trial Balance As on 31st December, 2005

	<i>Dr.</i>	<i>Cr.</i>
	<i>Rs.</i>	<i>Rs.</i>
Stores Control A/c	6,000	
Work-in-Progress A/c	47,000	
Finished Goods A/c 20,000		
Bank A/c	41,000	
Creditors A/c		7,000
Fixed Assets A/c	55,000	
Debtors A/c	22,000	
Share Capital A/c		80,000
Depreciation Provision A/c		6,300
Profit and Loss A/c		98,000
Prepaid Rent A/c	300	
	<u>1,91,300</u>	<u>1,91,300</u>

Illustration:

A company operates on historic job cost accounting system, which is not integrated with the financial accounts. At the beginning of a month, the opening balances in cost ledger were:

	<i>Rs. (in lakhs)</i>
Stores Ledger Control Account	80
Work-in-Progress Control Account	20
Finished Goods Control Account	430
Building Construction Account	10
Cost Ledger Control Account	540
During the month, the following transaction took place:	
Materials	
– Purchased	40
Issued to production	50
Issued to general maintenance	6
Issued to building construction	4
Wages	
– Gross wages paid	150



Cost Accounting

	Indirect wages	40
	For building construction	10
Works Overheads	– Actual amount incurred	160
	(excluding items shown above)	
	Absorbed in building construction	20
	Under absorbed	8
Royalty paid		5
Selling, distribution and administration overheads		25
Sales		450

At the end of the month, the stock of raw material and work-in-progress was Rs. 55 lakhs and Rs. 25 lakhs respectively. The loss arising in the raw material accounts is treated as factory overheads. The building under construction was completed during the month. Company's gross profit margin is 20% on sales.

Prepare the relevant control accounts to record the above transactions in the cost ledger of the company.

Solution:

<i>Dr.</i>	Cost Ledger Control Act		<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Costing P & L A/c	450	By Balance b/d	540
To Stores Ledger Control A/c	55	By Stores Ledger Control A/c	40
To WIP Control A/c	25	By Wages Control A/c	150
To Building Const. A/c	44	By Works Overhead Control A/c	160
To Finished Goods Control A/c	403	By Royalty A/c	5
		By Selling, Distribution and Administration Overheads A/c	25
		By Costing Profit & Loss A/c	<u>57</u>
	<u>977</u>		<u>977</u>



Non-Integrated Accounts

<i>Dr.</i>	Stores Ledger Control A/c		<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Balance b/d	80	By WIP Control A/c	50
To Cost Ledger Control A/c	40	By Works Overhead Control A/c	6
		By Building Const. A/c	4
		By Closing Balance	4
		By Works Overhead Control A/c	5
		(Loss)	
	<u>120</u>		<u>120</u>

<i>Dr.</i>	Work-in-Progress Control A/c		<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Balance b/d	20	By Finished Goods Control A/c	333
To Stores Ledger Control A/c	50	By Closing Balance	25
To Wage Control A/c	100		
To Works Overhead Control A/c	183		
To Royalty A/c	<u>5</u>		
	<u>358</u>		<u>358</u>

<i>Dr.</i>	Works Overhead Control A/c		<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Stores Ledger Control A/c	6	By Building Const. A/c	20
To Wage Control A/c	40	By WIP Control A/c	183
To Cost Ledger Control A/c	160	By Balance (Costing P & L A/c)	8
To Stores Ledger Control A/c (Loss)	<u>5</u>		
	<u>211</u>		<u>211</u>

<i>Dr.</i>	Wages Control A/c		<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Cost Ledger Control A/c	150	By Works Overhead Control A/c	40
		By Building Const. A/c	10
		By WIP Control A/c	<u>100</u>
	<u>150</u>		<u>150</u>



Cost Accounting

<i>Dr.</i>	Royalty A/c		<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Cost Ledger Control A/c	<u>5</u>	By WIP Control A/c	<u>5</u>
	<u>5</u>		<u>5</u>
<i>Dr.</i>	Cost of Goods Sold A/c		<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Finished Goods Control A/c	<u>360</u>	By Cost of Sales A/c	<u>360</u>
	<u>360</u>		<u>360</u>
<i>Dr.</i>	Selling, Distribution and Administration Overhead A/c		<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Cost Ledger Control A/c	<u>25</u>	By Cost of Sales A/c	<u>25</u>
	<u>25</u>		<u>25</u>
<i>Dr.</i>	Finished Goods Control A/c		<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Balance b/d	430	By Cost of Goods Sold A/c	360
		<i>(Refer to Working Note)</i>	
To WIP Control A/c	<u>333</u>	By Balance	<u>403</u>
	<u>763</u>		<u>763</u>
<i>Dr.</i>	Cost of Sales A/c		<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Cost of Goods Sold A/c	360	By Costing P & L A/c	385
To Selling, distribution and administration overhead A/c	<u>25</u>		<u>385</u>
	<u>385</u>		<u>385</u>



Non-Integrated Accounts

<i>Dr.</i>	Costing P & L A/c		<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Cost of Sales A/c	385	By Cost Ledger Control A/c	450
To Works Overhead Control A/c	8		
To Cost Ledger Control A/c (Profit)	<u>57</u>		<u> </u>
	<u>450</u>		<u>450</u>

<i>Dr.</i>	Building Construction A/c		<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
To Balance b/d	10	By Cost Ledger Control A/c	44
To Stores Ledger Control A/c	4		
To Wage Control A/c	10		
To Works Overhead Control A/c	<u>20</u>		<u> </u>
	<u>44</u>		<u>44</u>

(Rs. in lakhs)

Trial Balance

	<i>Dr.</i>	<i>Cr.</i>
To Stores Ledger Control A/c	55	
To WIP Control A/c	25	
To Finished Goods Control A/c	403	
To Cost Ledger Adjustment A/c	<u> </u>	<u>483</u>
	<u>483</u>	<u>483</u>

5.4 RECONCILIATION OF COST AND FINANCIAL ACCOUNTS

When the cost and financial accounts are kept separately, it is imperative that those should be reconciled, otherwise the cost accounts would not be reliable. In this connection, it is necessary to remember that a reconciliation of the two sets of accounts only can be made if both the sets contain sufficient details as would enable the causes of differences to be located. It is, therefore, important that in the financial accounts, the expenses should be analysed in the same way as in the cost accounts.

In the text book, there appears a General Ledger Adjustment Account as would appear in the Cost Ledger, students should study the entries therein as well as a discussion that follows to explain the manner in which the details of items included therein could be reconciled with the corresponding items appearing in the financial accounts. They would thus realise that the



Cost Accounting

reconciliation of the balances generally, is possible preparing a Memorandum Reconciliation Account. In this account, the items charged in one set of accounts but not in the other or those charged in excess as compared to that in the other are collected and by adding or subtracting them from the balance of the amount of profit shown by one of the accounts, shown by the other can be reached. The procedure is similar to the one followed for reconciling the balance with a bank that shown by the cash book or the ledger.

It is important, however, to know the causes which, generally, give rise to differences in the Cost and Financial Accounts. These are briefly summarised below :

5.4.1 Items included in the financial accounts but not in cost accounts :

- (a) *Matters of pure finance :*
- (i) Interest received on bank deposits.
 - (ii) Interest, dividends, etc. received on investments.
 - (iii) Rents receivable.
 - (iv) Losses on the sales of investments, building etc.
 - (v) Profits made on the sale of fixed assets.
 - (vi) Expenses of the company's share transfer office, if any.
 - (vii) Transfer fee received.
 - (viii) Remuneration paid to the proprietor in excess of a fair reward for services rendered.
 - (ix) Damages payable at law.
 - (x) Penalties payable at law.
 - (xi) Losses due to scrapping of machinery.
- (b) Item included in the cost accounts only (notional expenses):
- (i) Charges in lieu of rent where premises are owned.
 - (ii) Interest on capital employed in production, but upon which no interest is actually paid if the firm decided to treat interest as part of cost.
 - (iii) Salary for the proprietor where he works but does not charge a salary.
- (c) *Items whose treatment is different in the two sets of accounts.* The objective of cost accounting is to provide information to management for decision making and control purposes while financial accounting conforms to external reporting requirements. Hence there are chances that certain items are treated differently in the two sets of accounts. For example, LIFO method is not allowed for inventory valuation in India as per the Accounting Standard 2 issued by the Council of the ICAI. However, this method may be



Non-Integrated Accounts

adopted for cost accounts as it is more suitable for arriving at costs which shall be used as a base for deciding selling prices. Similarly cost accounting may use a different method of depreciation than what is allowed under financial accounting.

- (d) *Varying basis of valuation*: It is another factor which sometimes is responsible for the difference. It is well known that in financial accounts stock are valued either at cost or market price, whichever is lower. But in Cost Accounts, stocks are only valued at cost.

Circumstances where reconciliation statement can be avoided

When the Cost and Financial Accounts are integrated - there is no need to have a separate reconciliation statement between the two sets of accounts. Integration means that the same set of accounts fulfill the requirement of both i.e., Cost and Financial Accounts.

Illustration :

The following figures are available from the financial records of ABC Manufacturing Co. Ltd. for the year ended 31-3-2006.

	Rs.
Sales (20,000 units)	25,00,000
Materials	10,00,000
Wages	5,00,000
Factory Overheads	4,50,000
Office and administrative Overhead	2,60,000
Selling and distribution Overheads	1,80,000
Finished goods (1,230 units)	1,50,000

Rs.

Work-in-Progress :

Materials	30,000	
Labour	20,000	
Factory overheads	<u>20,000</u>	70,000
Goodwill written off		2,00,000
Interest on capital		20,000

In the Costing records, factory overhead is charged at 100% wages, administration overhead 10% of factory cost and selling and distribution overhead at the rate of Rs. 10 per unit sold.

Prepare a statement reconciling the profit as per cost records with the profit as per financial records.



Cost Accounting

Solution :

**Profit & Loss Account of ABC Manufacturing Co. Ltd.
(for the year ended 31-3-2006)**

	Rs.		Rs.
To Opening Stock Nil		By Sales (20,000 units)	25,00,000
To Materials	10,00,000	" Closing Stock :	
To Wages	5,00,000	" Finished goods (1,230 units)	1,50,000
To Factory Overheads	4,50,000	Work-in-Progress	70,000
To Office & Admn. Overheads	2,60,000		
To Selling & Dist. Overheads	1,80,000		
To Goodwill written off	2,00,000		
To Interest on Capital	20,000		
To Profit	<u>1,10,000</u>		
	<u>27,20,000</u>		<u>27,20,000</u>

Cost Sheet

	Rs.
Materials	10,00,000
Wages	5,00,000
Direct Expenses	<u>Nil</u>
Prime Cost	15,00,000
Add : Factory overhead at 100% wages	<u>5,00,000</u>
	20,00,000
Less : Closing WIP	<u>70,000</u>
Factory Cost of (20,000 + 1,230) units	19,30,000
Office & Admn. Overhead 10% of Factory cost	<u>1,93,000</u>
	21,23,000
Less: Closing Stock of finished goods (1,230 units)	<u>1,23,000</u>
Production Cost of 20,000 units	20,00,000
Selling & Dist. Overhead @ Rs. 10 per unit	<u>2,00,000</u>
Cost of sales of 20,000 units	22,00,000
Sales of 20,000 units	<u>25,00,000</u>
Profit	<u>3,00,000</u>



Non-Integrated Accounts

Reconciliation Statement

	Rs.	Rs.
Profit as per Cost Accounts		3,00,000
Add : Factory overheads over-absorbed (Rs. 5,00,000 – Rs. 4,50,000)	50,000	
Selling & Dist. Overhead over-absorbed (Rs. 2,00,000 – Rs. 1,80,000)	20,000	
Difference in the valuation of closing stock of finished goods (Rs. 1,50,000 – Rs. 1,23,000)	<u>27,000</u>	97,000
		3,97,000
Less: Office & Admn. overhead under-absorbed (Rs. 2,60,000 – Rs. 1,93,000)	67,000	
Goodwill written off taken in financial accounts	2,00,000	
Interest on capital	<u>20,000</u>	<u>2,87,000</u>
Profit as per financial accounts		<u>1,10,000</u>

Illustration :

Following are the figures extracted from the Cost Ledger of a manufacturing unit.

Stores :	Rs.
Opening balance	15,000
Purchases	80,000
Transfer from WIP	40,000
Issue of WIP	80,000
Issue to repairs and maintenance	10,000
Sold as a special case of cost	5,000
Shortage in the year	3,000
Work-in-Progress :	
Opening inventory	30,000
Direct labour cost charged	30,000
Overhead cost charged	1,20,000
Closing Balance	20,000

Finished Products :

Entire output is sold at 10% profit on actual cost from work-in-process.

Others :

Wages for the period	35,000
Overhead Expenses	1,25,000

Ascertain the profit or loss as per financial account and cost accounts and reconcile them.



Cost Accounting

Solution :

Stores Control A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Opening Balance	15,000	By WIP Control A/c	80,000
" Purchases	80,000	" Overhead Control A/c	10,000
" WIP Control A/c	40,000	" GLA A/c	5,000
		" Overhead Control A/c (Shortages)	3,000
		" Balance	<u>37,000</u>
	<u>1,35,000</u>		<u>1,35,000</u>

Wage Control A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To GLA A/c	35,000	By WIP Control A/c	30,000
		" Overhead Control A/c	<u>5,000</u>
	<u>35,000</u>		<u>35,000</u>

Overhead Control A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Material Control A/c	10,000	By WIP Control A/c	1,20,000
" Stores Ledger Control A/c	3,000	By Balance c/d	23,000
" GLA A/c	1,25,000		
" Wage Control A/c	<u>5,000</u>		
	<u>1,43,000</u>		<u>1,43,000</u>

WIP Control A/c

<i>Dr.</i>	<i>Rs.</i>	<i>Cr.</i>	<i>Rs.</i>
To Stores Control A/c	80,000	By Stores Control A/c	40,000
" Opening WIP A/c	30,000	" Closing Balance	20,000
" Wage Control A/c	30,000	" Finished goods	2,00,000
" Overhead Control A/c	<u>1,20,000</u>		
	<u>2,60,000</u>		<u>2,60,000</u>



Non-Integrated Accounts

	Rs.
Finished output at cost	2,00,000
Profit at 10% on actual cost from WIP Sales	<u>20,000</u>
	<u>2,20,000</u>

Statement of Profit as per Costing Records

	Rs.
Direct material Cost	40,000
Direct wages	<u>30,000</u>
Prime Cost	70,000
Production Overheads	<u>1,20,000</u>
Works Cost	1,90,000
Add: Opening WIP	<u>30,000</u>
	2,20,000
Less: Closing WIP	<u>20,000</u>
Cost of finished goods	2,00,000
Profit (10% of cost)	<u>20,000</u>
Sales	<u>2,20,000</u>

Profit & Loss A/c

	Rs.		Rs.
To Material (Op. bal. +		By Closing WIP	20,000
Purchases = Sale)	90,000	Sale	2,20,000
" WIP	30,000	" Balance	37,000
" Wages	35,000	" Net loss	3,000
" Overhead	<u>1,25,000</u>		
	<u>2,80,000</u>		<u>2,80,000</u>

Reconciliation Statement

	Rs.
Profit (loss) as per Financial Accounts	(3,000)
Add: Overheads overabsorbed in Cost A/c	<u>23,000</u>
Net Profit as per Accounts	<u>20,000</u>



Cost Accounting

Illustration:

The following figures, have been extracted from the Financial Accounts of a Manufacturing Firm for the first year of its operation:

	Rs.
Direct Material Consumption	50,00,000
Direct Wages	30,00,000
Factory Overhead	16,00,000
Administration Overheads	7,00,000
Selling and Distribution Overheads	9,60,000
Bad Debts	80,000
Preliminary Expenses written off	40,000
Legal Charges	10,000
Dividends Received	1,00,000
Interest Received on Deposits	20,000
Sales (1,20,000 units)	1,20,00,000
<i>Closing Stock :</i>	
Finished Goods (4,000 units)	3,20,000
Work-in-Progress	2,40,000

The cost accounts for the same period reveal that the direct material consumption was Rs.56,00,000. Factory overhead is recovered at 20% on prime cost. Administration overhead is recovered at Rs. 6 per unit of production. Selling and distribution overheads are recovered at Rs. 8 per unit sold.

Prepare the Profit and Loss Accounts both as per financial records and as per cost records. Reconcile the profits as per the two records.

Solution:

Profit and Loss Account

(As per financial records)

	Rs.		Rs.
To Direct Material	50,00,000	By Sales (1,20,000 units)	1,20,00,000
To Direct Wages	30,00,000	By <i>Closing Stock</i>	
To Factory Overheads	16,00,000	WIP	2,40,000
" Gross Profit	<u>29,60,000</u>	Finished Goods (4,000 units)	<u>3,20,000</u>
	<u>1,25,60,000</u>		<u>1,25,60,000</u>



Non-Integrated Accounts

To Administration Overheads	7,00,000	By Gross Profit b/d	29,60,000
” Selling and Distribution Overheads	9,60,000	” Dividend	1,00,000
” Bad Debts	80,000	” Interest	20,000
” Preliminary Expenses written off	40,000		
” Legal Charge	10,000		
” Net Profit	<u>12,90,000</u>		
	<u>30,80,000</u>		<u>30,80,000</u>

Statement of Cost and Profit

(As per Cost Records)

	Total Rs.
Direct Material	56,00,000
Direct Wages	<u>30,00,000</u>
Prime Cost	86,00,000
Factory Overhead	<u>17,20,000</u>
	1,03,20,000
Less: Closing Stock (WIP)	<u>2,40,000</u>
Works Cost (1,24,000 units)	1,00,80,000
Administration overhead (1,24,000 units @ Rs. 6 p.u.)	<u>7,44,000</u>
Cost of production of (1,24,000 units)	1,08,24,000
Less: Finished Goods (4,000 units @ Rs. 87.29)	<u>3,49,160</u>
Cost of goods sold (1,20,000 units)	1,04,74,840
Selling and Distribution Overhead (1,20,000 @ Rs. 8 p.u.)	<u>9,60,000</u>
Cost of Sales	1,14,34,840
Net profit (Balancing figure)	<u>5,65,160</u>
Sales Revenue	<u>1,20,00,000</u>



Cost Accounting

Statement of Reconciliation of profit as obtained under Cost and Financial Accounts

	Rs.	Rs.
Profit as per Cost Records		5,65,160
<i>Add:</i> Excess of Material Consumption	6,00,000	
" Factory Overhead	1,20,000	
" Administration Overhead	44,000	
Dividend Received	1,00,000	
Interest Received	<u>20,000</u>	<u>8,84,000</u>
		14,49,160
<i>Less:</i> Bad debts	80,000	
Preliminary expenses written off	40,000	
Legal Charges	10,000	
Over-valuation of stock in cost book (Rs.3,49,160 – Rs.3,20,000)	<u>29,160</u>	<u>1,59,160</u>
Profit as per Financial Records		12,90,000

Illustration:

The following information is available from the financial books of a company having a normal production capacity of 60,000 units for the year ended 31st March, 2006:

- (i) Sales Rs. 10,00,000 (50,000 units).
- (ii) There was no opening and closing stock of finished units.
- (iii) Direct material and direct wages cost were Rs. 5,00,000 and Rs. 2,50,000 respectively.
- (iv) Actual factory expenses were Rs. 1,50,000 of which 60% are fixed.
- (v) Actual administrative expenses were Rs. 45,000 which are completely fixed.
- (vi) Actual selling and distribution expenses were Rs. 30,000 of which 40% are fixed.
- (vii) Interest and dividends received Rs. 15,000.

You are required to:

- (a) Find out profit as per financial books for the year ended 31st March, 2006;
- (b) Prepare the cost sheet and ascertain the profit as per cost accounts for the year ended 31st March, 2006 assuming that the indirect expenses are absorbed on the basis of normal production capacity; and
- (c) Prepare a statement reconciling profits shown by financial and cost books.



Non-Integrated Accounts

Solution:

Working Note:

Profit & Loss Account (for the year ended 31st March, 2006)

	Rs.		Rs.
To Direct material	5,00,000	By Sales 50,000 units	10,00,000
To Direct wages	2,50,000	By Interest and dividends	15,000
To Actual factory expenses	1,50,000		
To Actual administrative expenses	45,000		
To Actual selling and distribution expenses	30,000		
To Profit	<u>40,000</u>		
	<u>10,15,000</u>		<u>10,15,000</u>

(a) Profit as per financial books for the year ended 31st March, 2006 is Rs. 40,000 (Refer to above Working note).

(b)

Cost Sheet (for the year ended 31st March, 2006)

	Rs.
Direct material	5,00,000
Direct wages	<u>2,50,000</u>
Prime cost	7,50,000
<i>Factory expenses:</i>	
Variable : Rs. 60,000	<u>60,000</u>
Fixed : Rs. 75,000	1,35,000
Works cost	8,85,000
Administrative expenses:	37,500
Cost of production	9,22,500
<i>Selling & distribution expenses:</i>	
Variable : Rs. 18,000	<u>18,000</u>
Fixed : Rs. 10,000	28,000
Cost of Sales	9,50,500
Profit	<u>49,500</u>
Sales revenue	<u>10,00,000</u>



Cost Accounting

(c)

Statement of Reconciliation (Reconciling profit shown by Financial and Cost Accounts)

	Rs.	Rs.
Profit as per Cost Account	49,500	—
Add : Income from interest and dividends	<u>15,000</u>	64,500
Less: Factory expenses under-charged in Cost Accounts (Rs. 1,50,000 – Rs. 1,35,000)	15,000	
Administrative expenses under-charged in Cost Accounts (Rs. 45,000 – Rs. 37,500)	7,500	
Selling & distribution expenses under—charged in Cost Accounts (Rs. 30,000 – Rs. 28,000)	<u>2,000</u>	<u>24,500</u>
Profit as per Financial Accounts		40,000

Illustration :

M/s. H.K. Piano Company showed a net loss of Rs. 4,16,000 as per their financial accounts for the year ended 31st March, 2004. The cost accounts, however, disclosed a net loss of Rs.3,28,000 for the same period. The following information was revealed as a result of scrutiny of the figures of both the sets of books:

	Rs.
(i) Factory overheads under-recovered	6,000
(ii) Administration overheads over-recovered	4,000
(iii) Depreciation charged in financial accounts	1,20,000
(iv) Depreciation recovered in costs	1,30,000
(v) Interest on investment not included in costs	20,000
(vi) Income-tax provided	1,20,000
(vii) Transfer fees (credit in financial books)	2,000
(viii) Stores adjustment (credit in financial books)	2,000

Prepare a Memorandum reconciliation account.

Solution:

Memorandum Reconciliation Account

Dr.		Rs.	Cr.	Rs.
<i>Particulars</i>		<i>Rs.</i>	<i>Particulars</i>	<i>Rs.</i>
To Net loss as per costing books	3,28,000		By Administration overhead over-recovered in costs	4,000
To Factory overheads under-recovered in costs	6,000		By Interest on investments	



Non-Integrated Accounts

To	Income-tax not provided in costs	1,20,000	not included in costs	20,000
			By Depreciation overcharged in costs	10,000
			By Transfer fees in financial books	2,000
			By Stores adjustment	2,000
			By Net loss as per financial books	<u>4,16,000</u>
		<u>4,54,000</u>		<u>4,54,000</u>

5.5 Self Examination Questions

Multiple Choice Questions

1. Separate books of accounts are maintained for costing and financial accounting purposes under,
 - (a) The inter locking system of accounting
 - (b) The integrated system of accounting
 - (c) Both a and b
 - (d) None of the above
2. Under integrated system of accounting, purchase of raw material is debited to which account,
 - (a) Purchase Account
 - (b) Work in progress control account
 - (c) Stores ledger control account/Raw material control account
 - (d) Neither 1,nor 2 nor 3
3. Under integrated system of accounting, issue of raw material is debited to which account,
 - (a) Purchase Account
 - (b) Work in progress control account
 - (c) Stores ledger control account/Raw material control account
 - (d) Neither 1,nor 2 nor 3
4. Notional costs
 - (a) May be included in interlocking accounts
 - (b) May be included in integrated accounts
 - (c) Cannot be included in Interlocking accounts
 - (d) Neither a nor b nor c



Cost Accounting

5. In a period Rs 50,000 was incurred on indirect labour. In a Cost Ledger, the double entry will be:

Debit	Credit
(a) Wages control account	Overhead control account
(b) WIP control account	Wages control account
(c) Overhead control account	Wages control account
(d) Wages control account	WIP control account

6. In an integrated accounting system the accounting entries for factory overhead absorbed would be:

Debit	Credit
(a) WIP control account	Overhead control account
(b) Overhead control account	WIP control account
(c) Overhead control account	Cost of sales account
(d) Cost of sales account	Overhead control account

7. At the end of a financial period, accounting entries for under absorbed overheads would be

Debit	Credit
(a) WIP control account	Overhead control account
(b) Profit and loss account	WIP control account
(c) Profit and loss account	Overhead control account
(d) Overhead control account	Profit and loss account

8. The double entry for factory cost of production in a cost ledger is,

Debit	Credit
(a) Cost of sales account	Finished goods control account
(b) Finished goods control account	WIP control account
(c) Costing profit and loss account	Finished goods control account
(d) WIP control account	Finished goods control account

9. In a non integrated system of accounting, the emphasis is on,

- Personal accounts
- real accounts
- Nominal accounts



Non-Integrated Accounts

- d. All of these
10. Which of the following accounts makes the cost ledger self balancing,
- Overhead adjustment account
 - Costing P & L account
 - Cost ledger control account
 - None of the above

Answers to Multiple Choice Questions

1.a; 2.c; 3.b; 4.a; 5.c; 6.a; 7.c; 8.b; 9.c; 10.c;

Short answer type questions

- What do you understand by Integrated Accounting System? State its advantages and pre-requisites.
- Discuss the important cost control accounts maintained in a costing system.
- "Reconciliation of costs and financial accounts in the modern computer age is redundant." Comment.

Long Answer Type Questions

- Why is reconciliation of cost and financial accounts necessary? State the possible reasons for difference in profits shown by both the accounts.
- The following trial balance results from entries in a cost ledger:

	Rs.	Rs.
(a) General Ledger Adjustment Account		1,15,900
(b) Stores Ledger Account	37,900	
(c) Work-in-progress Account	54,300	
(d) Finished Goods Account	23,500	
(e) Factory Overheads Account	500	
(f) Administration Expenses Account	_____	_____ 300
Total	<u>1,16,200</u>	<u>1,16,200</u>

Explain that each balance represents in each of the above transactions, and the traditions out of which it has arisen. Show (assumed) details of the Work-in-Progress Account.



Cost Accounting

3. The following balances are extracted from a company's ledger as on 31st March.

	<i>Dr.</i>	<i>Cr.</i>
	<i>Rs.</i>	<i>Rs.</i>
Raw Material Control Account	50,836	
Work-in-progress Control Account	12,745	
Finished Stock Control Account	25,980	
Nominal Ledger Control Account	<u> </u>	<u>89,561</u>
	<u>89,561</u>	<u>89,561</u>

Further transaction took place during the following quarter as follows:

	<i>Rs.</i>
Factory overhead-allocated to WIP	11,786
Goods finished at cost	36,834
Raw Materials purchased	22,422
Direct Wages — allocated to WIP	8,370
Raw materials — issued to production Cost of goods	41,389
Raw materials credited by supplier	836
Customer's return (at cost) of goods the finished	2,856
Inventory audit — raw material losses	1,236

You are required to write up the four accounts in the cost ledger.

Answers to Long Answer Type Questions.

- 2 (a). It represents the balance of all transactions relating to fixed assets, cash, suppliers and customers.
- (b) It represents the total of balances of each item of store in hand.
- (c) It represents total of the prime cost of individual unfinished accounts.
- (d) It represents the value of all finished goods at hand.
- (e) It represents the amount of factory overheads to be carried forward due to under absorption.
- (f) It represents the amount over absorbed on account of administration overheads.
3. Total of trial balance Rs. 1,34,595.

CHAPTER 6

METHOD OF COSTING (I) (JOB COSTING, CONTRACT COSTING, BATCH COSTING AND OPERATING COSTING)

Learning Objectives

When you have finished studying this chapter, you should be able to

- ◆ Understand the meaning and distinctive features of Job, Batch, Operating and Contract Costing.
- ◆ Understand the accounting procedures to be applied in the above-mentioned different methods of Costing.

6.1 INTRODUCTION

Today business and industry needs costing systems to meet their individual requirements. Costing experts believe that it may not be possible to devise a single costing system to fulfill everybody's needs. They have developed different methods of costing for different industries depending upon the type of manufacture and their nature. Mainly the industries can be grouped into two basic types:

- (1) Industries doing job work.
- (2) Industries engaged in mass production of a single product or identical production.

A concern engaged in the execution of specification order is characterised as a firm producing several items distinguishable from one another by respective specifications and other details. Such a concern is thought of involved in performing job works. Production under job work is strictly according to customer's specifications and each lot, job or production order is unique. Examples of jobs order type of production are : ships building, roads, bridges, manufacture of heavy electrical machinery, machine tools, iron foundries, wood working shops, etc. Here each job or unit of production is treated as a separate identity for the purpose of costing. The methods of costing and for ascertaining cost of each job are known as a job costing. Contract costing and Batch costing.

The continuous or process type of industry is characterised by the continuous production of uniform products according to standard specifications. In such a case the successive



lots are generally indistinguishable as to size and form and, even if there is some variation in specifications, it is of a minor character. Examples of continuous type of industries are chemical and pharmaceutical products, paper/food products, canning, paints, and varnish oil, rubber, textile etc. Here the methods of Costing used for the purpose of ascertaining costs are: process costing; single costing; operating costing etc.

6.2 JOB COSTING

According to this method costs are collected and accumulated according to jobs, contracts, products or work orders. Each job or unit of production is treated as a separate entity for the purpose of costing. Job costing is carried out for the purpose of ascertaining cost of each job and takes into account the cost of materials, labour and overhead etc. The job costing method is also applicable to industries in which production is in batches since batch production basically is of the same character as the job order production, the difference being mainly one in the size of different orders. The method then may also be described as “Batch Costing”.

The job costing method of costing may be regarded as the principal method of costing since the basic object and purpose of all costing is to analyse and ascertain cost of each unit of production so that it may be possible to control and regulate cost and to determine the profitability or otherwise of each work order or product line. The basic principles enunciated for the job costing method are, therefore, valid essentially for all types of industry. For example, printing; furniture; hardware; ship-building; heavy machinery; interior decoration, repairs and other similar work.

The job costing method essentially involves preparation of a separate cost sheet for each job, disclosing cost of material issued for the job, labour charges incurred (on the basis of bill of material and time cards respectively); when the job is completed, overhead charges are added for ascertaining total expenditure (*See carefully the entries made in the specimen page*)

Job (Account on page alongside the figures are assumed).

Job Costing may be employed in the following cases:

- When jobs are executed for different customers according to their specifications.
- When no two orders are alike and each order/job needs special treatment.
- Where the work-in-progress differs from period to period on the basis of the number of jobs in hand.



JOB (OR WORK) ACCOUNT

Job No. ———K 576 : M/s. Slow and Steady
 Brief Description ——— 10 Special Steel Cupboards
 Name of party : M/s. Slow and Steady
 Due for completion : August 25, 2005
 Commenced on July 10, 2005 ——— Completed on : August 19, 2005

MATERIAL			LABOUR			DIRECT EXPENSES			TOTAL
Date	Req. Slip No.	Rs.	Date	Wages Abs-tract No.	Rs.	Date	Description	Rs.	
2005			2005						
10/1	275	510.00	15/7	23	315.00	16/8	Materials	1,490.00	
3/17	310	530.00	22/7	24	430.00		Labour	2,050.00	
						320	Direct Expenses	150.00	
12/8	405	405.00	29/7	25	240.00		Prime Cost	3,690.00	
			5/8	26	410.00		Factory Expenses*	1,025.00	
							Works Cost	4,715.00	
			12/8	27	340.00		Admn. Expenses**	943.00	
			19/8	28	315.00				
			Total	2,050.00		Total	5,658.00		
						150	Cost of Production		
			Total			150			

Prepared by ——— Chadha
 Checked by ——— Murthy
 (If necessary, space may also be provided for including an amount for selling and distribution expenses. A column to record the number of hours can also be provided under the main head.)

*Say, at 50% of labour.
 **Say, at 20% of work cost.



6.2.1 Procedure of job Cost Accounting

Accounting for Materials : An essential requirement of job cost accounting is that direct materials and their cost must be traced to and identified with specific job or work order. This segregation of materials cost by jobs or work orders is brought about by the use of separate stores requisitions for each job or work order. Where a bill of material is prepared, it provides the basis for the preparation of these stores requisitions. But when the entire quantity of materials specified in the bill of materials is drawn in one lot or in instalments, the bill itself could be made to serve as a substitute for the stores requisition.

After the materials have been issued and the stores requisitions have been priced, it is usual to enter the value of the stores requisition in a material abstract or analysis book. It serves to analyse and collect the cost of all direct materials according to job or work orders and departmental standing orders or expense code numbers.

From the abstract book, the summary of materials cost of each job is posted to individual job cost sheets or cards in the Work-in-Progress ledger. The postings are usually made weekly or monthly. Similarly, at periodical intervals, from the material abstract books, summary cost of indirect material is posted to different standing orders or expense code numbers in the Overhead Expenses ledger. If any special material has been purchased for a particular job, it is generally the practice to charge such special material direct to the job concerned without passing it through the Stores Ledger, as soon as it is purchased.

If any surplus material is left over in the case of any job, unless it can be immediately and economically used on some other job, the same is returned to the store room with a proper supporting document/stores Debit Note or Shop Credit, and the relevant job account is credited with the value of excess material returned to the store room.

If the surplus material is utilised on some other job, instead of being returned to the store room first, a material transfer note is prepared. The transfer note would show the number of the transfer to job as well as transferee job (or jobs) so that, on that basis, the cost thereof can be adjusted in the Work-in-Progress Ledger.

Accounting for Labour : All direct labour cost must be analysed according to individual jobs or work orders. Similarly, different types of indirect labour cost also must be collected and accumulated under appropriate standing order or expenses code number.

The analysis of labour according to jobs or work orders is, usually, made by means of job time cards or sheets. All direct labour is booked against specific jobs in the job time cards or sheets. All the idle time also is booked against appropriate standing order expense code number either in the job time card for each job or on a separate idle time card for



Method of Costing (I)

each worker (where the job time card is issued job-wise). The time booked or recorded in the job time and idle time cards is valued at appropriate rates and entered in the labour abstract or analysis book. All direct labour cost is accumulated under relevant job or work order numbers, and the total or the periodical total of each job or work order is then posted to the appropriate job cost card or sheet in Work-in-Progress ledger. The postings are usually made at the end of each week or month.

The abstraction of idle time costs under suitable standing order or expenses code numbers is likewise done and the amounts are posted to the relevant departmental standing order or expense code number in the Overhead Expenses Ledger at periodical intervals. As regards other items of indirect labour cost these are collected from the payrolls books for the purpose of posting against standing order or expenses code numbers in the Overhead Expenses ledger.

Accounting for Overhead : Manufacturing overheads are collected under suitable standing order numbers and selling and distribution overheads against cost accounts numbers. Total overhead expenses so collected are apportioned to service and production departments on some suitable basis. The expenses of service departments are finally transferred to production departments. The total overhead of production departments is then applied to products on some realistic basis, e.g. machine hour; labour hour; percentage of direct wages; percentage of direct materials; etc. It should be remembered that the use of different methods will lead to a different amounts being computed for the works overhead charged to a job hence to different total cost.

The problem of accurately absorbing, in each individual job or work order, the overhead cost of different cost centres or departments involved in the manufacture is difficult under the job costing method. It is because the cost or the expenses thereof cannot be traced to or identified with any particular job or work order. In such circumstances, the best that can be done is to apply a suitable overhead rate to each individual article manufactured or to each production order. This is essentially an arbitrary method.

Price of a job : Price of a job may be arrived by adding the desired percentage of profit to the total cost of the job.

Treatment of spoiled and defective work : Spoiled work is the quantity of production that has been totally rejected and cannot be rectified. Defective work on the other hand refers to production that is not as perfect as the saleable product but is capable of being rectified and brought to the required degree of perfection provided some additional expenditure is incurred.



Cost Accounting

Normally, all the manufacturing operations are not fully successful; they result in turning out a certain amount of defective work. Nonetheless, over a period of time it is possible to work out a normal rate of defectives for each manufacturing process which would represent the number of defective articles which a process shall produce in spite of due care. Defects arise in the following circumstances :

- (1) Where a percentage of defective work is allowed in a particular batch as it cannot be avoided.
- (2) Where defect is due to bad workmanship.
- (3) Where defect is due to the Inspection Department wrongly accepting incoming material of poor quality.
 - (1) In the first case, when a normal rate of defectives has already been established, if the actual number of defectives is within the normal limit or is near thereto the cost of rectification will be charged to the whole job and spread over the entire output of the batch. If, on the other hand, the number of defective units substantially exceeds the normal, the cost of rectification of the number which exceeds the normal will be written off as a loss in the Costing Profit and Loss Account.
 - (2) In the second case, when the defective work is due to bad workmanship the cost of rectification will be abnormal cost, *i.e.*, not a legitimate element of the cost. Therefore, the cost of rectification shall be written off as a loss, unless by an arrangement, it is to be recovered as a penalty from the workman concerned. It is possible, however that the management did provide for a certain proportion of defectives on account of bad workmanship as an unavoidable feature of production. If that be the case, the cost of rectifying to the extent provided for by the management will be treated as a normal cost and charged to the batch.
 - (3) In the third case the defect being due to negligence of the Inspection Department, the cost of rectification will be charged to the department and will not be considered as cost of manufacture of the batch. Being an abnormal cost, it will be written off to the Costing Profit and Loss Account.

Illustration

The manufacturing cost of a work order is Rs. 1,000; 8% of the production against that order spoiled and the rejection is estimated to have a realisable value of Rs. 20 only. The normal rate of spoilage is 2%. Record this in the costing journal.

Solution

Actual loss is Rs. 60, *i.e.* Rs. 80 less Rs. 20 recoverable as materials. Of this net loss of



Method of Costing (I)

Rs. 15 is normal; Rs. 45 is the abnormal loss to be debited to the Costing Profit and Loss Account. The accounting entries necessary for recording the above facts would be :

	Rs.	Rs.	Rs.
Materials Control Account	Dr.	20	
Overhead Control Account	Dr.	15	
Costing Profit and Loss Control Account	Dr.	45	
To Work-in-Progress Control Account			80

In the case of defectives being inherent in the manufacturing process, the rectification cost may be charged to the specific jobs in which they have arisen. In case defectives cannot be identified with jobs, the cost of rectification may be treated as factory overheads. Abnormal defectives should be written off to the Costing Profit and Loss Account.

Illustration

A shop floor supervisor of a small factory presented the following cost for Job No. 303, to determine the selling price.

	<i>Per Unit</i>
	Rs.
Materials	70
Direct wages 18 hours @ Rs. 2.50 (Deptt. X 8 hours ; Deptt. Y 6 hours; Deptt. Z 4 hours)	45
Chargeable expenses	<u>5</u>
120	
Add : 33-1/3 % for expenses cost	<u>40</u>
	<u>160</u>

Analysis of the Profit/Loss Account (for the year 2005)

	<i>Rs.</i>		<i>Rs.</i>
Materials used	1,50,000	Sales less returns	2,50,000
Direct wages:			
Deptt. X	10,000		
Deptt. Y	12,000		
Deptt. Z	<u>8,000</u>	30,000	



Cost Accounting

Special stores items	4,000		
Overheads :			
Deptt. X	5,000		
Deptt. Y	<u>9,000</u>		
Deptt. Z	2,000	16,000	
Works cost	2,00,000		
Gross profit c/d	<u>50,000</u>		
	2,50,000		<u>2,50,000</u>
Selling expenses	20,000	Gross profit b/d	50,000
Net profit	<u>30,000</u>		
	<u>50,000</u>		<u>50,000</u>

It is also noted that average hourly rates for the three Departments X, Y and Z are similar.

You are required to:

Draw up a job cost sheet.

Calculate the entire revised cost using 2005 actual figures as basis.

Add 20% to total cost to determine selling price.

Solution

Job Cost Sheet

Customer Details _____

Job No. _____

Date of commencement _____

Date of completion _____

Particulars

Amount

Rs.

Direct materials

70

Direct wages :

Deptt. X Rs. 2.50×8 hrs. = Rs. 20.00

Deptt. Y Rs. 2.50×6 hrs. = Rs. 15.00

Deptt. Z Rs. 2.50×4 hrs. = Rs. 10.00

45

Chargeable expenses

5

Prime cost

120

Overheads :



Method of Costing (I)

Deptt. X	= $\frac{\text{Rs.5,000}}{\text{Rs.10,000}} \times 100 = 50\%$ of Rs. 20 = Rs. 10.00	
Deptt. Y	= $\frac{\text{Rs.9,000}}{\text{Rs.12,000}} \times 100 = 75\%$ of Rs. 15 = Rs. 11.25	_____
Deptt. Z	= $\frac{\text{Rs.2,000}}{\text{Rs.8,000}} \times 100 = 25\%$ of Rs. 10 = Rs. 2.50	23.75
Works cost		<u>143.75</u>
Selling expenses	= $\frac{\text{Rs.20,000}}{\text{Rs.2,00,000}} \times 100 = 10\%$ of work cost	14.38
Total cost		<u>158.13</u>
Profit (20% of total cost)		<u>31.63</u>
Selling price		189.76

6.3 CONTRACT COSTING

6.3.1 Introduction : A contract usually takes several years to get itself completed. If the profit on such contracts is recorded only after their completion, then wide fluctuations may be noted in the profit figures of contractors from year to year. To avoid these fluctuations in the reported profits and to reflect the revenue in the accounting period during which the activity is undertaken, the profit in respect of each contract in progress is transferred to the profit and loss account of the year by calculating the notional profit. The portion of notional profit to be transferred to the profit and loss account depends on the stage of completion of a contract. To determine such a profit figure the knowledge of various concepts as discussed below is essential in contract costing.

6.3.2 Meaning of Contract Costing : Contract or terminal costing, as it is termed, is one form of application of the principles of job costing. In fact a bigger job is referred to as a contract. Contract costing is usually adopted by building contractors engaged in the task of executing Civil Contracts. Contract costing have the following distinct features :

1. The major part of the work in connection with each contract is ordinarily carried out at the site of the contract.
2. The bulk of the expenses incurred by the contractor are considered as direct.
3. The indirect expenses, mostly consist of office expenses of the yards, stores and works.



Cost Accounting

4. A separate account is usually maintained for each contract.
5. The number of contracts undertaken by a contractor at a time is not usually very large.
6. The cost unit in contract costing is the contract itself.

6.3.3 Recording of contract costs : Material Cost : All materials supplied from the stores or purchased directly for the contract are debited to the concerned contract account. In the case of transfer of excess material from one contract to other contract, their costs would be adjusted on the basis of material transfer note, signed both by the transferee and the transferor foreman. In case the return of surplus material appears uneconomical on account of high cost of transportation, the same is sold and the concerned contract account is credited with the sale price. Any loss or profit arising therefrom is transferred to the Profit and Loss Account. Any theft, or destruction of material by fire represent a loss and as such, the same is transferred to the Profit and Loss Account. If any stores items are used for manufacturing tools, the cost of such stores items are charged to the work expenses account. If the contractee has supplied some materials without affecting the contract price, no accounting entries will be made in the contract account, only a note may be given about it.

Labour Cost : Labour actually employed on the site of the contract is regarded as direct (irrespective of the nature of the task performed) and the wages paid to them are charged to the concerned contract directly or on the basis of a wage analysis sheet (if concurrently a number of contracts are carried on and labourers are required to devote their time on two or more contracts).

Direct Expenses : Direct expenses (if any) are directly charged to the concerned contract.

Indirect Expenses : Indirect expenses (such as expenses of engineers, surveyors, supervisors etc.) may be distributed over several contracts as a percentage of cost of materials, or wages paid or of the prime cost. If however, the contracts are big, the labour hour method may be used for the distribution of expenses.

Plant and Machinery : The value of the plant in a contract may be either debited to contract account and the written down value thereof at the end of the year entered on the credit side for closing the contract account, or only a charge (depreciation) for use of the plant may be debited to the contract account.

Sub-Contract : Sub-contract costs are also debited to the Contract Account.

Extra work : The extra work amount payable by the contractee should be added to the contract price. If extra work is *substantial*, it is better to treat it as a separate contract. If it



Method of Costing (I)

is *not substantial*, expenses incurred should be debited to the contract account as “Cost of Extra work”.

Cost of work certified : All building contractors received payments periodically known as “running payment” on the basis of the architect’s or surveyor’s certificates. But payments are not equal to the value of the work certified, a small percentage of the amount due is retained as security for any defective work which may be discovered later within the guarantee period.

Mathematically :

$$\text{Cost of work certified} = \text{Cost of work to date} - (\text{Cost of work uncertified} + \text{Material in hand} + \text{Plant at site})$$

The amount retained is called retention money. The full value of the work certified should be credited to the Contract Account and debited to the account of the contract. Since the cash received from him will be less, the balance in his account will be shown as an asset in the balance sheet.

Work uncertified : It represents the cost of the work which has been carried out by the contractor but has not been certified by the contractee’s architect. It is always shown at cost price. The cost of uncertified work may be ascertained as follows :

	Rs.
Total cost to date	—
Less: Cost of work certified	—
Material in hand	—
Plant at site	—
Cost of work uncertified	—

Retention money : A contractor does not receive full payment of the work certified by the surveyor. Contractee retains some amount (say 10% to 20%) to be paid, after sometime, when it is ensured that there is no fault in the work carried out by contractor. If any deficiency or defect is noticed in the work, it is to be rectified by the contractor before the release of the retention money. Retention money provides a safeguard against the risk of loss due to faulty workmanship.

Cash received : It is ascertained by deducting the retention money from the value of work certified *i.e.*,

$$\text{Cash received} = \text{Value of work certified} - \text{Retention money.}$$

Work-in-progress: In Contract Accounts, the value of the work-in-progress consists of (i)



Cost Accounting

the cost of work completed, both certified and uncertified; (ii) the cost of work not yet completed; and (iii) the amount of profit taken as credit. In the Balance Sheet, the work-in-progress is usually shown under two heads, viz., certified and uncertified. The cost of work completed and certified and the profit credited will appear under the head 'certified' work-in-progress, while the completed work not yet certified and the cost of labour, material and expenses of work which has not yet reached the stage of completion are shown under the head "uncertified" work-in-progress.

Notional profit : It represents the difference between the value of work certified and cost of work certified. It is determined :

Notional profit = Value of work certified – (Cost of work to date – Cost of work not yet certified)

Estimated profit : It is the excess of the contract price over the estimated total cost of the contract.

6.3.4 Profit/loss on incomplete contracts : To determine the profit to be taken to Profit and Loss Account, in the case of incomplete contracts, the following four situations may arise:

- (i) *Completion of contract is less than 25 per cent*: In this case no profit should be taken to profit and loss account.
- (ii) *Completion of contract is upto 25 per cent or more than 25 per cent but less than 50 per cent*: In this case one-third of the notional profit, reduced in the ratio of cash received to work certified, should be transferred to the Profit and Loss Account. Mathematically:

$$\frac{1}{3} \times \text{Notional Profit} \times \frac{\text{Cash received}}{\text{Work received}}$$

- (iii) *Completion of contract is upto 50 per cent or more than 50 per cent but less than 90 per cent*: In this case, two-third of the notional profit, reduced by proportion of cash received to work certified, is transferred to the Profit and Loss Account. Mathematically :

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash received}}{\text{Work received}}$$

- (iv) *Completion of contract is upto 90 per cent or more than 90 per cent i.e. it is nearing completion*: In this case the profit to be taken to Profit and Loss Account is determined by determining the estimated Profit and using any one of the following formulas :



Method of Costing (I)

$$(a) \text{ Estimated Profit} \times \frac{\text{Work certified}}{\text{Contract price}}$$

$$(b) \text{ Estimated Profit} \times \frac{\text{Work certified}}{\text{Contract price}} \times \frac{\text{Cash received}}{\text{Work certified}}$$

OR

$$\text{Estimated Profit} \times \frac{\text{Cash received}}{\text{Contract price}}$$

$$(c) \text{ Estimated Profit} \times \frac{\text{Cost of work to date}}{\text{Estimated total cost}}$$

$$(d) \text{ Estimated Profit} \times \frac{\text{Cost of work to date}}{\text{Estimated total cost}} \times \frac{\text{Cash received}}{\text{Work certified}}$$

$$(e) \text{ Notional Profit} \times \frac{\text{Work certified}}{\text{Contract price}}$$

(This formula may be preferably used in the absence of estimated profit figure).

It is preferable to use formula (b) in the absence of specific instructions.

6.3.5 Cost plus Contract : Under Cost plus Contract, the contract price is ascertained by adding a percentage of profit to the total cost of the work. Such type of contracts are entered into when it is not possible to estimate the Contract Cost with reasonable accuracy due to unstable condition of material, labour services, etc.

Cost plus contracts have the following advantages and disadvantages :

Advantages :

- (i) The Contractor is assured of a fixed percentage of profit. There is no risk of incurring any loss on the contract.
- (ii) It is useful specially when the work to be done is not definitely fixed at the time of making the estimate.
- (iii) Contractee can ensure himself about 'the cost of the contract', as he is empowered to examine the books and documents of the contractor to ascertain the veracity of the cost of the contract.



Cost Accounting

Disadvantages - The contractor may not have any inducement to avoid wastages and effect economy in production to reduce cost.

Escalation Clause - If during the period of execution of a contract, the prices of materials, or labour etc., rise beyond a certain limit, the contract price will be increased by an agreed amount. Inclusion of such a clause in a contract deed is called an "Escalation Clause".

Illustration

The following expenses were incurred on a contract :	Rs.
Material purchased	6,00,000
Material drawn from stores	1,00,000
Wages	2,25,000
Plant issued	75,000
Chargeable expenses	75,000
Apportioned indirect expenses	25,000

The contract was for Rs. 20,00,000 and it commenced on January 1, 2005. The value of the work completed and certified upto 30th November, 2005 was Rs. 13,00,000 of which Rs. 10,40,000 was received in cash, the balance being held back as retention money by the contractee. The value of work completed subsequent to the architect's certificate but before 31st December, 2005 was Rs. 60,000. There were also lying on the site materials of the value of Rs. 40,000. It was estimated that the value of plant as at 31st December, 2005 was Rs. 30,000.

Solution :

Dr.	Contract Account		Cr.
	Rs.		Rs.
To Material purchased	6,00,000	By Work-in-progress :	
" Stores issued	1,00,000	Work certified	13,00,000
" Wages	2,25,000	Work uncertified	60,000
" Plant	75,000	Material unused	40,000
" Chargeable expenses	75,000	Plant less depreciation	30,000
" Indirect expenses	25,000		
" Profit and Loss Account, 2/3rds of profit on cash basis	1,76,000*		



Method of Costing (I)

” Work-in-progress		
balance of profit c/d	<u>1,54,000</u>	
	<u>14,30,000</u>	<u>14,30,000</u>
” Balance b/d: Work certified	13,00,000	
Uncertified	60,000	
Material at site	40,000	
Plant at site	<u>30,000</u>	
	14,30,000	
Less: Reserve	<u>1,54,000</u>	
	<u>12,76,000</u>	

*Computation of Profit :	Rs.
Apparent profit	3,30,000
2/3rd of that since 65% of the work is complete	2,20,000
80% of that on cash basis	1,76,000

An alternative method of presentation can be to deduct the balance of profit to be carried down (Rs. 1,54,000 in the above case) from the work certified before it is entered in the contract account. It will be Rs. 11,46,000 in the illustration given above. Of course, the reserve to be so deducted from the work certified will have to be first ascertained by considering the value of the work certified.

Illustration

A contractor prepares his accounts for the year ending 31st December each year. He commenced a contract on 1st April, 2005.

The following information relates to the contract as on 31st December, 2005 :

	Rs.
Material issued	2,51,000
Labour charges	5,65,600
Salary to Foreman	81,300

A machine costing Rs. 2,60,000 has been on the site for 146 days, its working life is estimated at 7 years and its final scrap value at Rs. 15,000.

A supervisor, who is paid Rs. 8,000 p.m. has devoted one-half of his time to this contract.

All other expenses and administration charges amount to Rs. 1,36,500.

Material in hand at site costs Rs. 35,400 on 31st December, 2005.



Cost Accounting

The contract price is Rs. 20,00,000. On 31st December, 2005 two-third of the contract was completed. The architect issued certificates covering 50% of the contract price, and the contractor had been paid Rs. 7,50,000 on account.

Prepare Contract A/c and show how much profit or loss should be included in financial accounts to 31st December, 2005.

Solution

Dr.	Contract Account		Cr.
	Rs.		Rs.
To Material issued	2,51,000	By Machine	2,46,000
" Labour charges	5,65,600	(See note 1)	
" Foreman salary	81,300	By Material (in hand)	35,400
" Machine	2,60,000	By Works cost	10,49,000
" Supervisor's salary (Rs. 8,000 × 9)/2	36,000		
" Adm. charges	<u>1,36,500</u>		
	<u>13,30,400</u>		<u>13,30,400</u>
To Works cost	10,49,000	By Work certified	10,00,000
To Notional profit	2,13,250	By Work uncertified (See Note 2)	2,62,250
	<u>12,62,250</u>		<u>12,62,250</u>
To Profit & Loss A/c	1,06,625	By Notional Profit	2,13,250
To Work-in-Progress	<u>1,06,625</u>		
	<u>2,13,250</u>		<u>2,13,250</u>

Notes :

1. *Machine* :

$$[(Rs. 2,60,000 - Rs. 15,000) \div 7] \times \frac{146}{365} = Rs. 14,000$$

Hence the value of machine after the period of 146 days is

$$Rs. 2,60,000 - Rs. 14,000 = Rs. 2,46,000$$



Method of Costing (I)

2. The cost of 66.67% of the contract is Rs. 10,49,000

$$\therefore \text{Cost of 100\% " " " " } \frac{\text{Rs. 10,49,000}}{66.67} \times 100 = \text{Rs. 15,73,500}$$

\therefore Cost of 50% of the contract which has been certified by the architect is Rs. 7,86,750. Also the cost of 16.67% of the contract, which has been completed but not certified by the architect is Rs. 2,62,250.

Illustration

M/s. Bansals Construction Company Ltd. took a contract for Rs. 60,00,000 expected to be completed in three years. The following particulars relating to the contract are available:

	2004	2005	2006
	Rs.	Rs.	Rs.
Materials	6,75,000	10,50,000	9,00,000
Wages	6,20,000	9,00,000	7,50,000
Cartage	30,000	90,000	75,000
Other expenses	30,000	75,000	24,000
Cumulative work certified	13,50,000	45,00,000	60,00,000
Cumulative work uncertified	15,000	75,000	—

Plant costing Rs. 3,00,000 was bought at the commencement of the contract. Depreciation was to be charged at 25% per annum, on the written down value method. The contractee pays 75% of the value of work certified as and when certified, and makes the final payment on completion of the contract.

You are required to make a contract account and contractee account as they would appear in each of the three years. Also show how the work-in-progress and other items should appear in the balance sheet.

Solution

<i>Dr.</i>	Contract Account		<i>Cr.</i>
	<i>Rs.</i>		<i>Rs.</i>
2004	2004		
To Materials	6,75,000	By Plant at site c/d	2,25,000
To Wages	6,20,000	By work-in-progress c/d :	Rs.



Cost Accounting

To Cartage	30,000	Work certified	13,50,000
To Other expenses	30,000	Work uncertified	<u>15,000</u> 13,65,000
To Plant	3,00,000	By Profit & Loss A/c	65,000
		(Loss transferred)	
	<u>16,55,000</u>		<u>16,55,000</u>

2005	Rs.	2005	Rs.
To Work-in-progress b/d :		By Work-in-progress c/d :	
Work certified	13,50,000	Work certified	45,00,000
Work uncertified	<u>15,000</u> 13,65,000	Work uncertified	<u>75,000</u> 45,75,000
To Plant b/d	2,25,000	By Plant at site c/d	1,68,750
To Materials	10,50,000		
To Wages	9,00,000		
To Cartage	90,000		
To Other expenses	75,000		
To Notional profit c/d	<u>10,38,750</u>		
	<u>47,43,750</u>		<u>47,43,750</u>
To Profit & loss A/c	5,19,375	By Notional profit b/d	10,38,750
To Work-in-progress c/d	5,19,375		
(profit in reserve)			
(Refer to working note 2)			
	<u>10,38,750</u>		<u>10,38,750</u>

2006	Rs.	2006	Rs.
To Work-in-progress b/d:		By Work-in-progress b/d	5,19,375
Work certified	45,00,000	(profit in reserve)	
Work uncertified	<u>75,000</u> 45,75,000	By Plant at site	1,26,562
		By Contractee's A/c	60,00,000
		(contract price)	
To Plant b/d	1,68,750		
To Materials	9,00,000		
To Wages	7,50,000		
To Cartage	75,000		



Method of Costing (I)

To Other expenses	24,000	
To Profit & loss A/c	<u>1,53,187</u>	
	<u>66,45,937</u>	<u>66,45,937</u>

Working Notes :

1. In 2004 there is a loss, and so the whole of it will be transferred to the profit and loss account.
2. In 2005, the contract is 3/4th complete. Hence, the profit to be transferred to the profit and loss account will be determined as under :

$$= \frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash received}}{\text{Work received}}$$

$$= \frac{2}{3} \times \frac{\text{Rs. } 33,75,000}{45,00,000} = \text{Rs. } 5,19,375$$

Contractee's account

	Rs.		Rs.
2004		2004	
To Balance c/d	<u>10,12,500</u>	By Bank	<u>10,12,500</u>
2005		2005	
To Balance c/d	33,75,000	By Balance b/d	10,12,500
	<u>33,75,000</u>	By Bank	<u>23,62,500*</u>
			<u>33,75,000</u>
2006		2006	
To Contract A/c (Contract price)	60,00,000	By Balance b/d	33,75,000
	<u>60,00,000</u>	By Bank	<u>26,25,000</u>
			<u>60,00,000</u>

*The total value of work certified at the end of 2005 was Rs. 45,00,000 of that worth Rs. 13,50,000 was certified in 2004. Hence, the cash to be received in 2005 is 75% of Rs. 31,50,000 (Rs. 45,00,000 – Rs. 13,50,000) i.e. Rs. 23,62,500.

Balance sheet (Extract) 2004

<i>Liabilities</i>	Rs.	<i>Assets</i>	Rs.
Capital	–	Plant at site	2,25,000
Less : Loss during the year	65,000		
		<i>Work-in-progress :</i>	<i>Rs.</i>
		Work certified	13,50,000



Cost Accounting

Work uncertified	<u>15,000</u>	
	13,65,000	
Less: Cash received	<u>10,12,500</u>	3,52,500

Balance sheet (Extract) 2005

<i>Liabilities</i>	<i>Rs.</i>	<i>Assets</i>	<i>Rs.</i>
Capital	–	Plant at site	1,68,750
Add: Profit during the year	5,19,375	Work-in-progress :	<i>Rs.</i>
		Work certified	45,00,000
		Work uncertified	<u>75,000</u>
			45,75,000
		Less: Profit in reserve	<u>5,19,375</u>
			40,55,625
		Less Cash received	33,75,000
			6,80,625

Balance sheet (Extract) 2006

<i>Liabilities</i>	<i>Rs.</i>	<i>Assets</i>	<i>Rs.</i>
Capital	–	Plant at site	1,26,562
Add: Profit during the year	1,53,157		

Illustration

Compute a conservative estimate of profit on a contract (which has been 90% complete) from the following particulars. Calculate the proportion of profit to be taken to Profit & Loss Account under various methods and give your recommendation.

Rs.

Total expenditure to date	4,50,000
Estimated further expenditure to complete the contract (including contingencies)	25,000
Contract price	6,12,000
Work certified	5,50,800
Work uncertified	34,000
Cash received	4,40,640



Method of Costing (I)

Solution

<i>Computation of notional profit</i>	Rs.
Value of work certified	5,50,800
Less: Cost of work certified	
(Rs. 4,50,000 – Rs. 34,000)	<u>4,16,000</u>
Notional profit	<u>1,34,800</u>
<i>Computation of estimated profit</i>	Rs.
Contract price	6,12,000
Less: Cost of work to date	4,50,000
Estimated further expenditure to complete the contract	<u>25,000</u>
Estimated total cost	<u>4,75,000</u>
Estimated profit	<u>1,37,000</u>

Profit to be transferred under various methods

- (i) $\text{Notional profit} \times \frac{\text{Work certified}}{\text{Contract price}}$
- $$= \text{Rs. } 1,34,800 \times \frac{\text{Rs. } 5,50,800}{\text{Rs. } 6,12,000} = \text{Rs. } 1,21,320$$
- (ii) $\text{Estimated profit} \times \frac{\text{Work certified}}{\text{Contract price}}$
- $$= \text{Rs. } 1,37,000 \times \frac{\text{Rs. } 5,50,800}{\text{Rs. } 6,12,000} = \text{Rs. } 1,23,300$$
- (iii) $\text{Estimated profit} \times \frac{\text{Work certified}}{\text{Contract price}} \times \frac{\text{Cash received}}{\text{Work certified}}$
- $$= \text{Rs. } 1,37,000 \times \frac{\text{Rs. } 5,50,800}{\text{Rs. } 6,12,000} \times \frac{\text{Rs. } 4,40,640}{\text{Rs. } 5,50,800} = \text{Rs. } 98,640$$
- (iv) $\text{Estimated profit} \times \frac{\text{Cost of work date}}{\text{Estimated total cost}}$
- $$= \text{Rs. } 1,37,000 \times \frac{\text{Rs. } 4,50,000}{\text{Rs. } 4,75,000} = \text{Rs. } 1,29,790$$



Cost Accounting

$$(v) \text{ Estimated profit} \times \frac{\text{Cost of work done}}{\text{Estimated total cost}} \times \frac{\text{Cash received}}{\text{Work certified}}$$

$$= \text{Rs. } 1,37,000 \times \frac{\text{Rs. } 4,50,000}{\text{Rs. } 4,75,000} \times \frac{\text{Rs. } 4,40,640}{\text{Rs. } 5,50,800} = \text{Rs. } 1,03,832$$

Recommendation : It is recommended that a sum of Rs. 98,640 may be transferred to the profit and loss account. This amount is the least and has been arrived by using the formula (iii) above. According to this formula, profit transferred to the profit and loss account is generally kept the minimum and allows withholding in reserve a larger portion of notional profit to meet future unforeseen expenses and contingencies.

Illustration

A contractor has entered into a long term contract at an agreed price of Rs. 1,75,000 subject to an escalation clause for materials and wages as spelt out in the contract and corresponding actuals are as follows :

	Standard		Actual	
	Qty (tonnes)	Rate (Rs.)	Qty (tonnes)	Rate (Rs.)
<i>Materials</i>				
A	5,000	5	5,050	4.80
B	3,500	8	3,450	7.90
C	2,500	6	2,600	6.60
<i>Labour</i>	<i>Hours</i>	<i>Hourly Rate (Rs.)</i>	<i>Hours</i>	<i>Hourly Rate (Rs.)</i>
X	2,000	7.00	2,100	7.20
Y	2,500	7.50	2,450	7.50
Z	3,000	6.50	3,100	6.60

Reckoning the full actual consumption of material and wages the company has claimed a final price of Rs. 1,77,360. Give your analysis of admissible escalation claim and indicate the final price payable.



Method of Costing (I)

Solution

Statement showing final claim

	Standard Qty/Hrs. (a)	Standard Rate (Rs.) (b)	Actual Rate (Rs.) (c)	Variation in Rate (Rs.) (d) = (c)–(b)	Escalation Claim (Rs.) (e) = (a) × (d)
<i>Materials</i>					
A	5,000	5.00	4.80	(–) 0.20	(–) 1,000
B	3,500	8.00	7.90	(–) 0.10	(–) 350
C	2,500	6.00	6.60	(+) 0.60	<u>1,500</u>
					<u>150</u>
					Materials escalation claim : (P)
<i>Labour</i>					
X	2,000	7.00	7.20	(+) 0.20	400
Y	2,500	7.50	7.50	–	–
Z	3,000	6.50	6.60	(+) 0.10	<u>300</u>
					<u>700</u>
					Wages escalation claim : (Q)
					<u>850</u>
					Final claim: (P) + (Q)

Statement showing final price payable

Agreed price	Rs. 1,75,000
Agreed escalation :	
Material cost	Rs. 150
Labour cost	Rs. 700
Final price payable	<u>Rs. 850</u>
Final price payable	Rs. 1,75,850

The claim of Rs. 1,77,360 is based on the total increase in cost. This can be verified as shown below:

Statement showing total increase in cost

	Qty/hrs (a)	Standard Cost		Qty/hrs (d)	Actual Cost		Increase/ Amount(Decrease) (Rs.) (g)=(f) – (c)
		Rate (Rs.) (b)	Amount (Rs.) (c) = (a) × (b)		Rate (Rs.) (e)	Amount (Rs.) (f) = (d) × (e)	
<i>I. Materials</i>							
A	5,000	5.00	25,000	5,050	4.80	24,240	(760)
B	3,500	8.00	28,000	3,450	7.90	27,255	(745)
C	2,500	6.00	<u>15,000</u>	2,600	6.60	<u>17,160</u>	<u>2,160</u>
			<u>68,000</u>			<u>68,655</u>	<u>655</u>



Cost Accounting

II. Labour

X	2,000	7.00	14,000	2,100	7.20	15,120	1,120
Y	2,500	7.50	18,750	2,450	7.50	18,375	(375)
Z	3,000	6.50	<u>19,500</u>	3,100	6.60	<u>20,460</u>	<u>960</u>
			<u>52,250</u>			<u>53,955</u>	<u>1,705</u>

Total (I + II) 2,360

The final price claimed by the company is contract price Rs. 1,75,000

Add : Increase in cost Rs. 2,360

Rs. 1,77,360

This claim is not admissible because escalation clause covers only that part of increase in cost, which has been caused by inflation.

Note : It is fundamental principle that the contractee would compensate the contractor for the increase in costs which are caused by factors beyond the control of contractor and not for increase in costs which are caused due to inefficiency or wrong estimation.

Illustration :

A contractor commenced a building contract on October 1, 2004. The contract price is Rs. 4,40,000. The following data pertaining to the contract for the year 2005-2006 has been compiled from his books and is as under :

		Rs.
April 1, 2005	Work-in-progress not certified	55,000
	Materials at site	2,000
2005-06	Expenses incurred :	
	Materials issued	1,12,000
	Wages paid	1,08,000
	Hire of plant	20,000
	Other expenses	34,000
March 31, 2006	Materials at site	4,000
	Work-in-progress : Not certified	8,000
	Work-in-progress : Certified	4,05,000

The cash received represents 80% of work certified. It has been estimated that further costs to complete the contract will be Rs. 23,000 including the materials at site as on March 31, 2006.



Method of Costing (I)

Required :

Determine the profit on the contract for the year 2005-06 on prudent basis, which has to be credited to P/L A/c.

Solution

Contract Account for the year 2005-06			
<i>Dr.</i>			<i>Cr.</i>
<i>Particulars</i>	<i>(Rs.)</i>	<i>Particulars</i>	<i>(Rs.)</i>
1.4.05			
To Work-in-progress (not certified)	55,000	By Materials at site	4,000
To Materials at site	2,000		
2005-06			
To Materials issued	1,12,000	By Cost of contract c/d (to date)	3,27,000
To Wages paid	1,08,000		
To Hire of plant	20,000		
To Other expenses	<u>34,000</u>		
	<u>3,31,000</u>		<u>3,31,000</u>
31.3.06			
To Cost of contract b/d (to date)	3,27,000	By Work-certified	4,05,000
To Profit & loss A/c	66,273	By Work-not certified	8,000
To Profit in reserve	<u>19,727</u>		
	<u>4,13,000</u>		<u>4,13,000</u>
Profit for the year 2005-06 = Rs. 4,13,000 – Rs. 3,27,000 = Rs. 86,000			

Estimated profit (*on the completion of the contract*)

	<i>Rs.</i>
Cost of the contract (to date)	3,27,000
Further cost of completing the contract	23,000
Total cost: (A)	3,50,000
Contract price: (B)	4,40,000
Estimated profit on the completion of contract: {(A) – (B)}	90,000



Cost Accounting

$$\text{Since } \left(\frac{\text{Work certified}}{\text{Contract price}} \right) \times 100 = \frac{\text{Rs.4,05,000}}{\text{Rs.4,40,000}} \times 100 = 92.05\%$$

Illustration

A construction company under-taking a number of contracts, furnished the following data relating to its uncompleted contracts as on 31st March, 2006 :

	(Rs. in lacs)			
	Contract Numbers			
	723	726	729	731
Total Contract Price	23.20	14.40	10.08	28.80
Estimated Costs on completion of contract	20.50	11.52	12.60	21.60
Expenses for the year ended 31.3.06 :				
Direct Materials	5.22	1.80	1.98	0.80
Direct Wages	2.32	4.32	3.90	2.16
Overheads (Excluding Depreciation)	1.06	2.60	2.62	1.05
Profit Reserve as on 1.4.05	1.50	—	—	—
Plant issued at Cost	5.00	3.50	2.75	3.00
Materials at Site on 1.4.05	0.75	—	—	—
Materials at Site on 31.3.06	0.45	0.20	0.08	0.05
Work Certified till 31.3.05	4.65	—	—	—
Work Certified during the year 2005-06	12.76	13.26	7.56	4.32
Work Uncertified as on 31.3.06	0.84	0.24	0.14	0.18
Progress payments received during the year	9.57	9.0	5.75	3.60

Depreciation @ 20% per annum is to be charged on plant issued. While the Contract No. 723 was carried over from last year, the remaining contracts were started in the 1st week of April, 2005. Required :

- (i) Determine the profit/loss in respect of each contract for the year ended 31st March, 2006.
- (ii) State the profit/loss to be carried to Profit & Loss A/c for the year ended 31st March, 2006.



Method of Costing (I)

Solution

**(i) Statement of Profit/Loss in respect of following contract numbers
for the year ended 31st March, 2006**

		(Rs. in lacs)			
		Contract Numbers			
		723	726	729	731
A.	<i>Contract completion percentage :</i>				
	Work certified : (a)	17.41	13.26	7.56	4.32
	Contract price : (b)	23.20	14.40	10.08	28.80
	Percentage of completion : [(a) – (b)]	75.04	92.08	75.00	15.00
B.	<i>Estimated profit on completion :</i>				
	Contract price : (c)	23.20	14.40	10.08	28.80
	Estimated costs on completion : (d)	20.50	11.52	12.60	21.60
	Estimated profit (loss) on completion : [(c) – (d)]	2.70	2.88	(2.52)	7.20
C.	<i>Profit of the year :</i>				
	Op. stock of materials	0.75	—	—	—
	Materials issued	5.22	1.80	1.98	0.80
	Direct wages	2.32	4.32	3.90	2.16
	Overheads	1.06	2.60	2.62	1.05
	Depreciation	1.00	0.70	0.55	0.60
	Total : (P)	10.35	9.42	9.05	4.61
	Profit in reserve	1.50	—	—	—
	Material at site on 31/3/06	0.45	0.20	0.08	0.05
	Total : (Q)	1.95	0.20	0.08	0.05
	Cost of contract : (R) = [(P) – (Q)]	8.40	9.22	8.97	4.56
	Work certified	12.76	13.26	7.56	4.32
	Work not certified	0.84	0.24	0.14	0.18
	Total : (S)	13.60	13.50	7.70	4.50
	Profit (loss) for the year [(R) – (S)]	5.20	4.28	(1.27)	(0.06)



Cost Accounting

(ii) Profit to be taken to Profit & Loss Account of the year in respect of respective contract

$$\text{Contract 723} = \frac{2}{3} \times \text{Notional profit} \times \frac{\text{Cash received}}{\text{Work certified}}$$

$$= \frac{2}{3} \times 5.20 \times \frac{9.57}{12.76} = \text{Rs. 2.60 lacs}$$

= Balance Rs. 2.60 lacs to reserve.

$$\text{Contract 726} = \text{Estimated total profits on completion} \times \frac{\text{Work certified}}{\text{Contract price}} \times \frac{\text{Cash received}}{\text{Work certified}}$$

$$= 2.88 \times \frac{13.26}{14.40} \times \frac{9.00}{13.26} = \text{Rs. 1.80 lacs}$$

= Balance to reserve Rs. 2.48 lacs

Contract 729 = Provide for current loss of Rs. 1.27 lacs

= Provide for expected loss of Rs. 1.25 lacs

Contract 731 = Provide for current loss of Rs. 0.06 lacs

Illustration

MNP Construction Ltd. commenced a contract on April 1, 2004. The total contract was for Rs. 17,50,000. It was decided to estimate the total profit and to take to the credit of P/L A/c the proportion of estimated profit on cash basis which work completed bore to the total contract. Actual expenditure in 2004-05 and estimated expenditure in 2005-2006 are given below :

	2004-2005 (Actual) Rs.	2005-2006 (Estimated) Rs.
Materials issued	3,00,000	5,50,000
Labour : Paid	2,00,000	2,50,000
: Outstanding at end	20,000	30,000
Plant purchased	1,50,000	—
Expenses : Paid	75,000	1,50,000
: Prepaid at end	15,000	—
Plant returns to store (historical cost)	50,000	1,00,000

(on Dec. 31, 2005)



Method of Costing (I)

Material at site	20,000	50,000
Work certified	8,00,000	Full
Work uncertified	25,000	—
Cash received	6,00,000	Full

The plant is subject to annual depreciation @ 25% of WDV Cost. The contract is likely to be completed on Dec. 31, 2005. Prepare the Contract A/c. Determine the profit on the contract for the year 2004-2005 on prudent basis, which has to be credited to P/L A/c.

Solution

**MNP Construction Ltd.
Contract Account (1st April, 2004 to 31st March, 2005)**

Dr.		Cr.	
<i>Particulars</i>	<i>Amount</i>	<i>Particulars</i>	<i>Amount</i>
	<i>(Rs.)</i>		<i>(Rs.)</i>
Materials issued	3,00,000	By Plant returned to store	37,500
Labour : Paid	2,00,000	<i>(Refer to working note 1)</i>	
Outstanding 20,000	2,20,000	By Materials at site	20,000
To Plant purchased	1,50,000	By Work certified	8,00,000
<i>(Refer to working note 4)</i>		By Work uncertified	25,000
To Expenses	60,000	By Plant at site	75,000
To Notional profit c/d	<u>2,27,500</u>	<i>(Refer to working note 2)</i>	<u> </u>
	<u>9,57,500</u>		<u>9,57,500</u>
To Profit and Loss A/c	66,321,43	By Notional profit b/d	2,27,500,00
<i>(Refer to working note 5)</i>			
To Work in Progress A/c	1,61,178,57		
<i>(Profit in reserve)</i>			
	<u>2,27,500,00</u>		<u>2,27,500,00</u>

**MSP Construction Ltd.
Contract Account (1st April, 2004 to 31st December, 2005)
(For computing estimated profit)**

Dr.		Cr.	
<i>Particulars</i>	<i>Amount</i>	<i>Particulars</i>	<i>Amount</i>
	<i>(Rs.)</i>		<i>(Rs.)</i>
To Materials issued	8,50,000	By Materials at site	50,000
<i>(Rs. 3,00,000 + Rs. 5,50,000)</i>		By Plant returned to store on	37,500



Cost Accounting

To Labour (<i>paid & outstanding</i>)	4,80,000	31st March, 2005	
(Rs. 2,20,000 + Rs. 2,30,000 + Rs. 30,000)		(Refer to working note 1)	
To Plant purchased	1,50,000	By Plant returned to store	60,937.50
To Expenses	2,25,000	on 31st December, 2005	
(Rs. 60,000 + Rs. 1,65,000)		(Refer to working note 3)	
To Estimated profit	<u>1,93,437.50</u>	By Contractee's A/c	<u>17,50,000</u>
	18,98,437.50		18,98,437.50

Working Notes :

- Value of the plant returned to store on 31st March, 2005* Rs.

Historical cost of the plant returned	50,000
Less : Depreciation @ 25% of WDV cost for 1 year	<u>12,500</u>
Value of the plant returned to store on 31st March, 2005	<u>37,500</u>
- Value of plant at site :* Rs.

Historical cost of the plant at site	1,00,000
Less : Depreciation @ 25% of WDV cost for 1 year	<u>25,000</u>
Value of the plant at site on 31st March, 2005	<u>75,000</u>
- Value of the plant returned to store on 31st December, 2005* Rs.

Value of the plant on 31st March, 2005	75,000.00
Less : Depreciation @ 25% of WDV for a period of 9 months	<u>14,062.50</u>
Value of the plant on 31-12-2005	60,937.50
- Expenses paid :*

Total expenses paid	<u>75,000</u>
Less : Prepaid expenses at end	<u>15,000</u>
Expenses paid for the year 2004-2005	<u>60,000</u>
- Profit to be credited to P/L A/c on 31st March, 2005 for the contract likely to be completed on 31st December, 2005

$$\text{Estimated profit} \times \frac{\text{Cash received}}{\text{Work certified}} \times \frac{\text{Work certified}}{\text{Total Contract price}}$$

$$= \text{Rs. } 1,93,437.50 \times \frac{\text{Rs. } 6,00,000}{\text{Rs. } 8,00,000} \times \frac{\text{Rs. } 8,00,000}{\text{Rs. } 17,50,000} = \text{Rs. } 66,321.43.$$



Miscellaneous Illustration

Illustration 1

Compute a conservative estimate of profit on a contract (which has been 90% complete) from the following particulars : (Rs.)

Total expenditure to date	22,50,000
Estimated further expenditure to complete the contract (including contingencies)	2,50,000
Contract price	32,50,000
Work certified	27,50,000
Work uncertified	1,75,000
Cash received	21,25,000

Solution:

Calculation of conservative Estimate of Profit	(Rs.)
Total expenditure to date	22,50,000
Estimated further expenditure to complete the contract (including contingencies)	<u>2,50,000</u>
	25,00,000
Estimated profit on contract	<u>7,50,000</u>
Contract price	32,50,000

Profit to be transferred to Profit and Loss A/c

$$\begin{aligned} & \text{Estimated profit} \times \frac{\text{Cash received}}{\text{Contract price}} \\ & = \text{Rs.}7,50,000 \times \frac{\text{Rs.}21,25,000}{\text{Rs.}32,50,000} = \text{Rs.}4,90,385 \end{aligned}$$

Illustration 2

AKP Builders Ltd. commenced a contract on April 1, 2005. The total contract was for Rs.5,00,000. Actual expenditure for the period April 1, 2005 to March 31, 2006 and estimated expenditure for April 1, 2006 to December 31, 2006 are given below :



Cost Accounting

Particulars	2005-06	2006-07
	(actual)	(9 months) (estimated)
Materials issued	90,000	85,750
Labour : Paid	75,000	87,325
Outstanding at the end	6,250	8,300
Plant	25,000	-
Sundry expenses : Paid	7,250	6,875
Prepaid at the end	625	-
Establishment charges	14,625	-

A part of the material was unsuitable and was sold for Rs.18,125 (cost being Rs.15,000) and a part of plant was scrapped and disposed of for Rs.2,875. The value of plant at site on 31 March, 2006 was Rs. 7,750 and the value of material at site was Rs. 4,250. Cash received on account to date was Rs. 1,75,000, representing 80% of the work certified. The cost of work uncertified was valued at Rs.27,375.

The contractor estimated further expenditure that would be incurred in completion of the contract :

- The contract would be completed by 31st December, 2006.
- A further sum of Rs.31,250 would have to be spent on the plant and the residual value of the plant on the completion of the contract would be Rs.3,750.
- Establishment charges would cost the same amount per month as in the previous year.
- Rs.10,800 would be sufficient to provide for contingencies.

Required: Prepare Contract Account and calculate estimated total profit on this contract. Profit transferrable to Profit and Loss Account is to be calculated by reducing estimated profit in proportion of work certified and contract price.

Solution:

AKP Builders Ltd.

Contract Account (2005-06)

Particulars		Rs.	Particulars		Rs.
To	Materials issued	90,000	By	Material sold	18,125
To	Labour	75,000	By	Plant sold	2,875



Method of Costing (I)

	<i>Add: Outstanding</i>	<u>6,250</u>	81,250	By	Plant at site	7,750
To	Plant		25,000	By	Material at site	4,250
To	Sundry Expenses	7,250		By	Work-in-progress	
	<i>Less : Prepaid</i>	<u>625</u>	6,625		Work certified	2,18,750
To	Establishment charges		14,625		Work uncertified	<u>27,375</u> 2,46,125
To	Profit & Loss A/c (profit on sale of material)		3,125			
To	Notional profit c/d		<u>58,500</u>			<u> </u>
			<u>2,79,125</u>			<u>2,79,125</u>
To	Profit & Loss A/c (transfer)		29,960	By	Notional profit b/d	58,500
To	Work-in-progress (reserve)		<u>28,540</u>			<u> </u>
			58,500			58,500

Profit to be transferred to Profit and Loss Account

$$= \text{Estimated profit} \times \frac{\text{Work Certified}}{\text{Contract price}}$$

$$= \text{Rs. } 68,481 \times \frac{2,18,750}{5,00,000} = \text{Rs. } 29,960$$

Calculation of Estimated Profit			(Rs.)
(1)	Material consumed	(90,000 + 3,125 – 18,125)	75,000
	<i>Add : Further consumption</i>		<u>85,750</u> 1,60,750
(2)	Plant used	(25,000 – 2,875)	22,125
	<i>Add: Further plant introduced</i>		31,250
	<i>Less: Closing balance of plant</i>		<u>3,750</u> 49,625
(3)	Establishment charges		14,625
	<i>Add: Further charges for nine month</i>	(14,625 × 9/12)	<u>10,969</u> 25,594
(4)	Sundry expenses		6,625
	<i>Add: Further expenses</i>		6,875



Cost Accounting

	<i>Add:</i> Prepaid expenses		<u>625</u>	14125
(5)	Labour cost		81,250	
	<i>Add:</i> Further cost	(87,325 – 6,250)	81,075	
	<i>Add:</i> Outstanding		<u>8,300</u>	1,70,625
(6)	Reserve for contingencies			10,800
	Estimated profit	(balancing figure)	<u>68,481</u>	
	Contract price			<u>5,00,000</u>

Illustration 3

RST Construction Ltd. commenced a contract on April 1, 2005. The total contract was for Rs. 49,21,875. It was decided to estimate the total profit on the contract and to take to the credit of Profit and Loss A/c that proportion of estimated profit on cash basis, which work completed bore to total contract. Actual expenditure for the period April 1, 2005 to March 31, 2006 and estimated expenditure for April 1, 2006 to September 30, 2006 are given below :

(Rs.)

	<i>April 1, 2005 to March 31, 2006 (Actuals)</i>	<i>April 1, 2006 to Sept. 30, 2006 (Estimated)</i>
Materials issued	7,76,250	12,99,375
Labour : Paid	5,17,500	6,18,750
Prepaid	37,500	-
Outstanding	12,500	5,750
Plant purchased	4,00,000	-
Expenses: Paid	2,25,000	3,75,000
Outstanding	25,000	10,000
Prepaid	15,000	-
Plant returns to store (historical cost)	1,00,000	3,00,000



Method of Costing (I)

	(on September 30, 2005)	(on September 30, 2006)
Work certified	22,50,000	Full
Work uncertified	25,000	-
Cash received	18,75,000	-
Materials at site	82,500	42,500

The plant is subject to annual depreciation @ 25% on written down value method. The contract is likely to be completed on September 30, 2006.

Required : Prepare the Contract A/c. Determine the profit on the contract for the year 2005-06 on prudent basis, which has to be credited to Profit and Loss A/c.

Solution:

	(Rs.)
Calculation of written down value of plant as on 30-9-2006.	
Plant purchased on 1-4-2005	4,00,000
Less: Plant returned to store on 30-9-2005	<u>1,00,000</u>
(Depreciation on it Rs.1,00,000 × 25/100 × 6/12 = Rs.12,500)	3,00,000
Less: Depreciation on Balance plant (3,00,000 × 25/100)	<u>75,000</u>
WDV of Plant on 1-4-2006	2,25,000
Less : Depreciation (2,25,000 × 25/100 × 6/12)	<u>28,125</u>
WDV of plant returned to store on 30-9-2006	<u>1,96,875</u>

Contract A/c (1-4-2005 to 31-3-2006)

<i>Particulars</i>	<i>Rs.</i>	<i>Particulars</i>	<i>Rs.</i>
To Materials issued	7,76,250	By Plant returned to	
To Labour	5,17,500	Store on 30-9-2005	1,00,000
Less: Prepaid	<u>37,500</u>	Less:	<u>12,500</u>
	4,80,000	Depreciation(1/2)	87,500
Add :	<u>12,500</u>		
Outstanding	4,92,500	By Plant at site on	3,00,000
		31.3.06	



Cost Accounting

To	Plant purchased	4,00,000	Less: Depreciation	<u>75,000</u>	2,25,000
To	Expenses	2,25,000	By	Materials at site	82,500
	Less : Prepaid	<u>15,000</u>	By	Work-in-progress	
		2,10,000		Work certified	22,50,000
	Add :	<u>25,000</u>		Work uncertified	25,000
	Outstanding	2,35,000			
To	Notional profit c/d	<u>7,66,250</u>			-
		<u>26,70,000</u>			<u>26,70,000</u>
To	Profit & Loss A/c (Tr.)	3,89,000	By	Notional profit b/d	7,66,250
To	Work-in-progress (Res.)	<u>3,77,250</u>			-
		7,66,250			7,66,250

Computation of Estimated Profit

Contract A/c (1-4-2005 to 30-9-2006)

Particulars		Rs.	Particulars		Rs.
To	Materials issued (7,76,250+12,99,375)	20,75,625	By	Materials at site	42,500
To	Labour (5,17,500 - 37,500 + 12,500 + 6,18,750+37,500 -12,500 + 5,750)	11,42,000	By	Plant returned to store on 30.9.2005 (1,00,000 – 12,500)	87,500
			By	Plant returned to store on 30.9.06	1,96,875
To	Plant purchased	4,00,000		(4,00,000 – 1,00,000 – 1,03,125)	
To	Expenses (2,25,000+25,000 -15,000+ 3,75,000 - 25,000 + 15,000 + 10,000)	6,10,000	By	Contractee A/c	49,21,875
To	Estimated profit	<u>10,21,125</u>			
		<u>52,48,750</u>			<u>52,48,750</u>



Method of Costing (I)

Since the contract is nearing completion, the following formula is used for transfer of profit to Profit and Loss Account.

$$\begin{aligned} \text{Estimated profit} &\times \frac{\text{Cash received}}{\text{Contract price}} \\ &= 10,21,125 \times \frac{18,75,000}{49,21,875} \\ &= \text{Rs. } 3,89,000. \end{aligned}$$

6.4 BATCH COSTING

6.4.1 Meaning of Batch Costing: This is a form of job costing. Under job costing, executed job is used as a cost unit, whereas under batch costing, a lot of similar units which comprises the batch may be used as a cost unit for ascertaining cost. In the case of batch costing separate cost sheets are maintained for each batch of products by assigning a batch number. Cost per unit in a batch is ascertained by dividing the total cost of a batch by number of items produced in that batch. Such a method of Costing is used in the case of pharmaceutical or drug industries, ready-made garments, industries manufacturing electronic parts of T.V., radio sets etc.

Illustration

A jobbing factory has undertaken to supply 200 pieces of a component per month for the ensuing six months. Every month a batch order is opened against which materials and labour hours are booked at actuals. Overheads are levied at a rate per labour hour. The selling price contracted for is Rs. 8 per piece. From the following data present the cost and profit per piece of each batch order and overall position of the order for 1,200 pieces.

<i>Month</i>	<i>Batch Output</i>	<i>Material cost</i> <i>Rs.</i>	<i>Direct wages</i> <i>Rs.</i>	<i>Direct labour hours</i>
January	210	650	120	240
February	200	640	140	280
March	220	680	150	280
April	180	630	140	270
May	200	700	150	300
June	220	720	160	320

The other details are :



Cost Accounting

Month	Chargeable expenses	Direct labour
	Rs.	hours
January	12,000	4,800
February	10,560	4,400
March	12,000	5,000
April	10,580	4,600
May	13,000	5,000
June	12,000	4,800

Solution

	Jan.	Feb.	March	April	May	June	Total
Batch output (in units)	210	200	220	180	200	220	1,230
Sale value	Rs. 1,680	1,600	1,760	1,440	1,600	1,760	9,840
Material cost	Rs. 650	640	680	630	700	720	4,020
Direct wages	Rs. 120	140	150	140	150	160	860
Chargeable expenses	Rs. 600	672	672	621	780	800	4,145
Total cost	Rs. 1,370	1,452	1,502	1,391	1,630	1,680	9,025
Profit per batch	Rs. 310	148	258	49	-30	80	815
Total cost per unit	Rs. 6.52	7.26	6.83	7.73	8.15	7.64	7.34
Profit per unit	Rs. 1.48	0.74	1.17	0.27	-0.15	0.36	0.66

Overall position of the order for 1,200 units

Sales value of 1,200 units @ Rs. 8 per unit	Rs. 9,600
Total cost of 1,200 units @ Rs. 7.34 per unit	<u>Rs. 8,808</u>
Profit	<u>Rs. 792</u>

6.4.2 Economic Batch Quantity : In batch costing the most important problem is the determination of optimum size of the batch (how much to produce) or Economic Batch Quantity.

The determination of economic batch quantity involve two types of costs viz., (i) set up cost (or preparation cost) and (ii) carrying cost. With the increase in the batch size, there is an increase in the carrying cost but the set up cost per unit of product is reduced; this situation is reversed when the batch size is reduced. Thus there is one particular batch size for which both set up and carrying costs are minimum. This size is known as economic or optimum batch quantity.



Method of Costing (I)

Economic batch quantity can be determined with the help of a table, graph or mathematical formula. The mathematical formula usually used for its determination is as follows :

$$EBQ = \sqrt{\frac{2DS}{IC}}$$

Where, D = Annual demand for the product
S = Setting up cost per batch
C = Carrying cost per unit of production

Note : If the rate of interest (I) and unit cost of production (C) are given, the following formula should be used for determining EBQ.

$$EBQ = \sqrt{\frac{2DS}{IC}}$$

Illustration :

Monthly demand for a product	500 units
Setting-up cost per batch	Rs. 60
Cost of manufacturing per unit	Rs. 20
Rate of interest	10% p.a.

Determine economic batch quantity.

Solution

$$EBQ = \sqrt{\frac{2DS}{IC}} = \sqrt{\frac{2 \times 500 \times 12 \times 60}{0.1 \times 20}} = 600 \text{ units.}$$

6.5 OPERATING COSTING

6.5.1 Meaning of Operating Costing: It is a method of ascertaining costs of providing or operating a service. This method of costing is applied by those undertakings which provide services rather than production of commodities. The emphasis under operating costing is on the ascertainment of cost of services rather than on the cost of manufacturing a product. This costing method is usually made use of by transport companies, gas and water works departments, electricity supply companies, canteens,



Cost Accounting

hospitals, theatres, schools etc.

For computing the operating cost, it is necessary to decide first, about the unit for which the cost is to be computed, this may often require the study of some technical and operating data, for finding out the factors which have a bearing on cost. The cost units usually used in the following service undertakings are as below :

Transport service	– Passenger km., quintal km., or tonne km.
Supply service	– Kw hr., Cubic metre, per kg., per litre.
Hospital	– Patient per day, room per day or per bed, per operation etc.
Canteen	– Per item, per meal etc.
Cinema	– Per ticket.

Composite units i.e. tonnes kms., quintal kms. etc. may be computed in two ways.

- (i) Absolute (weighted average) tonnes-kms., quintal kms. etc.
 - (ii) Commercial (simple average) tonnes-kms., quintal kms. etc.
- (i) Absolute (weighted average) tonnes-kms.

Absolute tonnes-kms., are the sum total of tonnes-kms., arrived at by multiplying various distances by respective load quantities carried.

- (ii) Commercial (simple average) tonnes-kms.

Commercial tonnes-kms., are arrived at by multiplying total distance kms., by average load quantity.

Note: To understand the concept of absolute tonnes-kms., and commercial tonnes-kms., students should refer to the following illustration.

Illustration

A lorry starts with a load of 20 tonnes of goods from station A. It unloads 8 tonnes at station B and rest of goods at station C. It reaches back directly to station A after getting reloaded with 16 tonnes of goods at station C. The distance between A to B, B to C and then from C to A are 80 kms., 120 kms., and 160 kms., respectively. Compute 'Absolute tonnes-kms.,' and 'Commercial tonnes-kms.'

Solution

$$\begin{aligned}\text{Absolute tonnes-kms.} &= 20 \text{ tonnes} \times 80 \text{ kms} + 12 \text{ tonnes} \times 120 \text{ kms} + 16 \text{ tonnes} \times 160 \text{ kms.} \\ &= 5,600 \text{ tonnes-kms.}\end{aligned}$$



Commercial tonnes-kms. = Average load × total kilometres travelled

$$= \left(\frac{20+12+16}{3} \right) \text{tonnes} \times 360 \text{ kms.} = 5,760 \text{ tonnes-kms.}$$

6.5.2 Preparation of Cost Sheet under Operating Costing: For preparing a cost sheet under operating cost, costs are usually accumulated for a specified period viz., a month, a quarter, or a year etc.

All of the accumulated costs should be classified under the following three heads:

1. Fixed costs or standing charges,
2. Variable costs or running charges,
3. Semi-variable costs or maintenance costs.

Note : In the absence of information about semi-variable costs, the costs may be shown under two heads only, i.e., fixed and variable.

Under operating costing, the per unit cost of service may be calculated by dividing the total cost for the period by the total units of service in the period.

Treatment of depreciation and interest - Depreciation if related to effluxion of time, may be treated as fixed. If it is related to the activity level, it may be treated as variable.

If information about interest is explicitly given, it may be treated as fixed cost.

Illustration

You have been given a permit to run a bus on a route 20 Km. long. The bus costs you Rs. 90,000. It has to be insured @ 3% p.a. and the annual tax will be Rs. 1,000. Garage rent is Rs. 100 p.m. Annual repairs will be Rs. 1,000 and the bus is likely to last for 5 years at the end of which the scrap value is likely to be Rs. 6,000.

The driver's salary will be Rs. 150 p.m. and the conductor's Rs. 100 together with 10% of the takings as commission (to be shared equally by both). Stationery will cost Rs. 50 p.m. The manager-cum-accountant's salary will be Rs. 250 p.m.

Diesel and oil be Rs. 25 per hundred kilometres. The bus will make 3 round trips for carrying on the average 40 passengers on each trip. Assuming 15% profit on takings, calculate the bus fare to be charged from each passenger. The bus will work on the average 25 days in a month.

Solution



Cost Accounting

Operating Cost Statement

Bus No. : DLP 4179

Carrying capacity : 40

	<i>Per annum</i>	<i>Per 100 passenger km.</i>
1	Rs. P. 2	Rs. P. 3
A. Standing Charges		
Depreciation (90,000 – 6,000) ÷ 5	16,800	
Tax	1,000	
Insurance	2,700	
Stationery	600	
Manager's salary	<u>4,200</u>	
Total	<u>25,300</u>	<u>1.756</u>
B. Maintenance charges		
Garage rent	1,200	
Repairs	<u>1,000</u>	
Total	<u>2,200</u>	<u>0.152</u>
C. Operating or running charges		
Diesel and oil	9,000	
Driver's salary	1,800	
Conductor's salary	<u>1,200</u>	
Total	12,000	0.833
Grand Total (A+B+C)		2.741
Loading @ 25/75		<u>0.91</u>
Fare per passenger-km.		<u>3.65</u>

Notes :

- (1) Number of kms. run in a month : $3 \times 2 \times 20 \times 25 = 3,000$
- (2) Diesel & Oil : $3,000 \times \frac{25}{100} = \text{Rs. } 750$
- (3) Number of passenger-kms. per month : $3,000 \times 40 = 1,20,000$
per annum : $1,20,000 \times 12 = 14,40,000$



- (4) *Loading* - If taking is Rs. 100, 10 will have to be given as commission and 15 must remain as profit; the cost must therefore be 75. On 75 the loading must be 25 to make the taking equal to 100.

Illustration

SMC is a public school having five buses each plying in different directions for the transport of its school students. In view of a larger number of students availing of the bus service the buses work two shifts daily both in the morning and in the afternoon. The buses are garaged in the school. The work-load of the students has been so arranged that in the morning the first trip picks up senior students and the second trip plying an hour later picks up the junior students. Similarly in the afternoon the first trip takes the junior students and an hour later the second trip takes the senior students home.

The distance travelled by each bus one way is 8 kms. The school works 25 days in a month and remains closed for vacation in May, June and December. Bus fee, however, is payable by the students for all 12 months in a year.

The details of expenses for a year are as under :

Driver's salary	Rs. 450 per month per driver
Cleaner's salary (Salary payable for all 12 months) (one cleaner employed for all the five buses)	Rs. 350 per month
Licence fee, taxes, etc.	Rs. 860 per bus per annum
Insurance	Rs. 1,000 per bus per annum
Repairs & maintenance	Rs. 3,500 per bus per annum
Purchase price of the bus Life 12 years	Rs. 1,50,000 each
Scrap value	Rs. 30,000
Diesel cost	Rs. 2.00 per litre

Each bus gives an average mileage of 4 km. per litre of diesel.

Seating capacity of each bus is 50 students.

The seating capacity is fully occupied during the whole year.

Students picked up and dropped within a range upto 4 kms. of distance from the school



Cost Accounting

are charged half fare and fifty per cent of the students travelling in each trip are in this category. Ignore interest. Since the charges are to be based on average cost you are required to :

- (i) Prepare a statement showing the expenses of operating a single bus and the fleet of five buses for a year.
- (ii) Work out the average cost per student per month in respect of –
 - (A) students coming from a distance of upto 4 kms. from the school and
 - (B) students coming from a distance beyond 4 kms. from the school.

Solution

Particulars	Rate	Per Bus		Fleet of 5	
	Rs.	No.	Rs.	No.	Rs.
Driver's salary	450 p.m.	1	5,400	5	27,000
Cleaner's salary	350 p.m.	1/5	840	1	4,200
Licence fee, taxes etc.	860 p.a.		860		4,300
Insurance	1,000 p.a.		1,000		5,000
Repairs & maintenance	3,000 p.a.		3,500		17,500
Depreciation	10,000 p.a.		10,000		50,000
Diesel (see Note 1)	—		<u>7,200</u>		<u>36,000</u>
Total :			<u>28,800</u>		<u>1,44,000</u>
Cost per month			2,400		12,000
(ii) No. of students on half fee basis					
(See note 2)			150		750
(A) Cost per student (half fee)	Rs.		16.00		Rs. 16.00
(B) Cost per student (full fee)	Rs.		32.00		Rs. 32.00

Working Notes :

1. Calculation of diesel cost per bus :



Method of Costing (I)

Number of trips of 8 kms. each/day	: 8
Distance travelled per day by a bus	: $8 \times 8 \text{ km/trip} = 64 \text{ km.}$
Distance travelled during a month	: $64 \times 25 = 1,600 \text{ km.}$
Distance travelled p.a. (May, June and December being vacation)	: $1,600 \times 9 = 14,400 \text{ km.}$
Mileage	: 4 Km./litre.
Diesel required	: $14,400/4 = 3,600 \text{ litres.}$
Cost of diesel	: $3,600 \text{ litres} \times \text{Rs. 2 per litre} = \text{Rs. 7,200 p.a. per bus.}$

2. Calculation of number of students per bus :

Bus capacity		50 students
Half fare	50% i.e.,	25 students
Full fare	50% i.e.,	25 students
Full fare students as equivalent to half fare students	i.e.,	50 students
Total number of half fare students per trip		75 students
Total number of half fare students in two trips.		150 students
On full fare basis number of students in two trips.		75 students

Illustration

From the following data pertaining to the year 2005-06 prepare a cost sheet showing the cost of electricity generated per k.w.h. by Chambal Thermal Power Station.

Total units generated	10,00,000 k.m.h.
	Rs.
Operating labour	50,000
Repairs & maintenance	50,000
Lubricants, spares and stores	40,000
Plant supervision	30,000
Administration overheads	20,000

Coal consumed per k.w.h. for the year is 2.5 k.g. @ Re. 0.02 per kg. Depreciation charges @ 5% on capital cost of Rs. 2,00,000.



Solution

Power House Cost Statement

Total units generated	10,00,000 k.w.h.		
		<i>Per annum</i>	<i>Per k.w.h.</i>
		<i>Rs.</i>	<i>Rs.</i>
<i>Fixed costs :</i>			
Plant supervision	30,000		
Administration overheads	20,000		
Depreciation (5% of Rs. 2,00,000 p.a.)	<u>10,000</u>		
Total fixed cost: (A)	<u>60,000</u>		0.06
<i>Variable costs</i>			
Operating labour	50,000		0.05
Lubricating, spares & stores	40,000		0.04
Repairs & maintenance	50,000		0.05
Coal cost (<i>Refer to working note</i>)	<u>50,000</u>		0.05
Total variable cost: (B)	<u>1,90,000</u>		
Total cost [(A) + (B)]	2,50,000		0.25

Working Note:

Coal cost 10,00,000 k.w.h. × 2.5 kg × 0.02 per kg. = Rs. 50,000

Standard Load - An alternative unit for the distribution of transport cost is the 'standard' load. Where the goods to be transported are of varying bulk and weight, the calculation of actual number of tonne-kilometres is not an easy matter. For example, if a business delivers its own products by its own transport, the cost per tonne-kilometres may be most misleading, for an article may have a bulk which is twice that of the other, though of the same weight. In such a case 'standard load' is selected as the unit, *i.e.*, the load which a lorry would carry. This would have reference both to bulk and weight and would give an efficient method for distributing the cost of transport over different departments. Thus, if the turnover of various departments is reduced to 'standard load' by first calculating their weight and then the bulk of article produced, the costs of distributing the product would be easily ascertained.

This principle also can be extended for associating cost with convenient units of service rendered by an organisation so that management is able to judge whether the organisation is running efficiently and in the manner in which the service requires to be



improved or be made more economical. The cost of generation of electricity on the same principle is correlated with units generated and also with units sold; in hospitals the cost of their maintenance is co-related to units of 'available bed-days'.

6.6 Miscellaneous Illustration

Illustration 1

Global Transport Ltd. charges Rs. 90 per ton for its 6-tons truck lorry load from city 'A' to city 'B'. The charges for the return journey are Rs. 84 per ton. No concession or reduction in these rates is made for any delivery of goods at intermediate station 'C'. In January 2007, the truck made 12 outward journeys for city 'B' with full load out of which 2 tons were unloaded twice in the way at city 'C'. The truck carried a load of 8 tons in its return journey for 5 times but was once caught by police and Rs. 1,200 was paid as fine. For the remaining trips the truck carried full load out of which all the goods on load were unloaded once at city 'C', but it returned without any load once only from 'C' station to 'A' station. The distance from city 'A' to city 'C' and city 'B' are 140 kms. and 300 kms. respectively.

Annual fixed costs and maintenance charges are Rs. 60,000 and Rs. 12,000 respectively. Running charges spent during January 2007 are Rs. 2,944.

You are required to find out the cost per absolute ton-kilometre and the profit for January, 2007.

Solution:

Statement showing the Operating Cost per ton-km. and Profit for January, 2007.

(i)	Costs incurred	Rs.	Rs.
	Fixed charges	60,000	
	Maintenance cost	<u>12,000</u>	
		<u>72,000</u>	
	Cost for the month (Rs. 72,000 ÷ 12)		6,000
	Monthly running charges		<u>2,944</u>
	Total monthly running cost		<u>8,944</u>

Cost per absolute tons-km. Rs. 8,944 ÷ 44,720 absolute ton-km. = Re. 0.20.

(ii)	Statement of Profit	Rs.	Rs.	
	Receipts		13,368	
	Less:Cost	8,944		



Cost Accounting

	Fine	<u>1,200</u>	<u>10,144</u>	
	Profit		<u>3,224</u>	

Comments:

- (i) Transporters often carry overloads, which attract fines and penalties. In this question absolute cost per ton-kilometre is required. This can be arrived at by considering both the entire receipts from the overloading as well as fines paid.
- (ii) Normally fines will not form part of cost. It is to be debited to profit and loss account directly.

Illustration 2

Mr. X owns a bus which runs according to the following schedule:

- (i) Delhi to Chandigarh and back, the same day.
Distance covered: 150 kms. one way.
Number of days run each month : 8
Seating capacity occupied 90%.
- (ii) Delhi to Agra and back, the same day.
Distance covered: 120 kms. one way.
Number of days run each month : 10
Seating capacity occupied 85%.
- (iii) Delhi to Jaipur and back, the same day.
Distance covered: 270 kms. one way.
Number of days run each month : 6
Seating capacity occupied 100%.
- (iv) Following are the other details:

Cost of the bus	Rs. 6,00,000
Salary of the Driver	Rs. 2,800 p.m.
Salary of the Conductor	Rs. 2,200 p.m.
Salary of the part-time Accountant	Rs. 200 p.m.
Insurance of the bus	Rs. 4,800 p.a.
Diesel consumption 4 kms per litre at	Rs. 6 per litre



Method of Costing (I)

Road tax	Rs. 1,500 p.a.
Lubricant oil	Rs. 10 per 100 kms.
Permit fee	Rs. 315 p.m.
Repairs and maintenance	Rs. 1,000 p.m.
Depreciation of the bus	@ 20% p.a.
Seating capacity of the bus	50 persons.

Passenger tax is 20% of the total takings. Calculate the bus fare to be charged from each passenger to earn a profit of 30% on total takings. The fares are to be indicated per passenger for the journeys:

- (i) Delhi to Chandigarh
- (ii) Delhi to Agra
- (iii) Delhi to Jaipur.

Solution:

Students are expected to work out the fare to be charged per passenger for different journeys. Before the same is found out, it is necessary to find out the preliminary data, i.e. kms. per month and passenger km. per month.

Total kms. covered per month

Bus route	Km. per trip	Trips per day	Days per month	Km. per month
Delhi to Chandigarh	150	2	8	2,400
Delhi to Agra	120	2	10	2,400
Delhi to Jaipur	270	2	6	<u>3,240</u>
				<u>8,040</u>

Passenger kms. per month

	Total seats available per month	Capacity utilised		Km. per trip	Passenger Km. per month
		%	Seats		
	(100% capacity)				
Delhi to Chandigarh & Back	800*	90	720	150	1,08,000
Delhi to Agra & Back	1,000@	85	850	120	1,02,000



Cost Accounting

Delhi to Jaipur & Back	600#	100	600	270	<u>1,62,000</u>
Total					<u>3,72,000</u>

* 50 seats × 2 trips × 8 days = 800 seats

@ 50 seats × 2 trips × 10 days = 1,000 seats

50 seats × 2 trips × 6 days = 600 seats

Now, the operating cost can be found out as under:

Monthly Operating Cost Statement

<i>Variable Costs</i>	<i>Rs.</i>	<i>Rs.</i>
Diesel [(8,040 km ÷ 4 km) × Rs. 6]		12,060
Lubricant oil [(8,040 km ÷ 100) × Rs. 10]		<u>804</u>
Total variable cost (A)		12,864
Maintenance costs (B)		1,000
<i>Fixed costs</i>		
Salary of driver	2,800	
Salary of conductor	2,200	
Salary of part-time accountant	200	
Insurance	400	
Road tax	125	
Permit fee	315	
Depreciation (Rs. 6,00,000 × 20%) ÷ 12	<u>10,000</u>	
Total fixed cost (C)		<u>16,040</u>
Total costs per month (A+B+C)		29,904
Profit and Passenger tax @ 100% of cost (Note below)		<u>29,904</u>
Total takings per month		<u>59,808</u>
Passenger km. per month		<u>3,72,000</u>

Rate per passenger km. = (Rs. 59,808 ÷ 3,72,000) = Re. 0.1607741 say Re. 0.16.



Method of Costing (I)

Proposed fare to be charged per passenger km.

Delhi to Chandigarh	=	Re. 0.16×150 km	=	Rs. 24.00
Delhi to Agra	=	Re. 0.16×120 km	=	Rs. 19.20
Delhi to Jaipur	=	Re. 0.16×270 km	=	Rs. 43.20

Note:

1. Passenger tax = 20% of total takings
2. Profit = 30% of total takings
3. Passenger tax + Profit = 50% of total takings
4. Cost (balance) = 50%
5. Total takings = 100%
6. Item 3 as a % of item 4 = 100%

Passenger tax (20% of Rs. 59,808) = Rs. 11,961.60

Profit (30% of Rs. 59,808) = Rs. 17,942.40

Rs. 29,904.00

Illustration 3

The Union Transport Company has been given a twenty kilometer long route to ply a bus. The bus costs the company Rs. 1,00,000. It has been insured at 3% per annum. The annual road tax amounts to Rs. 2,000. Garage rent is Rs. 400 per month. Annual repair is estimated to cost Rs. 2,360 and the bus is likely to last for five years.

The salaries of the driver and the conductor are Rs. 600 and Rs. 200 per month respectively in addition to 10% of the takings as commission to be shared equally by them. The manager's salary is Rs. 1,400 per month and stationery will cost Rs. 100 per month. Petrol and oil will cost Rs. 50 per 100 kilometres. The bus will make three round trips per day carrying on an average 40 passengers in each trip. Assuming 15% profit on takings and that the bus will ply on an average 25 days in a month, prepare operating cost statement on a full year basis and also calculate the bus fare to be charged from each passenger per kilometer.

Solution:

Union Transport Company

Statement showing operating cost of the bus per annum

A – Standing Charges:		Rs.
Manager's salary (Rs. 1,400 × 12)	=	16,800



Cost Accounting

Driver's salary (Rs. 600 × 12)	=	7,200
Conductor's salary (Rs. 200 × 12)	=	2,400
Road tax	=	2,000
Insurance (3% of Rs. 1,00,000)	=	3,000
Garage rent (Rs. 400 × 12)	=	4,800
Stationery (Rs. 100 × 12)	=	1,200
Depreciation (Rs. 1,00,000 ÷ 5 years)	=	<u>20,000</u>
		57,400
B – Maintenance Costs – Repairs		2,360
C – Running charges:		
Petrol and oil (36,000* km. × Rs. 50)/100		<u>18,000</u>
Total costs (A+B+C)		77,760
Add: 10% of takings for commission of driver and conductor		
15% Profit – desired on takings		
25% on total takings = 33-1/3 of cost		<u>25,920</u>
		<u>1,03,680</u>

*Calculation of total distance covered: (20 km. × 2 × 3 × 25 × 12) = 36,000 km. per annum.

Calculation of bus fare to be charged:

Effective passenger – kilometers:

(2 × 20 km × 3 trips × 40 passengers × 25 days × 12 months) = 14,40,000.

Rate to be charged per km. from each passenger = Rs. 1,03,680 ÷ 14,40,000 = Re. 0.072.

Illustration 4

A company is considering three alternative proposals for conveyance facilities for its sales personnel who have to do considerable traveling, approximately 20,000 kilometres every year. The proposals are as follows:

- (i) Purchase and maintain its own fleet of cars. The average cost of a car is Rs. 1,00,000.
- (ii) Allow the Executive use his own car and reimburse expenses at the rate of Rs. 1.60 paise per kilometer and also bear insurance costs.



Method of Costing (I)

- (iii) Hire cars from an agency at Rs. 20,000 per year per car. The company will have to bear costs of petrol, taxes and tyres.

The following further details are available:

Petrol Re. 0.60 per km.	Repairs and maintenance Re. 0.20 per km.
Tyre Re. 0.12 per km.	Insurance Rs. 1200 per car per annum
Taxes Rs. 800 per car per annum	Life of the car: 5 years with annual mileage of 20,000 kms.

Resale value: Rs. 20,000 at the end of the fifth year.

Work out the relative costs of three proposals and rank them.

Solution:

Alternative Proposals

	I Use of company's car		II Use of own car	III Use of hired car
	Rs. per annum	Rs. per km.	Rs. per km.	Rs. per km.
Reimbursement (A)		–	1.60	1.00 @
Fixed cost: (B)				
Per car per annum				
Insurance	1,200		0.06*	–
Taxes	800		–	0.04**
Depreciation (Rs. 1,00,000 – 20,000)/5	<u>16,000</u>		–	
Total	<u>18,000</u>			
Fixed cost per km (Rs. 18,000 ÷ 20,000 km.)		0.90		
Running and Maintenance Cost (C)				
Per car per km.				
Petrol		0.60	–	0.60
Repairs and Maintenance		0.20	–	–
Tyre		<u>0.12</u>	<u>–</u>	<u>0.12</u>
Total cost per km. (A+B+C)		<u>1.82</u>	<u>1.66</u>	<u>1.76</u>
Cost for 20,000 km.		Rs. 36,400	Rs. 33,200	Rs. 35,200
Ranking of alternative		III	I	II



Cost Accounting

proposals				
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Decision : II alternative i.e., use of own car, is the best alternative from company's point of view. III alternative, i.e. hiring cars from outside agency is the second best alternative. I alternative, i.e. maintaining the fleet is the costliest alternative.

* Rs. 1200/20000 Kms. = Re. 0.06; ** Rs. 800 /20,000 Kms. = Re. 0.04;

@ Rs. 20,000/20,000Kms = Re. 1.

6.7 MULTIPLE COSTING

It refers to the method of costing followed by a business wherein a large variety of articles are produced, each differing from the other both in regard to material required and process of manufacture. In such cases, cost of each article is computed separately by using, generally, two or more methods of costing. For instance, for ascertaining the cost of a bicycle, cost of each part will be ascertained by using batch or job costing method and, then the cost of assembling the parts will be ascertained by following the method of single or output costing.

6.8 Self Examination Questions

Multiple Choice Questions

- (a) The principal factors to be considered in designing a cost system include :
- (i) manufacturing process
 - (ii) desire of management
 - (iii) nature of business
 - (iv) all of the above.
- (b) The most suitable cost system where the products differ in type of materials and work performed is :
- (i) Job Costing
 - (ii) Process Costing
 - (iii) Operating Costing
 - (iv) None of these.
- (c) Which of the following statements is true
- (i) Job cost sheet may be used for estimating profit of jobs.



Method of Costing (I)

- (ii) Job costing cannot be used in conjunction with marginal costing.
 - (iii) In cost plus contracts, the contractor runs a risk of incurring a loss.
 - (iv) Batch costing is a variant of jobs costing.
- (d) The method of costing used in job order industries is known as
- (i) Process costing
 - (ii) Job costing
 - (iii) Contract costing
 - (iv) Marginal costing.
- (e) Which of the following statements is true
- (i) In job costing method, a cost sheet is prepared for each job.
 - (ii) A production order is an order received from a customer for particular jobs.
 - (iii) In contract costing, the contract which is complete up to one fourth of the total contract, one-fourth of the profit should be transferred to Profit & Loss Account.
 - (iv) In contract costing profit of each contract is computed when the contract is completed.
- (f) Which of the following would best describe the characteristics of contract costing:
- (a) homogeneous products;
 - (b) customer driven production;
 - (c) short period of time between the commencement and completion of the cost unit
- (i) (a) and (b) only
 - (ii) (b) and (c) only
 - (iii) (a) and (c) only
 - (iv) (b) only
- (g) In job costing which of the following documents are used to record the issue of direct material to a job'
- (i) goods received note
 - (ii) Material requisition



Cost Accounting

- (iii) Purchase order
- (iv) Purchase requisition
- (h) Which of the following statements is true,
 - (i) Job cost sheet may be prepared for facilitating routing and scheduling of the job
 - (ii) Job costing can be suitably used for concerns producing uniformly any specific product
 - (iii) Job costing cannot be used in companies using standard costing
 - (iv) Neither (i) nor (ii) nor (iii)
- (i) A lorry capable of carrying 5 tonnes of goods normally carries 80% of the load on the outward journey and 40% of the load on inward journey. The journey is 300 kms. for one side. It takes two days to complete the return trip. In a year of 300 days compute the tonnes Kms.
 - (i) 2,70,000
 - (ii) 3,00,000
 - (iii) 3,30,000
 - (iv) 3,40,000
- (j) Which of the following statements is true,
 - (i) In job costing a cost sheet is prepared for each job
 - (ii) The concept of economic batch quantity is similar to economic order quantity
 - (iii) In job costing the cost of each job is arrived at by dividing the total cost incurred by the number of jobs
 - (iv) Neither (i) nor (ii) nor (iii)

Answers to Multiple Choice Questions

a.(iv); b.(i); c. (iv); d.(ii); e.(i); f.(iv); g.(ii);h.(iv);i.(i); j(i&ii)



Short Answer Type Questions

1. Define the main features of job costing. Mention enterprises which use job costing.
2. Describe briefly the procedure of Cost accumulation under job order costing.
3. Explain briefly what you understand by multiple costing.
4. Explain units of cost used in service undertakings. How are they computed?
5. What are the main features of cost-plus-contracts?

Long Answer Type Questions

1. Explain the nature and use of batch costing. Describe the concept of the economical batch with the help of any suitable example.
2. Why is a portion of profit on uncompleted contracts transferred to the profit and loss account? How would you determine the amount of profit to be transferred to the profit and loss account?
3. Describe the main features of industrial units using job costing.
4. Describe the essential feature of operating costing and state where it can be usefully implemented.

Numerical Questions

1. Raw materials 'X' costing Rs. 100 per kg and Y costing Rs. 60 per kilogram are mixed in equal proportions for making product A. The loss of material in processing works out to 25% of the output. The production expenses are allocated at 50% of direct material cost. The end product is priced with a margin of 33 $\frac{1}{3}$ % over the total cost. Material Y is not easily available and substitute raw material 'Z' has been found for 'Y' costing Rs. 50 per kg. It is required to keep the proportion of this substitute material in the mixture as low as possible and at the same time maintain the selling price of the end product at existing levels and ensure the same quantum of profit as at present.

You are required :

To Compute what should be the ratio of mix of the raw materials X and Z.

2. Mr. Bansal has a factory. He specialises in the manufacture of small tables of standard size. He can make 15,000 small tables in a year. The cost per table works out as under



Cost Accounting

for the year and he made and sold 10,000 tables.

	<i>Rs.</i>
Materials	180
Labour	60
Overhead (fixed	90
recovered @ 50%	
of material cost.)	—
Total cost	<u>330</u>

Prices are fixed by adding a margin of 10% of the total cost arrived at the above.

In the current year, due to fall in the cost of materials, the total cost worked out as under :-

	<i>Rs.</i>
Materials	120
Labour	60
Overhead recovered	
@ 50% of material	
cost	<u>60</u>
Total cost	<u>240</u>

Mr. Bansal maintained his standard margin of 10% on the total cost. Sales were at the same level as in the last year.

You are asked to

- (a) Determine the profit or loss for the current year
- (b) Compute the price which should have been charged in the current year to yield the same profit or loss as last year.



Method of Costing (I)

3. In a factory in a month 3 new jobs were commenced. The materials and labour used on them were as follows :

	<i>Job 1</i>	<i>Job 2</i>	<i>Job 3</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Materials	4,000	4,500	2,700
Labour	5,100	8,300	1,400

Works overheads is charged at 60% of labour and office expenses @ 10% of works cost. Jobs 1 and 2 were completed but job 3 was still in progress. Prepare the job Accounts.

4. An expenditure of Rs. 4,85,000 has been incurred on a contract till 31st March, 2006 and value of the work certified is Rs. 5,50,000. The cost of work performed but not yet certified is Rs. 15,000. The profit of Rs. 30,000 had been taken to the credit of Profit & Loss Account till 31st March, 2005. The estimated future expenses are Rs. 1,00,000. The estimated total expenses is to include a provision of 2-1/2 per cent for contingencies. The contract price is Rs. 7,00,000 and the payment received till date is Rs. 5,00,000.

Calculate the profit to be taken to the credit of Profit and Loss Account for the year ended on 31st March, 2006.

5. A transport Service Company is running 4 boxes between towns which are 50 kms. apart. Seating capacity of each bus is 40 passengers. The following particulars were obtained from their books for April 2006,

	<i>Rs.</i>
Wages of Drivers, Conductors and Cleaners	2,400
Salaries of Officer and Supervisory Staff	1,000
Diesel oil and other oil	4,000
Repairs and Maintenance	800
Taxations, Insurance, etc.	1,600
Depreciation	2,600
Interest and other charges	<u>2,000</u>
	<u>14,400</u>



Cost Accounting

Actual passengers carried were 75% of the seating capacity. All the buses run on all the days of the month. Each bus made one round trip per day. Find out the costs per passenger-km.

Answers to Numerical Questions.

1. $X : Z = 3 : 2$.
2. (a) Rs. 2,40,000; (b) 303.
3. Cost at the end of month : Rs. 13,376; Rs. 19,558 and Rs. 4,100.
4. Rs. 48,571.
5. Rs. 351.85.

CHAPTER 7

METHOD OF COSTING (II) (PROCESS COSTING, OPERATION COSTING, JOINT PRODUCTS AND BY-PRODUCTS)

Learning Objectives

When you have finished studying this chapter, you should be able to

- ◆ Understand the meaning of Process and Operation costing.
- ◆ Understand and differentiate between Joint and By products.
- ◆ Understand the accounting treatment required for normal and abnormal process losses.
- ◆ Understand the treatment for abnormal gain.
- ◆ Understand the accounting treatment required for joint products and by products.

7.1 MEANING OF PROCESS COSTING

Process Costing is a method of Costing used in industries where the material has to pass through two or more processes for being converted into a final product. It is defined as “a method of Cost Accounting whereby costs are charged to processes or operations and averaged over units produced”. Such type of costing method is useful in the manufacturing of products like steel, soap, chemicals, rubber, vegetable oil, paints, varnish etc. where the production process is continuous and the output of one process becomes the input of the following process till completion.

7.1.1 Basic features : Industries, where process costing can be applied, have normally one or more of the following features :

1. Each plant or factory is divided into a number of processes, cost centres or departments, and each such division is a stage of production or a process.
2. Manufacturing activity is carried on continuously by means of one or more process run sequentially, selectively or parallelly.
3. The output of one process becomes the input of another process.
4. The end product usually is of like units not distinguishable from one another.



Cost Accounting

5. It is not possible to trace the identity of any particular lot of output to any lot of input materials. For example, in the sugar industry, it is impossible to trace any lot of sugar bags to a particular lot of sugarcane fed or *vice versa*.
6. Production of a product may give rise to Joint and/or By-Products.

7.1.2 Costing Procedure : The Cost of each process comprises the cost of :

- | | |
|----------------------------|-------------------------------|
| (i) Materials | (ii) Labour |
| (iii) Direct expenses, and | (iv) Overheads of production. |

Materials - Materials and supplies which are required for each process are drawn against material requisitions from stores. Each process for which the above drawn materials will be used should be debited with the cost of materials consumed on the basis of the information received from the Cost Accounting department. The finished product of first process generally become the raw materials of second process; under such a situation the account of second process, be debited with the cost of transfer from the first process and the cost of any additional material required under this second process.

Labour - Each process account should be debited with the labour cost or wages paid to labour for carrying out the processing activities. Sometimes the wages paid are apportioned over the different processes after selecting appropriate basis.

Direct expenses - Each process account should be debited with direct expenses like depreciation, repairs, maintenance, insurance etc. associated with it.

Overheads of production - Expenses like rent, power expenses, lighting bills, gas and water bills etc. are known as production overheads. These expenses cannot be allocated to a process. The suitable way out to recover them is to apportion them over different processes by using suitable basis. Usually, these expenses are estimated in advance and the processes debited with these expenses on a pre-determined basis.

7.2 OPERATION COSTING

It is defined as the refinement of process costing. It is concerned with the determination of the cost of each operation rather than the process. In those industries where a process consists of distinct operations, the method of costing applied or used is called operation costing. Operation costing offers better scope for control. It facilitates the computation of unit operation cost at the end of each operation by dividing the total operation cost by total output units.

Illustration :

From the following data, prepare process accounts indicating the cost of each process and the total cost. The total units that pass through each process were 240 for the period.



Method of Costing (II)

	Process A	Process B	Process C
	Rs.	Rs.	Rs.
Materials	1,500	500	200
Labour	800	2,000	600
Other expenses	260	720	250

Indirect expenses amounting to Rs. 850 may be apportioned on the basis of wages. There was no opening or closing stock.

Solution :

<i>Dr.</i>	Process 'A' Account				<i>Cr.</i>
	<i>Per unit</i>	<i>Total</i>		<i>Per unit</i>	<i>Total</i>
	Rs.	Rs.		Rs.	Rs.
To Material	6.25	1,500	By Transfer to		
" Labour	3.34	800	Process 'B' A/c	11.50	2,760
" Other expenses	1.08	260			
" Indirect expenses	<u>0.83</u>	<u>200</u>			
	11.50	2,760		11.50	2,760

<i>Dr.</i>	Process 'B' Account				<i>Cr.</i>
	<i>Per unit</i>	<i>Total</i>		<i>Per unit</i>	<i>Total</i>
	Rs.	Rs.		Rs.	Rs.
To be transferred			By Transfer to		
from Process 'A' A/c	11.50	2,760	Process 'C' A/c	27.00	6,480
" Materials	2.08	500			
" Labour	8.34	2,000			
" Other expenses	3.00	720			
" Indirect expenses	<u>2.08</u>	<u>500</u>			
	27.00	6,480		27.00	6,480



Cost Accounting

Dr.	Process 'C' Account				Cr.
	Per unit	Total	Per unit	Total	
	Rs.	Rs.	Rs.	Rs.	
To be transferred			By Finished stock		
from Process 'B' A/c	27.00	6,480	A/c transfer	32.00	7,680
" Materials	0.83	200			
" Labour	2.54	600			
" Other expenses	1.04	250			
" Indirect expenses	<u>0.59</u>	<u>150</u>			
	32.00	7,680		32.00	7,680

7.3 TREATMENT OF NORMAL PROCESS LOSS, ABNORMAL PROCESS LOSS AND ABNORMAL GAIN

Loss of material is inherent during processing operation. The loss of material under different processes arises due to reasons like evaporation or a change in the moisture content etc. Process loss is defined as the loss of material arising during the course of a processing operation and is equal to the difference between the input quantity of the material and its output. There are two types of material losses viz. (i) Normal loss and (ii) Abnormal loss.

(i) *Normal process loss* : It is defined as the loss of material which is inherent in the nature of work. Such a loss can be reasonably anticipated from the nature of the material, nature of operation, the experience and technical data. The cost of normal process loss in practice is absorbed by good units produced under the process. The amount realised by the sale of normal process loss units should be credited to the process account.

(ii) *Abnormal process loss* : It is defined as the loss in excess of the pre-determined loss. This type of loss may occur due to the carelessness of workers, a bad plant design or operation etc. Such a loss cannot obviously be estimated in advance. But it can be kept under control by taking suitable measures. The cost of an abnormal process loss unit is equal to the cost of a good unit. The total cost of abnormal process loss is credited to the process account from which it arise. Cost of abnormal process loss is not treated as a part of the cost of the product. In fact, the total cost of abnormal process loss is debited to costing profit and loss account.

Abnormal gain : Sometimes, loss under a process is less than the anticipated normal figure. In other words, the actual production exceeds the expected figures. Under such a situation the difference between actual and expected loss or actual and expected production is known as abnormal gain. So abnormal gain may be defined as unexpected gain in production under



Method of Costing (II)

normal conditions. The process account under which abnormal gain arises is debited with the abnormal gain. The cost of abnormal gain is computed on the basis of normal production.

To be more clear about the above concepts we consider the following illustration.

Illustration :

A product passes through three processes. The output of each process is treated as the raw material of the next process to which it is transferred and output of the third process is transferred to finished stock.

	<i>1st Process</i>	<i>2nd Process</i>	<i>3rd Process</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Material issued	40,000	20,000	10,000
Labour	6,000	4,000	1,000
Manufacturing overhead	10,000	10,000	15,000

10,000 units have been issued to the 1st process and after processing, the output of each process is as under :

	<i>Output</i>	<i>Normal Loss</i>
Process No. 1	9,750 units	2%
Process No. 2	9,400 units	5%
Process No. 3	8,000 units	10%

No stock of materials or of work-in-progress was left at the end. Calculate the cost of the finished articles.

Solution:

Process No. 1 Account

	<i>Units</i>	<i>Rs.</i>		<i>Units</i>	<i>Rs.</i>
To Material	10,000	40,000	By Normal wastage	200	
" Labour		6,000	" Abnormal wastage	50	286
" Overhead		10,000	(cost per unit, Rs. 5.714)		
			" Process No. 2	9,750	55,714
			(Transfer of completed units)		
	10,000	56,000		10,000	56,000



Cost Accounting

Note : *The cost of the abnormal wastage :*

Normal Output	=	10,000 units – 200 units	=	9,800 units
Cost per unit of normal output	=	Rs. 56,000 ÷ 9,800 units	=	Rs. 5.714
Cost of 50 units	=	Rs. 5.714 × 50	=	Rs. 286

Process No. 2 Account

	<i>Units</i>	<i>Rs.</i>		<i>Units</i>	<i>Rs.</i>
To Process No. 1	9,750	55,714	By Normal wastage	488	–
” Materials		20,000	(5% of 9,750)		
” Labour		4,000	” Process No. 3	9,400	91,051
” Overhead		10,000	(cost per unit		
” Abnormal gain			Rs. 9.686)		
@ Rs. 9.686	<u>138</u>	<u>1,337</u>			
	9,888	91,051		9,888	91,051

Note : The cost per unit is obtained by dividing Rs. 89,714 by 9,262 units, *i.e.*, 9,750 units less 488 units.

Process No. 3 Account

	<i>Units</i>	<i>Rs.</i>		<i>Units</i>	<i>Rs.</i>
To Process No. 2	9,400	91,051	By Normal wastage	940	
” Materials		10,000	” Abnormal wastage	460	6,364
” Labour		1,000	(Cost per unit		
” Overhead		15,000	Rs. 13.836)		
			” Finished stock	<u>8,000</u>	<u>1,10,687</u>
	<u>9,400</u>	<u>1,17,051</u>		9,400	1,17,051

Note : *The calculation of the cost of abnormal wastage :*

Normal Output	=	9,400 units – 940 units	=	8,460 units.
Cost per unit of normal output	=	Rs. 1,17,051 ÷ 8,460	=	Rs. 13,836
Cost of 460 units is	=	Rs. 6,364.		



7.4 COSTING OF EQUIVALENT PRODUCTION UNITS

In the case of process type of industries, it is possible to determine the average cost per unit by dividing the total cost incurred during a given period of time by the total number of units produced during the same period. But this is hardly the case in most of the process type industries where manufacturing is a continuous activity. The reason is that the cost incurred in such industries represents the cost of work carried on opening work-in-progress, closing work-in-progress and completed units. Thus to ascertain the cost of each completed unit it is necessary to ascertain the cost of work-in-progress in the beginning and at the end of the process.

The valuation of work-in-progress presents a good deal of difficulty because it has units under different stages of completion from those in which work has just begun to those which are only a step short of completion. Work-in-progress can be valued on actual basis, *i.e.*, materials used on the unfinished units and the actual amount of labour expenses involved. However, the degree of accuracy in such a case cannot be satisfactory. An alternative method is based on converting partly finished units into equivalent finished units.

Equivalent production means converting the incomplete production units into their equivalent completed units. Under each process, an estimate is made of the percentage completion of work-in-progress with regard to different elements of costs, *viz.*, material, labour and overheads. It is important that the estimate of percentage of completion should be as accurate as possible. The formula for computing equivalent completed units is :

$$\text{Equivalent completed units} = \frac{\{\text{Actual number of units in the process of manufacture}\}}{\{\text{Percentage of work completed}\}} \times$$

For instance, if 25% of work has been done on the average of units still under process, then 200 such units will be equal to 50 completed units and the cost of work-in-progress will be equal to the cost of 50 finished units.

7.4.1 Valuation of work-in-progress : For the valuation of work-in-progress following three methods are available :

- (1) First-in-First Out (FIFO) method.
 - (2) Last-in-First Out (LIFO) method.
 - (3) Average Cost method (or weighted average cost method).
- (1) *First-in-first-out method* - Under this method the units completed and transferred include completed units of opening work-in-progress and subsequently introduced units. Proportionate cost to complete the opening work-in-progress and that to process the completely processed units during the period are derived separately. The cost of opening



Cost Accounting

work-in-progress is added to the proportionate cost incurred on completing the same to get the complete cost of such units. Complete cost of such units plus cost of units completely processed constitute the total cost of units transferred.

Illustration :

Opening work-in-progress 1,000 units (60% complete); Cost Rs. 1,100. Units introduced during the period 10,000 units; Cost Rs. 19,300. Transferred to next process - 9,000 units.

Closing work-in-progress - 800 units (75% complete). Normal loss is estimated at 10% of total input including units in process at the beginning. Scrap realise Re. 1 per unit. Scrapped are 100% complete.

Compute equivalent production and cost per equivalent unit. Also evaluate the output.

Solution :

FIFO Method Statement of equivalent production and cost per unit

Particulars	Input		Output units	Equivalent Production	
	units	Particulars		% of work done during current period	Equivalent units
Op. work-in-process	1,000	Op. WIP :			
		Completed	1,000	40	400
Units introduced	10,000	Completed	8,000	100	8,000
		Normal loss	1,100	-	-
		Closing work- in-process	800	75	600
		Abnormal loss	100	100	100
			11,000		9,100
Cost of the Process (for the period)					Rs. 19,300
Less: Scrap value of normal loss					<u>Rs. 1,100</u>
Cost per equivalent unit					Rs. 18,200 ÷ 9,100 units = Rs. 2



Method of Costing (II)

Statement of Evaluation

Particulars	Equivalent units	Cost per equivalent unit	Amount
	Rs.	Rs.	
1. Opening WIP completed	400	2.00	800
Add: Cost of opening WIP	–	–	1,100
Complete Cost of 1,000 units of Op. WIP	1,000	1.90	1,900
2. Completely processed units	8,000	2.00	16,000
3. Abnormal loss	100	2.00	200
4. Closing WIP	600	2.00	1,200

(2) *Last-in first-out Method* - According to this method units lastly entering in the process are the first to be completed. This assumption has a different impact on the costs of the completed units and the closing inventory of work-in-progress. The completed units will be shown at their current cost and the closing inventory of work-in-progress will continue to appear at the cost of the opening inventory of work-in-progress.

Illustration :

From the following information relating to the month of April 06, calculate the equivalent production units and the value of finished production and work-in-progress, using the LIFO method.

Opening work-in-progress on 1st April: 5,000 units; 50% complete.

Cost

	Rs.
Materials	6,000
Labour	8,000
Overheads	<u>8,000</u>
	<u>22,000</u>

Units introduced into the process : 10,000.

Cost

	Rs.
Materials	30,000
Labour	52,500
Overheads	<u>70,000</u>
	<u>1,52,500</u>



Cost Accounting

During the period 7,500 units were completed and transferred to the next process. Closing work-in-progress on 30th April: 7,500 units, 50% complete.

Solution :

(i) **Computation of Equivalent Production Units
(LIFO method)**

Units	Particulars	Equivalent production		
		Units out	% of com- pletion	Equivalent units
5,000	Opening Work-in-Process			
10,000	Units introduced into the process			
	Units completed and transferred, of the units introduced during the period	7,500	100	7,500
	Of the units introduced during the period	2,500	50	1,250
	Of the opening work in process	5,000	–	–
15,000		15,000		8,750

* Since the units in the opening work in process were already 50% complete; no work has been done on these units during the period.

(ii) Cost per unit of equivalent production = $\frac{\text{Rs. } 1,52,000}{8,750} = \text{Rs. } 17.43$

Valuation of finished production and WIP.

1. Finished production : $7,500 \times \text{Rs. } 17.43 = \text{Rs. } 1,30,725$

2. Closing WIP: $\text{Rs. } 22,000 + (1,250 \times \text{Rs. } 17.43) = \text{Rs. } 43,787.50$

(3) *Average Cost Method* - Under this method, the cost of opening work-in-progress and cost of the current period are aggregated and the aggregate cost is divided by output in terms of completed units. The equivalent production in this case consists of work-load already contained in opening work-in-process and work-load of current period.

Refer to illustration solved by FIFO method - Under Average Cost Method, the solution will be as follows :



Method of Costing (II)

Statement of equivalent Production and Cost per unit

<i>Output</i>	<i>Units</i>	<i>Equivalent Percentage</i>	<i>Production units</i>
Transferred to Next Process	9,000	100	9,000
Normal Loss	1,100	–	–
Abnormal Loss	100	100	100
Closing work-in-process	800	75	600
			9,700

Costs :	<i>Rs.</i>
Opening Work-in-Process	1,100
Cost of units introduced	<u>19,300</u>
	20,400
Less : Scrap value realised on normal loss	<u>1,100</u>
	<u>19,300</u>

Cost per equivalent unit Rs. 19,300 ÷ 9,700 units = Rs. 1.99 (approx.)

Statement of Evaluation

<i>Particulars</i>	<i>Equivalent units</i>	<i>Cost per equivalent unit (Rs.)</i>	<i>Amount Rs.</i>
1. Transferred to next process	9,000	1.99	17,910
2. Abnormal loss	100	1.99	199
3. Closing Work-in-process	600	1.99	<u>1,194</u>
			<u>19,303</u>

Illustration :

Following information is available regarding process A for the month of February, 2006 :

<i>Production Record</i>	<i>Rs.</i>
Units in process as on 1.2.2006 (All materials used, 25% complete for labour and overhead)	4,000
New units introduced	16,000
Units completed	14,000



Cost Accounting

Units in process as on 28.2.2006 (All materials used, 33-1/3% complete for labour and overhead)	6,000
Cost Records	
<i>Work-in-process as on 1.2.2006</i>	<i>Rs.</i>
Materials	6,000
Labour	1,000
Overhead	1,000
	8,000
<i>Cost during the month</i>	
Materials	25,600
Labour	15,000
Overhead	15,000
	55,600

Presuming that average method of inventory is used, prepare :

- (i) Statement of equivalent production.
- (ii) Statement showing cost for each element.
- (iii) Statement of apportionment of cost.
- (iv) Process cost account for process A.

Solution :

(i) **Statement of equivalent production**
(Average cost method)

<i>Particulars</i>			<i>Materials</i>		<i>Labour</i>		<i>Overhead</i>	
<i>Input</i>	<i>Output</i>	<i>Units</i>	<i>%</i>	<i>Equivalent</i>	<i>%</i>	<i>Equivalent</i>	<i>%</i>	<i>Equivalent</i>
			<i>Completion</i>	<i>units</i>	<i>Completion</i>	<i>units</i>	<i>Completion</i>	<i>units</i>
20,000	Completed	14,000	100	14,000	100	14,000	100	14,000
_____	WIP	<u>6,000</u>	100	<u>6,000</u>	33-1/3	<u>2,000</u>	33-1/3	<u>2,000</u>
20,000		20,000		20,000		16,000		16,000



Method of Costing (II)

(ii) Statement showing cost for each element

<i>Particulars</i>	<i>Materials</i>	<i>Labour</i>	<i>Overhead</i>	<i>Total</i>
Cost of opening work-in-progress (Rs.)	6,000	1,000	1,000	8,000
Cost incurred during the month (Rs.)	<u>25,600</u>	<u>15,000</u>	<u>15,000</u>	<u>55,600</u>
Total cost (Rs.) : (A)	31,600	16,000	16,000	63,600
Equivalent units : (B)	20,000	16,000	16,000	
Cost per equivalent unit (Rs.) : (C) = (A/B)	1.58	1	1	3.58

(iii) Statement of apportionment of cost

		<i>Rs.</i>		<i>Rs.</i>
Value of output transferred : (a)	14,000 units @ Rs. 3.58			50,120
Value of closing work-in-progress : (b)				
Materials	6,000 units @ 1.58		9,480	
Labour	2,000 units @ Re. 1		2,000	
Overhead	2,000 units @ Re. 1		<u>2,000</u>	<u>13,480</u>
Total cost : (a + b)				63,600

(iv) Process cost account for process A:

Process A Cost Account

<i>Dr.</i>					<i>Cr.</i>
	<i>Units</i>	<i>Rs.</i>		<i>Units</i>	<i>Rs.</i>
To Opening WIP	4,000	8,000	By Completed units	14,000	50,120
To Materials	16,000	25,600	By Closing WIP	6,000	13,480
To Labour		15,000			
To Overhead		<u>15,000</u>			
	<u>20,000</u>	<u>63,600</u>		<u>20,000</u>	<u>63,600</u>

7.5 INTER-PROCESS PROFITS

In some process industries the output of one process is transferred to the next process not at cost but at market value or cost plus a percentage of profit. The difference between cost and the transfer price is known as inter-process profits. The advantages and disadvantages of using inter-process profit, in the case of process type industries are as follows :

Advantages :

1. Comparison between the cost of output and its market price at the stage of completion is facilitated.



Cost Accounting

2. Each process is made to stand by itself as to the profitability.

Disadvantages :

1. The use of inter-process profits involves complication.
2. The system shows profits which are not realised because of stock not sold out.

Illustration

A Ltd. produces product 'AXE' which passes through two processes before it is completed and transferred to finished stock. The following data relate to October 2005 :

<i>Particulars</i>	<i>Process</i>		<i>Finished stock</i>
	<i>I</i>	<i>II</i>	
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Opening stock	7,500	9,000	22,500
Direct materials	15,000	15,750	
Direct wages	11,200	11,250	
Factory overheads	10,500	4,500	
Closing stock	3,700	4,500	11,250
Inter-process profit included in opening stock		1,500	8,250

Output of Process I is transferred to Process II at 25% profit on the transfer price.

Output of Process II is transferred to finished stock at 20% profit on the transfer price. Stock in process is valued at prime cost. Finished stock is valued at the price at which it is received from process II. Sales during the period are Rs. 1,40,000.

Prepare Process cost accounts and finished goods account showing the profit element at each stage.

Solution

Process I Account

	<i>Total</i>	<i>Cost</i>	<i>Profit</i>		<i>Total</i>	<i>Cost</i>	<i>Profit</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Opening stock	7,500	7,500	–	Transfer to			
Direct materials	15,000	15,000	–	Process II A/c	54,000	40,500	13,500
Direct wages	<u>11,200</u>	<u>11,200</u>	–				
	33,700	33,700	–				
Less Closing stock	<u>3,700</u>	<u>3,700</u>					



Method of Costing (II)

Prime cost	30,000	30,000	–			
Overheads	<u>10,500</u>	<u>10,500</u>	–			
Process cost	40,500	40,500	–			
Profit 33 $\frac{1}{3}$ of						
Total cost	13,500	–	13,500			
(see working note 1)						
	<u>54,000</u>	<u>40,500</u>	<u>13,500</u>	<u>54,000</u>	<u>40,500</u>	<u>13,500</u>

Process II Account

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
Opening stock	9,000	7,500	1,500	Transfer			
Transferred from				to finished	1,12,500	75,750	36,750
Process I	54,000	40,500	13,500	stock A/c			
Direct materials	15,750	15,750	–				
Direct wages	<u>11,250</u>	<u>11,250</u>	–				
	90,000	75,000	15,000				
Less : Closing stock	<u>4,500</u>	<u>3,750</u>	<u>750</u>				
Prime cost	85,500	71,250	14,250				
Overheads	<u>4,500</u>	<u>4,500</u>	–				
Process cost	90,000	75,750	14,250				
Profit 25% on total cost	22,500	–	22,500				
(See working note 2)							
	<u>1,12,500</u>	<u>75,750</u>	<u>36,750</u>		<u>1,12,500</u>	<u>75,750</u>	<u>36,750</u>

(Finished Stock Account)

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
Opening stock	22,500	14,250	8,250	Sales	1,40,000	82,500	57,500
Transferred from							
Process II	<u>1,12,500</u>	<u>75,750</u>	<u>36,750</u>				
	1,35,000	90,000	45,000				
Less : Closing stock	11,250	7,500	3,750				
Finished stock : Cost	<u>1,23,750</u>	<u>82,500</u>	<u>41,250</u>				
Profit	<u>16,250</u>	–	<u>16,250</u>				
	<u>1,40,000</u>	<u>82,500</u>	<u>57,500</u>		<u>1,40,000</u>	<u>82,500</u>	<u>57,500</u>



Working Notes :

Let the transfer price be 100 then profit is 25; *i.e.* cost price is Rs.75.

1. If cost is Rs. 75 then profit is Rs. 25

$$\text{If cost is Rs. 40,500 then profit is } \frac{25}{75} \times 40,500 = \text{Rs. 13,500}$$

2. If cost is Rs. 80 then profit is Rs. 20

$$\text{If cost is Rs. 90,000 then profit is } \frac{20}{80} \times 90,000 = \text{Rs. 22,500}$$

7.6 JOINT PRODUCTS AND BY-PRODUCTS

7.6.1 Meaning of Joint Products and By-Products : Agricultural product industries, chemical process industries, sugar industries, and extractive industries are some of the industries where two or more products of equal or unequal importance are produced either simultaneously or in the course of processing operation of a main product. In all such industries, the management is faced with the problems such as, valuation of inventory, pricing of product and income determination, problem of taking decision in matters of further processing of by-products and/or joint products after a certain stage etc. In fact the various problems relate to (i) apportionment of common costs incurred for various products and (ii) aspects other than mere apportionment of costs incurred upto the point of separation. Before taking up the above problems, we first define the various necessary concepts.

Joint Products - Joint products represent “two or more products separated in the course of the same processing operation usually requiring further processing, each product being in such proportion that no single product can be designated as a major product”. In other words, two or more products of equal importance, produced, simultaneously from the same process, are known as joint products. For example, in the oil industry, gasoline, fuel oil, lubricants, paraffin, coal tar, asphalt and kerosene are all produced from crude petroleum. These are known as joint products.

Co-Products - Joint products and co-products are used synonymously in common parlance, but strictly speaking a distinction can be made between two. Co-products may be defined as two or more products which are contemporary but do not emerge necessarily from the same material in the same process. For instance, wheat and gram produced in two separate farms with separate processing of cultivation, are the co-products. Similarly timber boards made from different trees are co-products.



By-Products - These are defined as "products recovered from material discarded in a main process, or from the production of some major products, where the material value is to be considered at the time of severance from the main product." Thus by-products emerges as a result of processing operation of another product or they are produced from the scrap or waste of materials of a process. In short a by-product is a secondary or subsidiary product which emanates as a result of manufacture of the main product. Examples of by-products are molasses in the manufacture of sugar, tar, ammonia and benzole obtained on carbonisation of coal and glycerine obtained in the manufacture of soap.

Distinction between Joint-Product and By-Product - The main points of distinction as apparent from the definitions of Joint Products and By-Products are :

(i) Joint products are of equal importance whereas by-products are of small economic value. (ii) Joint products are produced simultaneously but the by-products are produced incidentally in addition to the main products.

7.6.2 Apportionment of joint costs : Joint product costs occur in many industries such as : petroleum, oil refinery, meat-making, textiles, dairy, flour mill, saw mill and many other process industries and top management of business concerns require the Accountants to give their opinion for many managerial decisions such as to process further or to sell at split-off stage. To answer this question they require apportionment of joint costs over different products produced.

The main problem faced in the case of joint products/by-products is the apportionment of the total cost incurred upto the point of separation of joint products/or by products. For costs incurred after the split off point there is no problem, as these costs can be directly allocated to individual joint products or by-products. Thus the apportionment of joint costs over different products produced involve the following two cases.

1. When two or more products are simultaneously produced and there is by-product.
2. When there are both joint products and by-products.

7.6.3 Method of apportioning joint cost over joint products : Proper apportionment of joint cost over the Joint Products is of considerable importance, as this affects (a) Valuation of closing inventory; (b) Pricing of products; and (c) Profit or loss on the sale of different products.

The commonly used methods for apportioning total process costs upto the point of separation over the joint products are as follows :

- (i) Physical unit method
- (ii) Average unit cost method



Cost Accounting

- (iii) Survey method
- (iv) Contribution margin method
- (v) Market value method :
 - (a) At the point of separation
 - (b) After further processing
 - (c) Net realisable value.

(i) *Physical unit method* - This method is based on the assumption that the joint products are capable of being measured in the same units. Accordingly joint costs here are apportioned on the basis of some physical base, such as weight or measure expressed in gallons, tonnes etc. In other words, the basis used for apportioning joint cost over the joint products is the physical volume of material present in the joint products at the point of separation. Any loss arising during the stage of processing is also apportioned over the products on the same basis. This method cannot be applied if the physical units of the two joint products are different. The main defect of this method is that it gives equal importance and value to all the joint products.

Illustration

A coke manufacturing company produces the following products by using 5,000 tonnes of coal @ Rs. 15 per tonne into a common process.

Coke	3,500 tonnes
Tar	1,200 tonnes
Sulphate of ammonia	52 tonnes
Benzol	48 tonnes

Apportion the joint cost amongst the products on the basis of the physical unit method.

Solution

	Products					Total
	Coke	Tar	Sulphate of Ammonia	Benzol	Wastage	
Output (in tonnes)	3,500	1,200	52	48	200	5,000
Wastage (in tonnes)	146	50	2	2	200	

(apportioned on the basis of weights)



Method of Costing (II)

Total weight (in tonnes)	3,646	1,250	54	50	5,000
Joint Cost (in Rs.) @ Rs. 15 per tonne	54,690	18,750	810	750	75,000

Note : 1. Apportionment of wastage of 200 tonnes over the four products is as follows:

$$\text{Coke} : \frac{200}{4800} \times 3,500 \text{ tonnes} = 146 \text{ tonnes}$$

$$\text{Tar} : \frac{200}{4800} \times 1,200 \text{ tonnes} = 50 \text{ tonnes}$$

Sulphate of ammonia : 2 tonnes

Benzol : 2 tonnes

(ii) *Average unit cost method* - Under this method, total process cost (upto the point of separation) is divided by total units of joint products produced. On division average cost per unit of production is obtained.

This is a simple method. The effect of application of this method is that all joint products will have uniform cost per unit. If this method is used as the basis for price fixation, then all the products may have more or less the same price. Under this method customers of high quality items are benefitted as they have to pay less price on their purchase.

Illustration

Find out the cost of joint products A, B and C using average unit cost method from the following data :

(a) Pre-separation Joint Cost Rs. 60,000.

(b) Production data :

<i>Products</i>	<i>Units produced</i>
A	500
B	200
C	<u>300</u>
	<u>1,000</u>



Cost Accounting

Solution

$$\text{Average cost per unit} = \frac{\text{Total joint costs}}{\text{Units produced}} = \frac{\text{Rs.60,000}}{1,000 \text{ units}} = \text{Rs. 60}$$

The joint costs apportioned @ Rs. 60 are as follows :

Products	Units	Costs per unit	Value
A	500	Rs. 60	Rs. 30,000
B	200	Rs. 60	Rs. 12,000
C	300	Rs. 60	<u>Rs. 18,000</u>
			<u>Rs. 60,000</u>

(iii) *Survey method* - This method is also known as point value method. It is based on technical survey of all the factors involved in the production and distribution of products. Under this method joint cost are apportioned over the joint products, on the basis of percentage/point values, assigned to the products according to their relative importance. The percentage or points used for the purpose are usually computed by management with the help of technical advisers. This method is considered to be more equitable than other methods.

(iv) *Contribution margin method* - According to this method, joint costs are segregated into two parts - variable and fixed. The variable costs are apportioned over the joint products on the basis of units produced (average method) or physical quantities. In case the products are further processed after the point of separation, then all variable cost incurred be added to the variable costs determined earlier. In this way total variable cost is arrived which is deducted from their respective sales values to ascertain their contribution. The fixed costs are then apportioned over the joint products on the basis of the contribution ratios.

Illustration

Find out the cost of joint products A and B using contribution margin method from the following data :

Sales

A : 100 kg @ Rs. 60 per kg

B : 120 kg @ Rs. 30 per kg

Joint costs

Marginal cost Rs. 4,400

Fixed cost Rs. 3,900



Method of Costing (II)

Solution

The marginal cost (variable cost) of Rs. 4,400 is apportioned over the joint products A and B in the ratio of their physical quantity *i.e.* 100 : 120

$$\text{Marginal cost for Product A : Rs. } 4,400 \times \frac{100}{220} = \text{Rs. } 2,000$$

$$\text{Marginal cost for Product B : Rs. } 4,400 \times \frac{120}{220} = \text{Rs. } 2,400$$

The fixed cost of Rs. 3,900 is apportioned over the joint products A and B in the ratio of their contribution margin *i.e.* 40 : 12

(Refer to working note)

$$\text{Product A : Rs. } 3,900 \times \frac{40}{52} = \text{Rs. } 3,000$$

$$\text{Product B : Rs. } 3,900 \times \frac{12}{52} = \text{Rs. } 900$$

Working Note :

Computation of contribution margin ratio

Products	Sales revenue (Rs.)	Marginal cost (Rs.)	Contribution (Rs.)
A	6,000	2,000	4,000
B	3,600	2,400	1,200

(Refer to above)

Contribution ratio is 40 : 12

(v) *Market value method* - This is the most popular and convenient method because it makes use of a realistic basis for apportioning joint costs. Under this method joint costs are apportioned after ascertaining "what the traffic can bear". In other words, the products are made to bear a proportion of the joint cost on the basis of their ability to absorb the same. Market value means weighted market value *i.e.* units produced \times price of a unit of joint product.

(a) *Market value at the point of separation* - This method is used for the apportionment of joint costs to joint products upto the split off point. It is difficult to apply this method if the market value of the products at the point of separation are not available. It is a useful method where further processing costs are incurred disproportionately.



Cost Accounting

To determine the apportionment of joint costs over joint products, a factor known as multiplying factor is determined. This multiplying factor on multiplication with the sales values of each joint product gives rise to the proportion of joint cost. For example, a concern incurs a joint cost of Rs. 64,500 in producing two products A (200 units), B (200 units) and earns a sales revenue of Rs. 86,000 by selling @ Rs. 170 per unit of product A and B @ Rs. 260 per unit of product B. The multiplying factor in this case is obtained by dividing the total joint cost by total sales revenue and finally multiplying the figure so obtained by 100. The multiplying factor based on the data can be computed as follows :

$$\text{Multiplying factor : } \frac{\text{Rs.64,500}}{\text{Rs.86,000}} \times 100 = 75\%$$

$$\begin{aligned} \text{Joint cost apportioned over product A} &= \text{Sales revenue of product A} \times 75\% \\ &= \text{Rs. 34,000} \times 75\% \\ &= \text{Rs. 25,500} \end{aligned}$$

$$\begin{aligned} \text{Joint cost apportioned over product B} &= \text{Sales revenue of product B} \times 75\% \\ &= \text{Rs. 52,000} \times 75\% \\ &= \text{Rs. 39,000} \end{aligned}$$

Alternatively - This joint cost may be apportioned in the ratio of sales values of different joint products.

(b) *Market value after processing* - Here the basis of apportionment of joint cost is the total sales value of finished products and involves the same principle as discussed in (a) above. Suppose that in the example given in Part (a) above, if sales prices of products A and B after further processing is Rs. 200 and Rs. 300 respectively the joint cost apportioned over Products A and B is as follows :

The pre-separation costs of Rs. 64,500 will be apportioned in the ratio of (2 : 3) as follows:

Market sales value after further processing

	Rs.
A : 200 units × Rs. 200	= 40,000
B : 200 units × Rs. 300	= <u>60,000</u>
	<u>1,00,000</u>



Method of Costing (II)

Joint cost apportioned :

$$A = \text{Rs. } 64,500 \times \frac{\text{Rs. } 40,000}{\text{Rs. } 1,00,000} = \text{Rs. } 25,800$$

$$B = \text{Rs. } 64,500 \times \frac{\text{Rs. } 60,000}{\text{Rs. } 1,00,000} = \text{Rs. } 38,700$$

The use of this method is unfair where further processing costs after the point of separation are disproportionate or when all the joint products are not subjected to further processing. The *net realisable value method* which is discussed as below overcomes the shortcoming of this method.

(c) *Net realisable value method* : From the sales value of the joint products (at finished stage) are deducted :

- (i) estimated profit margins,
- (ii) selling and distribution expenses, if any, and
- (iii) post-split off costs.

The resultant figure so obtained is known as net realisable value of joint products. Joint costs are apportioned in the ratio of net realisable value. Suppose that in the example given in part (a) above if further processing costs for products A and B are Rs. 4,000 and Rs. 32,000 respectively the Joint cost may be apportioned to products A and B as follows:

Products	Sales revenue (Rs.)	Further processing cost (Rs.)	Net realisable value (Rs.)	Joint cost apportioned ratio
	(a)	(b)	(c)=(a)-(b)	
A	34,000	4,000	30,000	3/5
B	52,000	32,000	20,000	2/5

$$\text{Joint cost apportioned over product A} = \text{Rs. } 64,500 \times \frac{3}{5} = \text{Rs. } 38,700$$

$$\text{Joint cost apportioned over product B} = \text{Rs. } 64,500 \times \frac{2}{5} = \text{Rs. } 25,800$$

This method is extensively used in many industries.



Cost Accounting

Illustration :

Inorganic Chemicals purchases salt and processes it into more refined products such as Caustic Soda, Chlorine and PVC. In the month of July, Inorganic Chemicals purchased Salt for Rs. 40,000. Conversion of Rs. 60,000 were incurred upto the split off point, at which time two sealable products were produced. Chlorine can be further processed into PVC.

The July production and sales information is as follows :

	<i>Production (tonnes)</i>	<i>Sales quantity (tonnes)</i>	<i>Selling price (per tonnes)</i>
Caustic Soda	1,200	1,200	Rs. 50
Chlorine	800	—	—
PVC	500	500	Rs. 200

All 800 tonnes of Chlorine were further processed, at an incremental cost of Rs. 20,000 to yield 500 tonnes of PVC. There were no beginning or ending inventories of Caustic Soda, Chlorine or PVC in July.

There is active market for Chlorine. Inorganic Chemicals could have sold all its July production of Chlorine at Rs. 75 per tonne.

Required :

- (1) To calculate how joint cost of Rs. 1,00,000 would be apportioned between Caustic Soda and Chlorine under each of following methods :
 - (a) Sales value at split off,
 - (b) Physical measure (method), and
 - (c) Estimated net realisable value.
- (2) Lifetime Swimming Pool Products offers to purchase 800 tonnes of Chlorine in August at Rs. 75 per tonne. This sale of Chlorine would mean that no PVC would be produced in August. How the acceptance of this offer for the month of August would affect operating income ?



Method of Costing (II)

Solution :

1. (a) Sales value at split off method

<i>Products</i>	<i>Sales in tonnes</i>	<i>Selling price per tonne (Rs.)</i>	<i>Sales Joint revenue (Rs.)</i>	<i>cost apportioned* (Rs.)</i>
	(a)	(b)	(c)=(a) × (b)	
Caustic Soda	1,200	50	60,000	50,000
Chlorine	800	75	<u>60,000</u>	<u>50,000</u>
			1,20,000	1,00,000

$$* \text{ Apportioned joint cost} = \frac{\text{Total joint cost}}{\text{Total sale value}} \times \text{Sale revenue of each product}$$

$$\text{Joint cost apportioned to Caustic Soda} = \frac{\text{Rs. 1,00,000}}{\text{Rs. 1,20,000}} \times \text{Rs. 60,000} = \text{Rs. 50,000}$$

$$\text{Joint cost apportioned to Chlorine} = \frac{\text{Rs. 1,00,000}}{\text{Rs. 1,20,000}} \times \text{Rs. 60,000} = \text{Rs. 50,000}$$

(b) Physical measure method

<i>Products</i>	<i>Sale in (tonnes)</i>	<i>Joint cost apportioned **</i>
Caustic Soda	1,200	60,000
Chlorine	<u>800</u>	<u>40,000</u>
	2,000	1,00,000

$$** \text{ Apportioned joint cost} = \frac{\text{Total joint cost}}{\text{Total physical value}} \times \text{Physical units of each product}$$

$$\text{Joint cost apportioned to Caustic Soda} = \frac{\text{Rs. 1,00,000}}{\text{2000 tonnes}} \times \text{1,200 tonnes} = \text{Rs. 60,000}$$



Cost Accounting

$$\text{Joint cost apportioned to chlorine} = \frac{\text{Rs. } 1,00,000}{2000 \text{ tonnes}} \times 800 \text{ tonnes} = \text{Rs. } 40,000$$

(c) Estimated net realisable value method

Products	Sale revenue (Rs.) (a)	Further processing cost (Rs.) (b)	Net realisable value (Rs.) (c) = (a) – (b)	Apportioned*** Joint cost
Caustic Soda (1,200 tonnes × Rs. 50)	60,000	–	60,000	42,857
Chlorine (500 tonnes of PVC × Rs. 200)	1,00,000	20,000	80,000	57,143
			1,40,000	1,00,000

$$\text{**Apportioned joint cost} = \frac{\text{Total joint cost}}{\text{Total net realisable value}} \times \text{Net realisable value of each product}$$

$$\text{Apportioned joint cost for Caustic Soda} = \frac{\text{Rs. } 1,00,000}{\text{Rs. } 1,40,000} \times \text{Rs. } 60,000 = \text{Rs. } 42,857$$

$$\text{Apportioned joint cost for Chlorine} = \frac{\text{Rs. } 1,00,000}{\text{Rs. } 1,40,000} \times \text{Rs. } 80,000 = \text{Rs. } 57,143$$

2. Incremental revenue from further

processing of Chlorine into PVC Rs. 40,000

(500 tonnes × Rs. 200 – 800 tonnes × Rs. 75)

Less : Incremental cost of further processing of Chlorine into PVC Rs. 20,000

Incremental operating income from further processing Rs. 20,000

The operating income of Inorganic Chemicals will be reduced by Rs. 20,000 in August if it sells 800 tonnes of Chlorine to Lifetime Swimming Pool Products, instead of further processing of Chlorine into PVC for sale.



Method of Costing (II)

Illustration

SUNMOON Ltd. produces 2,00,000 : 30,000; 25,000; 20,000 and 75,000 units of its five products A, B, C, D and E respectively in a manufacturing process and sells them at Rs. 17, Rs. 13, Rs. 8, Rs. 10 and Rs. 14 per unit. Except product D remaining products can be further processed and then can be sold at Rs. 25, Rs. 17, Rs. 12 and Rs. 20 per unit in case of A, B, C and E respectively.

Raw material costs Rs. 35,90,000 and other manufacturing expenses cost Rs. 5,47,000 in the manufacturing process which are absorbed on the products on the basis of their 'Net realisable value'. The further processing costs of A, B, C and E are Rs. 12,50,000; Rs. 1,50,000; Rs. 50,000 and Rs. 1,50,000 respectively. Fixed costs are Rs. 4,73,000.

You are required to prepare the following in respect of the coming year:

- Statement showing income forecast of the company assuming that none of its products are to be further processed.
- Statement showing income forecast of the company assuming that products A, B, C and E are to be processed further.

Can you suggest any other production plan whereby the company can maximise its profits? If yes, then submit a statement showing income forecast arising out of adoption of that plan.

Solution

Working Note:

Statement showing apportionment of joint costs on net realisable value basis

<i>Products</i>	<i>Sales value</i>	<i>Post separation</i>	<i>Net realisable value</i>	<i>Apportioned joint costs</i>
	(1)	(2)	(1)-(2)=(3)	(4)
	Rs.	Rs.	Rs.	Rs.
A	50,00,000 (2,00,000 units × Rs. 25)	12,50,000	37,50,000	26,25,000
B	5,10,000 (30,000 units × Rs. 17)	1,50,000	3,60,000	2,52,000
C	3,00,000 (25,000 units × Rs. 12)	50,000	2,50,000	1,75,000
D	2,00,000	—	2,00,000	1,40,000



Cost Accounting

	(20,000 units × Rs. 10)			
E	15,00,000	1,50,000	13,50,000	9,45,000
	(75,000 units × Rs. 20)			
			<u>59,10,000</u>	<u>41,37,000</u>

$$\begin{aligned} \text{Total joint cost} &= \text{Raw material costs} + \text{Manufacturing expenses} \\ &= \text{Rs. } 35,90,000 + \text{Rs. } 5,47,000 = \text{Rs. } 41,37,000 \end{aligned}$$

$$\text{Apportioned joint cost} = \frac{\text{Total joint cost}}{\text{Total net realisable value}} \times \text{Net realisable value of each product}$$

$$\text{Apportioned joint cost for Product A} = \frac{\text{Rs. } 41,37,000}{\text{Rs. } 59,10,000} \times \text{Rs. } 37,50,000 = 26,25,000$$

Similarly, the apportioned joint cost for products B, C, D and E are Rs. 2,52,000; Rs. 1,75,000; Rs. 1,40,000 and Rs. 9,45,000 respectively.

(a) Statement showing income forecast of the company assuming that none of its products are further processed

	Products					Total
	A	B	C	D	E	
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Sales revenue	34,00,000	3,90,000	2,00,000	2,00,000	10,50,000	52,40,000
	(2,00,000	(30,000	(25,000	(20,000	(75,000	
	units ×	units ×	units ×	units ×	units ×	
	Rs. 17)	Rs. 13)	Rs. 8)	Rs. 10)	Rs. 14)	
Less: Apportioned joint cost	<u>26,25,000</u>	<u>2,52,000</u>	<u>1,75,000</u>	<u>1,40,000</u>	<u>9,45,000</u>	<u>41,37,000</u>
						(Refer to working note)
Excess of revenue over joint cost of manufacturing	7,75,000	1,38,000	25,000	60,000	1,05,000	11,03,000
Less: Fixed cost						<u>4,73,000</u>
Profit						<u>6,30,000</u>



Method of Costing (II)

(b) Statement showing income forecast of the company: assuming that products A, B, C and E are further processed (Refer to working note)

	<i>Products</i>					<i>Total</i> Rs.
	<i>A</i> Rs.	<i>B</i> Rs.	<i>C</i> Rs.	<i>D</i> Rs.	<i>E</i> Rs.	
Sales revenue : (X)	50,00,000	5,10,000	3,00,000	2,00,000	15,00,000	75,10,000
Apportioned joint cost : (Y)	26,25,000	2,52,000	1,75,000	1,40,000	9,45,000	41,37,000
Further processing cost : (Z)	12,50,000	1,50,000	50,000	-	1,50,000	16,00,000
Total manufacturing cost : (K)=(Y)+(Z)	38,75,000	4,02,000	2,25,000	1,40,000	10,95,000	57,37,000
Excess of sales revenue over total manufacturing cost : [(X)-(K)]	11,25,000	1,08,000	75,000	60,000	4,05,000	17,73,000
Less: Fixed cost						<u>4,73,000</u>
Profit						<u>13,00,000</u>

Suggested production plan for maximising profits

On comparing the figures of excess of revenue over cost of manufacturing in the above statements one observes that the concern is earning more after further processing of A, C and E products but is loosing a sum of Rs. 30,000 in the case of product B (if it is processed further). Hence the best production plan will be to sell A, C and E after further processing and B and D at the point of split off. The profit statement based on this suggested production plan is as below :

Profit statement based on suggested production plan

	<i>Products</i>					<i>Total</i> Rs.
	<i>A</i> Rs.	<i>B</i> Rs.	<i>C</i> Rs.	<i>D</i> Rs.	<i>E</i> Rs.	
1	2	3	4	5	6	7
Sales revenue : (X)	50,00,000	3,90,000	3,00,000	2,00,000	15,00,000	73,90,000
Appointed joint cost : (Y)	26,25,000	2,52,000	1,75,000	1,40,000	9,45,000	41,37,000
Further processing cost : (Z)	12,50,000	-	50,000	-	1,50,000	14,50,000
Total manufacturing cost : (K)=(Y)+(Z)	38,75,000	2,52,000	2,25,000	1,40,000	10,95,000	55,87,000
Excess of sales revenue						



Cost Accounting

over manufacturing cost	11,25,000	1,38,000	75,000	60,000	4,05,000	18,03,000
: [(X)-(K)]						
Less: Fixed cost						<u>4,73,000</u>
Profit						<u>13,30,000</u>

Hence the profit of the company has increased by Rs. 30,000.

7.6.4 Methods of apportioning joint cost over by-products : The following methods may be adopted for the accounting of by-products and arriving at the cost of production of the main product :

(a) *Market value or value on realisation* : The realisation on the disposal of the by-product may be deducted from the total cost of production so as to arrive at the cost of the main product. For example, the amount realised by the sale of molasses in a sugar factory goes to reduce the cost of sugar produced in the factory.

When the by-product requires some additional processing and expenses are incurred in making it saleable to the best advantage of the concern, the expenses so incurred should be deducted from the total value realised from the sale of the by-product and only the net realisations should be deducted from the total cost of production to arrive at the cost of production of the main product. Separate accounts should be maintained for collecting additional expenses incurred on :

- (i) further processing of the by-product, and
- (ii) selling, distribution and administration expenses attributable to the by-product.

(b) *Standard cost in technical estimates* : By-products may be valued at standard costs. The standard may be determined by averaging costs recorded in the past and making technical estimates of the number of units of original raw material going into the main product and the number forming the by-product or by adopting some other consistent basis. This method may be adopted where the by-product is not saleable in the condition in which it emerges or comparative prices of similar products are not available.

(c) *Comparative price* : Under this method, the value of the by-product is ascertained with reference to the price of a similar or an alternative material. Suppose in a large automobile plant a blast furnace not only produces the steel required for the car bodies but also produces gas which is utilised in the factory. This gas can be valued at the price which would have been paid to a gas company if the factory were to buy it from outside sources.



(d) *Re-use basis* : In some cases the by-product may be of such a nature that it can be reprocessed in the same process as part of the input of the process. In that case the value put on the by-product should be same as that of the materials introduced into the process. If, however, the by-product can be put into an earlier process only, the value should be the same as for the materials introduced into the process.

7.6.5 Treatment of By-Product Cost in Cost-Accounting : By-product cost can be dealt in cost accounting in the following ways :—

(i) *When they are of small total value* : When the by-products are of small total value, the amount realised from their sale may be dealt in any one the following two ways :

1. The sales value of the by-products may be credited to the Profit and Loss Account and no credit be given in the Cost Accounts. The credit to the Profit and Loss Account here is treated either as miscellaneous income or as additional sales revenue.
2. The sale proceeds of the by-product may be treated as deductions from the total costs. The sale proceeds in fact should be deducted either from the production cost or from the cost of sales.

(ii) *When the by-products are of considerable total value* : Where by-products are of considerable total value, they may be regarded as joint products rather than as by-products. To determine exact cost of by-products the costs incurred upto the point of separation, should be apportioned over by-products and joint products by using a logical basis. In this case, the joint costs may be divided over joint products and by-products by using relative market values ; physical output method (at the point of split off) or ultimate selling prices (if sold).

(iii) *Where they require further processing* : In this case, the net realisable value of the by-product at the split-off point may be arrived at by subtracting the further processing cost from the realisable value of by-products.

If total sales value of by-products at split-off point is small, it may be treated as per the provisions discussed above under (i).

In the contrary case, the amount realised from the sale of by-products will be considerable and thus it may be treated as discussed under (ii).

(Students must solve a large number of questions from process costing so as to acquire the required proficiency in the area).



Method of Costing (II)

- (iii) Statement of distribution cost, and
 (iv) Process 'A' Account, Normal and Abnormal Loss Accounts.

Solution:

(a) Statement of Equivalent Production

Input Details	Units	Output Details	Units	Equivalent Production			
				Material		Labour & O.H.	
				Units	%	Units	%
Opening WIP	2,000	Completed and transferred to process B	35,000	35,000	100	35,000	100
Units introduced	38,000	Normal Loss (5% of 40,000)	2,000	—	—	—	—
		Abnormal loss	1,000	1,000	100	800	80
		Closing WIP	2,000	2,000	100	1,600	80
	<u>40,000</u>		<u>40,000</u>	<u>38,000</u>		<u>37,400</u>	

(b) Statement of Cost

Details	Cost at the beginning of the process (Rs.)	Cost added (Rs.)	Total Cost (Rs.)	Equivalent Production (units)	Cost per unit (Rs.)
Material	80,000	14,80,000	15,60,000		
Less : Value of Normal Scrap			<u>40,000</u>		
			<u>15,20,000</u>	38,000	40
Labour	15,000	3,59,000	3,74,000	37,400	10
Overheads	45,000	10,77,000	11,22,000	37,400	<u>30</u>
					80

(c) Statement of Distribution of Cost (Rs.)

i) Completed and transferred to Process B	(35,000 units @ Rs.80)	28,00,000
ii) Abnormal Loss – 1,000 units		
Materials	(1,000 units @ Rs.40)	40,000
Labour and overheads	(800 units @ Rs.40)	<u>32,000</u>
		72,000



Cost Accounting

iii) Closing W.I.P. – 2,000 units			
Materials	(2,000 units @ Rs.40)	80,000	
Labour and overheads	(1,600 units @ Rs.40)	<u>64,000</u>	1,44,000

(d) **Process A A/c**

Particulars		Units	Rs.	Particulars		Units	Rs.
To	Balance:			By			
	Opening W.I.P.	2,000	1,40,000		Normal Loss	2,000	40,000
	Materials – Rs.80,000				(@Rs.20 per paise)		
	Labour – Rs.15,000			By	Abnormal loss	1,000	72,000
	Overheads – Rs.45,000			By	Process B A/c	35,000	28,00,000
To	Materials introduced	38,000	14,80,000		(transferred to the next		
To	Direct Labour		3,59,000		Process)		
To	Overheads	—	<u>10,77,000</u>	By	Balance c/d (Closing WIP)	<u>2,000</u>	<u>1,44,000</u>
		<u>40,000</u>	<u>30,56,000</u>			<u>40,000</u>	<u>30,56,000</u>

Normal Loss A/c

Particulars	Units	Rs.	Particulars	Units	Rs.
To Process A A/c	2,000	40,000	By Cost Ledger Control A/c	2,000	40,000

Abnormal Loss A/c

Particulars	Units	Rs.	Particulars	Units	Rs.
To Process A A/c	1,000	72,000	By Cost Ledger Control A/c	1,000	20,000
		—	By Costing Profit / Loss A/c		<u>52,000</u>
		<u>72,000</u>			<u>72,000</u>

Illustration 2

RST Limited processes Product Z through two distinct processes – Process I and Process II. On completion, it is transferred to finished stock. From the following information for the year 2006-07, prepare Process I, Process II and Finished Stock A/c :

Particulars	Process I	Process II
Raw materials used	7,500 units	—
Raw materials cost per unit	Rs.60	—



Method of Costing (II)

Transfer to next process/finished stock	7,050 units	6,525 units
Normal loss (on inputs)	5%	10%
Direct wages	Rs.1,35,750	Rs.1,29,250
Direct Expenses	60% of Direct wages	65% of Direct wages
Manufacturing overheads	20% of Direct wages	15% of Direct wages
Realisable value of scrap per unit	Rs.12.50	Rs.37.50

6,000 units of finished goods were sold at a profit of 15% on cost. Assume that there was no opening or closing stock of work-in-progress.

Solution:

Process I A/c

Particulars	Units	Rs.	Particulars	Units	Rs.
To Raw material used (@Rs.60)	7,500	4,50,000	By Normal loss (5% of 7,500)	375	4,688
To Direct wages		1,35,750	By Process II A/c	7,050	6,82,403
To Direct expenses		81,450	(transfer @ Rs.96.795)		
To Manufacturing overhead	_____	<u>27,150</u>	By Abnormal loss (@ Rs.96.795)	<u>75</u>	<u>7,259</u>
	<u>7,500</u>	<u>6,94,350</u>		<u>7,500</u>	<u>6,94,350</u>

Transfer price in Process I A/c

$$= \frac{\text{Rs.}6,94,350 - \text{Rs.}4,688}{7,500 \text{ units} - 375 \text{ units}} = \frac{\text{Rs.}6,89,662}{7,125 \text{ units}} = \text{Rs.}96.795 \text{ p.u.}$$

Process II A/c

Particulars	Units	Rs.	Particulars	Units	Rs.
To Process I A/c (transfer @ Rs.96.795)	7,050	6,82,403	By Normal loss (10% of 7,050 units)	705	26,438
To Direct wages		1,29,250	By Finished Stock A/c	6,525	9,13,825



Cost Accounting

To	Direct expenses	84,013	(transfer @ Rs.140.05)		
To	Manufacturing overhead	19,387			
To	Abnormal gain (@ Rs.140.05)	180	25,210		
		<u>7,230</u>	<u>9,40,263</u>	<u>7,230</u>	<u>9,40,263</u>

Transfer price in Process II A/c

$$= \frac{\text{Rs.9,15,053} - \text{Rs.26,438}}{7,050 \text{ units} - 705 \text{ units}} = \frac{\text{Rs.8,88,615}}{6345 \text{ units}} = \text{Rs.140.05 p.u.}$$

Finished Goods Stock A/c

Particulars		Units	Rs.	Particulars		Units	Rs.
To	Process II A/c (transfer @ Rs.140.05)	6,525	9,13,825	By	Cost of sales	6,000	8,40,300
				By	Balance c/d	<u>525</u>	<u>73,525</u>
		<u>6,525</u>	<u>9,13,825</u>			<u>6,525</u>	<u>9,13,825</u>

Income Statement

Particulars		Rs.	Particulars		Rs.
To	Cost of sales (6,000 units @ Rs.140.05)	8,40,300	By	Abnormal gain	
				Process II A/c – 180 units (Rs.140.05 – Rs.37.50)	18,459
To	Abnormal loss Process I – 75 units (Rs.96.795 – Rs.12.50)	6,322	By	Sales (6,000 units @ Rs.161.06)	9,66,360
To	Net Profit	<u>1,38,197</u>			
		<u>9,84,819</u>			<u>9,84,819</u>

Illustration 3

A company produces a component, which passes through two processes. During the month of April, 2006, materials for 40,000 components were put into Process I of which 30,000 were completed and transferred to Process II. Those not transferred to Process II were 100% complete as to materials cost and 50% complete as to labour and overheads cost. The Process I costs incurred were as follows :



Method of Costing (II)

Direct material	Rs.15,000
Direct wages	Rs.18,000
Factory overheads	Rs.12,000

Of those transferred to Process II, 28,000 units were completed and transferred to finished goods stores. There was a normal loss with no salvage value of 200 units in Process II. There were 1,800 units, remained unfinished in the process with 100% complete as to materials and 25% complete as regard to wages and overheads.

No further process material costs occur after introduction at the first process until the end of the second process, when protective packing is applied to the completed components. The process and packing costs incurred at the end of the Process II were :

Packing materials	Rs.4,000
Direct wages	Rs.3,500
Factory overheads	Rs.4,500

Required :

- Prepare Statement of Equivalent Production, Cost per unit and Process I A/c.
- Prepare Statement of Equivalent Production, Cost per unit and Process II A/c.

Solution:

Process I – Statement of Equivalent Production

Particulars	Completed Units	Closing stock of WIP			Equivalent Production units
		Units	% of Completion	Equivalent Units	
	(1)			(2)	(1) + (2)
Material	30,000	10,000	100%	10,000	40,000
Labour	30,000	10,000	50%	5,000	35,000
Overhead	30,000	10,000	50%	5,000	35,000



Cost Accounting

Process I

<i>Particulars</i>	<i>Process Cost (Rs.)</i>	<i>Equivalent Production (units)</i>	<i>Process Cost p.u. (2)/(3)</i>	<i>WIP stock Equivalent units</i>	<i>Cost of WIP Stock (Rs.) (4) × (5)</i>	<i>Transfer to Process II (2)-(6)</i>
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Material	15,000	40,000	0.375	10,000	3,750	11,250
Labour	18,000	35,000	0.514	5,000	2,570	15,430
Overhead	<u>12,000</u>	35,000	0.343	5,000	<u>1,715</u>	<u>10,285</u>
	45,000				8,035	36,965

Process I A/c

<i>Particulars</i>	<i>Unit</i>	<i>Rs.</i>	<i>Particulars</i>	<i>Units</i>	<i>Rs.</i>
To Direct material	40,000	15,000	By Transfer to Process II	30,000	36,965
To Direct wages		18,000	By WIP stock	10,000	8,035
To Factory overhead	—	<u>12,000</u>		—	—
	<u>40,000</u>	<u>45,000</u>		<u>40,000</u>	<u>45,000</u>

Process II – Statement of Equivalent Production

<i>Particulars</i>	<i>Completed Units</i>	<i>Closing stock of WIP</i>			<i>Equivalent Production units</i>
		<i>Units</i>	<i>% of Completion</i>	<i>Equivalent Units</i>	
	(1)			(2)	(1) + (2)
Material	28,000	1,800	100%	1,800	29,800
Labour	28,000	1,800	25%	450	28,450
Overhead	28,000	1,800	25%	450	28,450



Method of Costing (II)

Process II

<i>Particulars</i>	<i>Process Cost (Rs.)</i>	<i>Equivalent Production (units)</i>	<i>Process Cost p.u. (2)/(3)</i>	<i>WIP stock Equivalent units</i>	<i>Cost of WIP Stock (Rs.) (4) × (5)</i>	<i>Transfer to Finished Stock (2)-(6)</i>
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Material	36,965	29,800	1.240	1,800	2,232	34,733
Labour	3,500	28,450	0.123	450	55	3,445
Overhead	<u>4,500</u>	28,450	0.158	450	<u>71</u>	<u>4,429</u>
	44,965				2,358	42,607
Add: Packing Cost						<u>4,000</u>
Transfer to Finished Stock						46,607

Process II A/c

Particulars		Units	Rs.	Particulars		Units	Rs.
To	Transfer from Process I	30,000	36,965	By	Finished Stock	28,000	46,607
To	Direct wages		3,500	By	Normal loss	200	-
To	Factory overhead		4,500	By	WIP stock	1,800	2,358
To	Packing charges		<u>4,000</u>				
		<u>30,000</u>	<u>48,965</u>			<u>30,000</u>	<u>48,965</u>

7.8 Self Examination Questions

Multiple Choice Questions

- (i) When FIFO method is used in process costing, the opening stock costs are:
- kept separate from the costs of the new period
 - added to new costs
 - subtracted from the new costs
 - averaged with other costs to arrive at total costs.
- (ii) When average method is used in Process Costing, the opening inventory costs are :
- kept separate from the costs of the new period



Cost Accounting

- (b) added to new costs
 - (c) subtracted from the new costs
 - (d) averaged with other costs to arrive at total costs.
- (iii) Popular methods for calculating equivalent production are
- (a) FIFO
 - (b) Average cost
 - (c) Both 1 and 2
 - (d) Neither 1 nor 2
- (iv) When average method is used in process costing , the opening inventory costs are
- (a) Kept separate from the costs of the new period
 - (b) Added to new costs
 - (c) Subtracted from the new costs
 - (d) Averaged with other costs to arrive at total costs
- (v) When FIFO method is used in Process costing , the opening stocks are
- (a) Kept separate from the costs of the new period
 - (b) Added to new costs
 - (c) Subtracted from the new costs
 - (d) Averaged with other costs to arrive at total costs
- (vi) The output of a process consists of two joint products, Jointpro A and Jointpro B, and a by-product. Jointpro B could go through a further process in order to increase its sales value. To assist management in making the decision whether to carry out further processing, which ONE of the following is relevant ?
- (a) The share of the total processing cost which has been allocated to Jointpro B
 - (b) The sales value of Jointpro A and the by-product
 - (c) The physical quantities of all three products at separation point
 - (d) The cost of further processing Jointpro B and the increase in sales value that will result



Method of Costing (II)

- (vii) When compared with normal spoilage, abnormal spoilage
- (a) arises more frequently from factors that are inherent in the manufacturing process.
 - (b) is generally thought to be more controllable by production management than normal spoilage
 - (c) is given the same accounting treatment as normal spoilage.
 - (d) is not typically influenced by the "tightness" of production standards.
- (viii) Which of the following statements is true,
- (a) Process costing is ordinarily applied where all the operations are performed in one department.
 - (b) Equivalent unit or equivalent production comprises the units completed during the period together with equivalent completed units, represented in the beginning and ending WIP inventories.
 - (c) Job Costing and process costing cannot be simultaneously used in the same industry.
 - (d) The cost of abnormal process loss is not included in the cost of the process.
- (ix) Which of the following statements is true,
- (a) In process costing, ordinarily no distinction is made between direct and indirect materials.
 - (b) There is no difference between the terms 'co-products' and 'joint products'.
 - (c) Operating costing is the same as operation costing
 - (d) Neither a nor b nor c
- (x) The main purpose of accounting of joint products, and by-products is to,
- (a) Determine profit or loss on each product line
 - (b) Determine the selling price .
 - (c) Comply with the statutory requirements
 - (d) Identify the cost and load it on the main product

Answers to Multiple Choice Questions

i.(a); ii.(c); iii. (c); iv. (c); v. (a); vi.(d); vii. (b); viii. (b); ix.(a); x. (a)



Short Answer Type Questions

1. Define and explain the terms “Joint Products” and “By-products”. Enumerate the methods which may be employed in costing joint products.
2. Explain briefly the methods of accounting for by-products.
3. Distinguish between :
 - (i) Joint product and By-product
 - (ii) Abnormal loss and abnormal gain.
4. How would you deal with by-products in costing :
 - (i) Where they are of small total value?
 - (ii) Where they are of considerable total value?
 - (iii) Where they require further processing?
5. Describe briefly the various ways of valuing work-in-progress in process costing.

Long Answer Type Questions

1. Describe the general features of process costing. How is unit cost determined in process costing ?
2. What is meant by operation costing? Is it different from process costing ?
3. What do you understand by the terms, “normal process loss” and “abnormal process loss”? How is the value of abnormal process loss determined?
4. What is meant by abnormal gain in process costing? How is it dealt with in Cost Accounting?
5. What do you understand by the term “inter-process profits”? What is the utility of transferring the output of one process to another process at more than cost?

Numerical Questions

1. A product passes through three processes, A, B, and C. The normal wastage of each process is as follows : Process A-3% Process B-5% and Process C-8%.

The wastage of process A was sold at 0.25 p. per unit, that of process B at 0.50 p. per unit, and that of process C, at Re. 1 per unit. 10,000 units were issued to the Process A in the beginning of October 1998 at a cost of Re. 1 per unit. The other expenses were :



Method of Costing (II)

	<i>Process A</i>	<i>Process B</i>	<i>Process C</i>
Sundry materials	Rs. 1,000	Rs. 1,500	Rs. 500
Labour	5,000	8,000	6,500
Direct expenses	1,050	1,188	2,000
Actual output (units)	9,500	9,100	8,100

Prepare the Process accounts, assuming that there were no opening or closing stocks. Also give the Abnormal Wastage and the Abnormal Gain Accounts.

2. In a manufacturing unit, raw materials passes through four processes I, II, III & IV and the output of each process is the input of the subsequent process. The loss in the four processes I, II, III & IV are respectively 25%, 20% and 16-2/3% of the input. If the end product at the end of Process IV is 40,000 Kg. what is the quantity of raw material required to be fed at the beginning of Process I and the cost of the same at Rs. 5 per Kg.?

Find out also the effect of increase or decrease in the material cost of the end product for variation of every rupee in the cost of raw material.

3. In a certain period 300 units of main product are produced and 200 units are sold at Rs. 30 per unit. The by-product emerging from the main product is sold at Rs. 600. The total cost of production of 300 units is Rs. 4,500. Calculate the amount of gross profit after crediting by-product value (a) to the cost of production and (b) to cost of sales.
4. The following information is given about two products produced jointly upto a stage.

Joint cost (Rs)		40,000
Number of units of Product	A	2,000
	B	600
Selling price (Rs.)	A	30
	B	25
Special (separate) expenses (Rs.)	A	8,000
	B	3,000

Ascertain the profit earned in total and by each product.

5. A factory producing article P also produces a by-product Q which is further processed into a finished product. The cost of manufacture is given below :

Subsequent Cost

	<i>Joint Costs (Rs.)</i>	<i>P (Rs.)</i>	<i>Q (Rs.)</i>
Material	5,000	3,000	1,500



Cost Accounting

Labour	3,000	1,400	1,000
Overheads	<u>2,000</u>	<u>600</u>	<u>500</u>
	<u>10,000</u>	<u>5,000</u>	<u>3,000</u>

Selling Price Are P : Rs. 16,000, and Q : Rs. 8,000

Estimated profit on selling prices are 25% for P and 20% for Q. Assume that selling and distribution expenses are in proportion of the sale prices. Show how you would apportion joint costs of manufacture and prepare a statement showing cost of production of P and Q.

6. X Ltd. manufactures product A, which yields two by-products B and C. In a period, the amount spent upto the point of separation was Rs. 20,000. Subsequent expenses were :

	A	B	C
	Rs.	Rs.	Rs.
Materials	250	180	60
Direct wages	500	300	120
Overheads	<u>840</u>	<u>300</u>	<u>180</u>
Total	<u>1,100</u>	<u>780</u>	<u>360</u>
Gross sale value	15,200	10,000	5,100

It was estimated that profit as a percentage of sales of B and C would be 25% and 15% respectively. Ascertain the profit earned on A.

Answers to Numerical Questions.

1. Pr A Ab wastage Rs. 350, Pr B Ab Gain Rs. 225, Pr C Ab wastage Rs. 272.
2. For every increase or decrease in the material cost, the cost of the end product would increase/decrease by 2.5 times.
3. Rs. 3,400, Rs. 3,600.
4. Total profit Rs. 24,000 : A Rs. 20,000 or Rs. 19,500; B, Rs. 4,000, Rs. 4,500.
5. P. Rs. 11,733 ; Rs. 6,267
6. Rs. 4,795.

CHAPTER 8

STANDARD COSTING

Learning Objectives

When you have finished studying this chapter you should be able to;

- ◆ Understand the meaning of standard cost and variances.
- ◆ Understand the concept of capacity with reference to a product cost sheet.
- ◆ Understand the difference between controllable and uncontrollable variances.
- ◆ Compute variances related to material, labour, overhead and sales.
- ◆ Understand the reporting pattern which may be adopted for control and decision making purposes.
- ◆ Understand the meaning of disposition of variances.
- ◆ Understand the advantages and disadvantages of standard costing and variance analysis.

8.1 INTRODUCTION

Standard costing is defined by the ICMA, London, “as the preparation and use of standard costs, their comparison with actual costs and the analysis of variances to their causes and points of incidence.” Standard costing, thus, is a system of costing which can be used in conjunction with any method of costing, like job costing, process costing, etc.

The evolution of standard costing can be traced back to the late nineteenth century when Frederick W. Taylor (1856-1915) and Frank Gilbreth (1869–1924) demonstrated the concept of the time and motion study. Accountants were quick to grab on the fundamental notion that one activity can be performed in one best way. They converted such an estimate of time required to complete a job into money by multiplying it by the prevailing labour rates. Thus the concept of standard labour rate to do a job was established. Material consumption standards were easy to establish as the engineering function would know how much quantity would be required to manufacture one unit of finished goods and this when multiplied by the estimated purchase price would provide for the material cost details. Product manufacturing costs computed then were typically characterised by simplistic assumptions, with the use of ‘blanket’ overhead rates like simple labour overhead recovery bases being the common practice. It may be noted that, during the times of the evolution of standard costing and variance analysis, the classification of overheads as variable and fixed was not prevalent. Expenses then were either



Cost Accounting

direct or Indirect with raw material and the majority of labour being in the former category and the balance known as overheads (refer to chapter 1 for a clear understanding). However, standard costing was quick to imbibe the subsequent introduction of variability and fixed concepts which happened during the 1940s. The successful establishment of estimates or standards relating to the raw material cost, labour cost and the overhead burden provided all information related to product cost. Look at the following estimate of cost prepared in a tabular form;

Estimated Standard Cost in Rs.

Capacity : ----- units

Description	Total Cost	Total Fixed Cost	Total Variable Cost	Fixed Cost per unit	Variable Cost per unit	Total Cost per unit
Bill of Material Cost	xxx	-----	xxx	-----	xxx	xxx
Direct Labour	xxx	-----	xxx	-----	xxx	xxx
Manufacturing overheads	xxx	xxx	xxx	xxx	xxx	xxx
Marketing and administrative overheads	xxx	xxx	xxx	xxx	xxx	xxx
Total cost per unit				xxx	xxx	xxx
Add desired profit						xxx
Desired selling price/unit						xxx

The bill of material cost refers to the raw material cost which goes into the making of one unit of finished good. This cost is Direct in nature as it can be traced economically with the cost object i.e., the finished product. The same can be said for direct labour. The other two expenses i.e. manufacturing and marketing/administration are considered as overheads since they do not bear a direct relationship with the cost object. Note that these overheads shall need to be computed considering the capacity utilization which is possible within the given infrastructure. Hence, in case a company produces below its capacity the cost incidence/unit of these overheads shall increase and be more than what has been estimated as standard. In other words the total estimated standard fixed cost (overheads) shall not be fully utilised, thereby leading to an unutilised portion (variance). This variance is known as production volume variance (for further details please refer to the discussion under 'Types of variances'). Deviations from estimates can also occur in the other estimated costs i.e.



material cost, labour cost and the estimated selling price. You shall learn more about such variances as you proceed. However, companies, many a times, do not consider the total capacity available as the level of activity to be considered for building a cost estimate. Different types of capacities may be considered. These shall lead to different estimates of Product costs. Why? Let us consider a simple example of a product whose material cost is estimated to be Rs. 10 per unit and the direct labour shall amount to Rs. 5 per unit. Overheads are estimated to be Rs. 1,00,000 per month. These overheads are fixed in nature and can support a production of 20,000 units. Hence the incidence of overhead cost is $\frac{\text{Rs } 1,00,000}{20,000} =$

Rs. 5 per unit and the resultant estimated standard cost of the product is Rs. 20 (the sum of the standard material, standard labour and standard overhead costs). However, in case the capacity considered is only 10,000 units, the estimated /standard cost shall go up to Rs. 25. (Rs. 10, raw material + Rs. 5, labour + Rs. 10, overheads).

8.2 DEFINITION OF STANDARD COST

Standard cost is defined “as a pre-determined cost which is calculated from management’s standards of efficient operation and the relevant necessary expenditure. It may be used as a basis for price fixing and for cost control through variance analysis.”

The standard cost of a product has been defined by Blocker and Weltmer “as a pre-determined cost based upon engineering specification and representing highly efficient production for quantity standards and forecasts of future market trends for price standards with a fixed amount expressed in dollars for material, labour and overhead for an estimated quantity of production.” It may be seen from this definition that engineering specifications are the basis of quantity standards for materials and time standards for labour while budgets are of importance in determining material price standards, labour rate standards and overhead standards.

8.3 SETTING UP OF STANDARD COST

A standard cost by definition is an estimate correlating a technical specification of materials and labour to the prices and wage rates with the addition of overhead for a prescribed level of output. It is thus a measure in quantities, hours and value of the factors of production. There are three main parts of standard costs, viz., (a) direct material, (b) direct labour, and (c) overhead expenses. The compilation of direct material and direct labour standards entails the setting of the following:

8.3.1 Physical standards: The first step in manufacturing a product is to determine standard quantity of different materials to be used under the manufacturing process; various sub-assemblies, components, other small parts, etc. Besides this the length of time an average worker should take to complete a job. These standards so determined are known as physical



Cost Accounting

standards. The purposes of setting physical standards are:

- (a) To secure economies in manufacture, and
- (b) Set selling prices in advance to make it possible to estimate the cost. In printing industry, for example, the standards relating to the printed output are necessary in submitting quotations, for proposed jobs.

In manufacturing organisations, the task of setting physical standards is assigned to the industrial engineering department.

Physical standards of manufacturing activity refer to (a) specification of products and materials, (b) method of manufacture, (c) equipment to be used. Standards must always be thought of primarily in terms of specific things, as for example, units of time, kilograms of materials, hours of plant capacity, and units of output. The fundamental principle is that if the standards are to be of optimum utility, they should be capable of comparison with actual happenings on a physical unit basis at the primary levels. The fundamental or primary standards determined in terms of units of measurement or physical things need not be changed unless operating methods or products changes.

Although it is not the duty of a cost accountant to set physical standards, they are the bases for standard costs. He must be satisfied with regard to the following points:

- (a) Ensuring that adequate inspection of materials and parts has been carried out. If the inspection does not adequately localise faulty work, the cost accountant may have a hard time while explaining his variance reports.
- (b) He is notified of every change in physical standards made by engineers so as to enable him to revise his costs as and when such changes are introduced.

Material quantity standards: The following procedure is usually followed for setting material quantity standards.

- (a) *Standardisation of products:* Detailed specifications, blueprints, norms for normal wastage etc., of products along with their designs are settled.
- (b) *Product classification:* Detailed classified list of products to be manufactured are prepared.
- (c) *Standardisation of material:* Specifications, quality, etc., of materials to be used in the standard products are settled.
- (d) *Preparation of bill of materials:* A bill of material for each product or part showing the symbol or code, description and quantity of each material to be used is prepared.
- (e) *Test runs:* Sample or test runs under regulated conditions may be useful in setting quantity standards in a precise manner.



Labour quantity standards: The following are the steps involved in setting labour quantity standards:

- (a) Standardisation of product, as explained above.
- (b) Product classification, as defined earlier.
- (c) *Standardisation of methods:* Selection of proper machines to use proper sequence and method of operations.
- (d) *Manufacturing layout:* A plan of operation for each product listing the operations to be performed is prepared.
- (e) Time and motion study is conducted for selecting the best way of completing the job or motions to be performed by workers and the standard time which an average worker will take for each job.
- (f) The operator is given training to perform the job or operations in the best possible manner.

Problems faced while setting physical standards: The problems involved while setting physical standards will vary from industry to industry and may be illustrated as under:

- (a) A situation may arise where the company is introducing the manufacture of a new line of product. In such cases, it may be necessary to employ workers who have no experience in the job. This creates a problem of setting standard time because it is necessary to make adjustment for the inexperience of workers.
- (b) Changes in technology may necessitate installation of sophisticated machines. When such machines are installed, the precise estimation of output and standard of efficiency achievable will pose a problem until after a long time when the working conditions are settled. Thus, setting standards for these machines and estimating the standard costs will need considerable amount of work.
- (c) Often manufacturers go in for product diversification to improve profitability. One of the most important problems that arise with the proposed change in product may be retooling. For example, when an old copper part is to be changed into one made of bronze to suit the new product, special care has to be taken to order new tools which in turn, pose the problem of setting up of standard time in respect of the new tools.
- (d) Standards of material specifications are established and if the materials are not available as per specifications, the standards may not be achievable.
- (e) In any engineering factory using punch press operations, the problem of the most economic way of punching discs from metallic rolls arises. The problem actually is how the raw material shall be used with least waste and computing the maximum amount of material that will be allowed for a unit of product. Consider, for example, the most economical way to



Cost Accounting

blank 2-1/6" round diaphragms from a coil of sheet alloy 2" wide.

(f) Very often the cost accountant is confronted with the problem of choosing the type of standards to be adopted. For example, the industrial engineer has furnished the standard time for all direct labour operations as under:

1. Standard time attainable by the best operations is 2 hours per unit of product including allowances for personal fatigue and delay.
2. Attainable good performance for the average trained operator is 2.10 hours per unit of product.
3. Average past performance is 2.60 hours per unit.

The problem is, should direct labour standard hour be based on maximum efficiency or attainable good performance or average past performance? If costs are to represent maximum efficiency, the unit cost used in selling price will relatively be low but a high debit variance may arise if the standard efficiency is not achieved. If, however, the standard cost is based on attainable good performance, the variances may tend to be nil. If efficiency is to be gauged, maximum efficiency standard will reflect the off standard performance, thereby enabling the departmental head to exercise control.

Similar problems as those mentioned above, may also arise in setting of waste standards. For example, the question may arise as to whether only absolutely unavoidable wastage should be provided or the past average level of wastage may be provided. This will again have different impact on the standard cost of production.

8.3.2 Price or Rate standards: Broadly, the price or rate standards can be set on either of the following bases:

- (a) Actual average or mean price expected to prevail during the coming period, say one year; or
- (b) Normal prices expected to prevail during a cycle of seasons which may be of a number of years.

Material price standards: Material prices are not altogether within the control of the manufacturer; but the purchasing department, on being apprised of production quantities required, should be able, from its knowledge of current market conditions and trends, to state with reasonable accuracy price for the constituent items. The standards for prices of materials should be based on the following factors, if price fluctuations are small and are not serious.

- (a) Stock of materials on hand and the prices at which they are held;



- (b) The prices at which orders for future deliveries of materials have already been placed and
- (c) Anticipated fluctuation in price levels.

In case there are violent fluctuations in the market price, it may be difficult to determine standard costs of materials; fluctuations in the market price may be of different sorts; prices may be different from month to month, from one season to another or from one year to another. Also, along with prices going up sometimes and coming down at other time, there may be a secular trend which, on the whole, is pushing price upwards or downwards. The nature of difficulties encountered in fixing standard costs of materials will naturally be different in each case. In addition the purchasing policy of the company and the objective to be achieved (from cost accounting) will make a difference.

The difficulty in determining the standard cost of material in such a situation can be resolved as follows:

- (a) In case prices fluctuate from month to month, the average of prices of a year corrected for the known secular changes and any other expected change can very well serve as the standard price for the next year.
- (b) If the fluctuations are seasonal, but the whole year's requirements are purchased at one time, the weighted average of the likely prices to be paid should be treated as the standard price. But, if buying is also spread over the whole year, the weighted average of the prices for the whole year should be the standard price.
- (c) If prices fluctuate from one year to another, a careful estimate of the price likely to prevail next year, based on a statistical study, should be adopted as the standard price.

Wage rate standard: Standard wage rates may be set to cover various grades of labour. In factories 'where contracts with workers' unions exist, the rates approved by contract usually become the standard for the period for which the contract applies.

Overhead expense standards: In computing the overhead expense standards, consideration should be given to the level of output and the expenses budgeted. A budget showing the level of output to be considered for arriving at overhead expense standards may be based on the practical manufacturing capacity or the average sales capacity or the budgeted capacity to be utilised in the coming year. After having chosen one of the methods of output level, the expenses can be budgeted under different heads under what the management calls good performance for the level of output chosen. These expenses are classified under fixed and variable categories.

Thus, the overhead expenses standards are set by computing the optimum level of output for the production departments and thereafter drafting a budget for fixed and variable expenses



which will be incurred at this level. If production is seasonal or it fluctuates during the year, a flexible budget may be prepared to facilitate comparison between the target set and the actual expenditure for the period.

Standard hour: In industries like coal mining, where the products are homogeneous, the calculation of output is relatively simple. But in concerns manufacturing several products it is difficult to establish a satisfactory basis on which to measure output of the various departments because of differences in volume of individual products, quality, etc.

The most satisfactory method of common measure is the use of standard hour. ICMA, London, defines a standard hour as a hypothetical hour, which measures the amount of work which should be performed in one hour. The standard hour is thus a unit of work and not of time.

For example, a furniture company producing chairs, desks, tables and cabinets, may show the work content of each type of product measured in standard hours as under:

<i>Product</i>	<i>Std. Hours per unit</i>	<i>Quantity Produced</i>	<i>Output in Std. hours</i>
Chairs	12	100	1,200
Desk	25	25	625
Tables	24	50	1,200
Cabinets	20	100	2,000

8.4 TYPES OF STANDARDS

The accuracy and relevance of an established standard cost depends upon the reliability of the standards set up. In order to compute the standards we must know what degree of accuracy is necessary. There are four different bases or standards which should be considered. These standards have been discussed below:

8.4.1 Ideal standards: These represent the level of performance attainable when prices for material and labour are most favourable, when the highest output is achieved with the best equipment and layout and when the maximum efficiency in utilisation of resources results in maximum output with minimum cost. These type of standards are criticised on three grounds:

- (i) Since such standards would be unattainable, no one would take them seriously.
- (ii) The variances disclosed would be variances from the ideal standards. These would not, therefore, indicate the extent to which they could have been reasonably and practically avoided.
- (iii) There would be no logical method of disposing of these variances.

8.4.2 Normal standards: These are standards that may be achieved under normal operating conditions. The normal activity has been defined as “the number of standard hours which will



produce at normal efficiency sufficient goods to meet the average sales demand over a term of years". These standards are, however, difficult to set because they require a degree of forecasting. The variances thrown out under this system are deviations from normal efficiency, normal sales volume, or normal productive volume. If the actual performance is found to be abnormal, large variances may result and necessitate revision of standards.

8.4.3 Basic or Bogey standards: These standards are used only when they are likely to remain constant or unaltered over a long period. According to this standard, a base year is chosen for comparison purposes in the same way as statisticians use price indices. Since basic standards do not represent what should be attained in the present period, current standards should also be prepared if basic standards are used. Basic standards are, however, well suited to businesses having a small range of products and long production runs. Basic standards are set, on a long-term basis and are seldom revised. When basic standards are in use, variances are not calculated as the difference between standard and actual cost. Instead, the actual cost is expressed as a percentage of basic cost. The current cost is also similarly expressed and the two percentages are compared to find out how much the actual cost has deviated from the current standard. The percentages are next compared with those of the previous periods to establish the trend of actual and current standard from basic cost.

8.4.4 Current standards: These standards reflect the management's anticipation of what actual costs will be for the current period. These are the costs which the business will incur if the anticipated prices are paid for the goods and services and the usage corresponds to that believed to be necessary to produce the planned output. The variances arising from expected standards represent the degree of efficiency in usage of the factors of production, variation in prices paid for materials and services and difference in the volume of production.

8.5 NEED FOR STANDARD COSTS

Since standard costs are pre-determined costs computed before the production takes place, they are preferable to actual costs. Moreover, certain conditions resulting from mass production make standard costs necessary and strongly advisable. Some of such conditions are:

- (a) Historical costs may be too expensive to compute. For example, in a manufacturing concern producing about 1,00,000 parts, divided into various lots, imagine the time and clerical labour involved in arriving at the actual cost lot by lot and then averaging it to determine the cost per unit.
- (b) The unit costs computed on historical data may vary from day to day and they are of no use to the sales department in setting selling prices. For example, if the historical costs per unit of product in a week are Rs. 1.05, 0.99, 1.27, 1.18, 1.42, 1.56, the selling price cannot be varied from day to day to match the costs.



(c) Historical costs are not known until after the completion of a month or even a longer period. But in many cases, to take a decision, the cost of a product has to be calculated even before the production begins.

(d) Historical costs may not be adequate for the measurement of efficiency. Standard costs are well suited for measuring operating efficiency because they represent what the costs should be. The management, consequently, knows immediately whether the performance is satisfactory.

8.5.1 Uses of Standard Costs

1. Use of standard costs is an effective way for planning and controlling costs.
2. Pricing decisions and decisions involving submission of quotations, answering tenders etc., are also facilitated by the use of standard costs.
3. Identification and measurement of variances from standards has been made possible with the use of standard cost, with a view to improve performance or to correct loose standards, if any.
4. Facilitates management by exception.

8.6 THE PROCESS OF STANDARD COSTING

Standard costs are pre-determined by using a careful analysis of production methods, physical conditions and price factors. They represent achievable targets and help to build up budgets, gauge performance and obtain product costs. The actual costs will vary from month to month or even from day to day. The basic objective, therefore, of standard costing system is to assist the departmental head by identifying and describing the variances over which he has control. Thus, a set of standards developed under the standard costing system outlines how a task must be accomplished and how much it should cost. As work is done actual costs are recorded and compared with standard cost to determine the variances. The variances, thus arrived at, are analysed further with a view to discovering better ways of adhering to standards or of altering the standards so as to accomplish the objectives. Under this system, the cost is pre-determined for each element, namely, material, labour and overhead and for each line of product manufactured or service rendered. It, therefore, involves:

- (a) The setting of standards,
- (b) Ascertainment of actual costs,
- (c) Comparison of actual and standard costs to determine the variance, and
- (d) Investigation of variances and taking appropriate action thereon wherever necessary.



8.7 TYPES OF VARIANCES

8.7.1 Controllable and un-controllable variances: The purpose of the standard costing reports is to investigate the reasons for significant variances so as to identify the problems and take corrective action. Variances are broadly of two types, namely, controllable and uncontrollable. Controllable variances are those which can be controlled by the departmental heads whereas uncontrollable variances are those which are beyond their control. For example, price variance is normally regarded as uncontrollable if the price increase is due to fluctuations of prices in the market. It becomes controllable if the production controller has failed to place orders in time and urgent purchase was made at extra cost. In the former case, no responsibility is attached to any one whereas the departmental head has responsibility for the loss in the latter case. As already explained, not all price variances are uncontrollable. If the uncontrollable variances are of significant nature and are persistent, the standard may need revision.

Variances may be broadly classified under the following heads according to the main type of cost.

(a) **Material** – The two basic variances arising during material consumption are material usage and material price variances. The former arises because of variations in the quantity of material actually consumed when compared with what should have been consumed as per the established standards and the latter because of the differences between the planned and the actual material prices paid to the suppliers. Mathematically

$$\text{Material costs variance} = (\text{Std. qty} \times \text{Std. Price}) - (\text{Actual qty} \times \text{Actual price})$$

$$\text{Material usage variance} = \text{Std. price} (\text{Std. Qty.} - \text{Actual qty.})$$

$$\text{Material price variance} = \text{Actual qty.} (\text{Std. price} - \text{Actual price})$$

$$\text{Material cost variance} = \text{Material usage variance} + \text{Material price variance}$$

(b) **Labour** – Similar to material usage variance, labour efficiency variance measures the efficiency of labour by identifying the difference between the actual hours worked and the hours which should have been worked as per the established standards. Deviations in the actual rate of pay and the ones estimated are measured by the labour rate variance. Mathematically

$$\text{Labour cost variance} = (\text{Std. time} \times \text{Std. Rate}) - (\text{Actual time} \times \text{Actual rate})$$

$$\text{Labour efficiency variance} = \text{Std. rate} (\text{Std. time} - \text{Actual time})$$

$$\text{Labour rate variance} = \text{Actual time} (\text{Std. rate} - \text{Actual rate})$$

$$\text{Labour cost variance} = \text{Labour efficiency variance} + \text{Labour rate variance}$$



Cost Accounting

(c) **Overheads** – Normally, for several type of overhead expenses either a single recovery rate or two recovery rates, one representing fixed overheads and the other representing variable overheads, will be prepared. Refer to the 'Estimated Standard Cost' table on page 8,2. Overheads have been classified as both fixed and variable thereby giving a standard fixed cost (overhead) per unit and standard variable cost (overhead) per unit. The recovery of the fixed components of the estimated overheads depends upon capacity utilization. In case a company produces less than the projected utilization it shall not be able to recover all the budgeted fixed overheads. This unrecovered portion is known as production volume variance. The other variation is because of variations in actual spending when compared with both estimated fixed and estimated variable overheads. Such a variance is known as Overhead expenses variance. The following detailed discussion shall help you have a clear understanding of these two variances.

(1) **Production Volume Variance:** The term fixed overheads implies that the element of cost does not vary directly in proportion to the output. In other words fixed overheads do not change within a given range of activity. However the unit cost changes even though the fixed overheads are constant in total within the given range of output. So, higher the level of activity, the lower will be the unit cost or vice versa. The management is, therefore, faced with a costing difficulty because it requires a representative rate for charging fixed overheads irrespective of changes in volume of output. For example, if the fixed overheads are Rs. 10,000 and the output varies from 8,000 to 11,000 units, the cost per unit of output would be as under :

<i>Fixed Overheads (Rs.)</i>	<i>Output in units</i>	<i>Cost per unit of output (Rs.)</i>
10,000	8,000	1.25
10,000	9,000	1.11
10,000	10,000	1.00
10,000	11,000	0.91

We have, however, seen that in standard costing, a predetermined rate of overhead recovery is established for costing purposes. This involves the establishment of a predetermine capacity. If we take, for example; 10,000 units as predetermine volume/capacity, the pre-determined rate will be Re.1 per unit. If the factory produces only 8,000 units, there will be a loss due to under-recovery which can be explained in two-ways:

(a) The actual cost will be Rs. $10,000 \div 8,000$ units = Rs. 1.25 per unit whereas the absorbed cost is Re. 1 per hour. Since the cost is more by Re. 0.25 per unit, the total loss is 8,000 units \times Re. 0.25 or Rs. 2,000.



Standard Costing

(b) Since the factory has produced only 8,000 units, the amount of overheads recovered is 8,000 units × Re.1 or Rs. 8,000. Since fixed overheads are constant, the amount which should have been ideally incurred for the department is Rs.10,000. Hence there is a difference of Rs 2,000 between the overheads recovered and the overheads estimated. This variance is known as production volume variance. This shows the cost of failure on the part of the factory to produce at the planned activity of 10,000 units. If the company produces 11,000 units, the variance will show the benefits of operating at a level above the budgeted activity. If, however, the factory has produced 10,000 units, there will be no production volume variance because the actual activity equals what was budgeted i.e. the production of 10,000 units.

(2) Overhead expenses variance :As discussed above, the Production Volume Variance analyses the unrecovered fixed overheads. Apart from this, there can be variations in the actual spending of both fixed and variable overheads when compared to what was established as a standard. Such variations can be accounted for by analyzing a **Overhead expenses variance**.

The following illustration shows how overhead expense rates are computed and variance analysed.

Illustration

The overhead expense budget for a factory producing to a capacity of 200 units per month is as follows:

Description of overhead	Fixed cost per unit in Rs.	Variable cost per unit in Rs.	Total cost per unit in Rs.
Power and fuel	1,000	500	1,500
Repair and maintenance	500	250	750
Printing and stationary	500	250	750
Other overheads	1,000	500	1,500
	Rs. 3,000	Rs. 1,500	4,500

The factory has actually produced only 100 units in a particular month. Details of overheads actually incurred have been provided by the accounts department and are as follows:

Description of overhead	Actual cost
Power and fuel	Rs. 4,00,000
Repair and maintenance	Rs. 2,00,000
Printing and stationary	Rs. 1,75,000
Other overheads	Rs. 3,75,000



Cost Accounting

You are required to compute the production volume variance and the overhead expenses variance.

Solution

Production volume variance

Standard fixed overheads per unit	:	Rs 3,000 (Given)
Actual production	:	100 units
Standard production (capacity)	:	200 units
Unabsorbed units	:	100 units (200 – 100)
Production volume variance	:	Rs 3,000 × 100 units = Rs 3,00,000 (Adverse)

Overhead expenses variance

Standard fixed overheads for actual production	:	Rs 6,00,000
Standard variable overheads for actual production	:	Rs 1,500 × 100 units = Rs 1,50,000
Std total overheads for actual production	:	Rs 7,50,000
Actual overheads	:	Rs 11,50,000
Overhead expense variance	:	Rs 4,00,000 (Adverse)

Sales variances : Variances which arise due to a change in the actual selling price and the actual quantity of units sold from that what was budgeted are known as sales variances.

These variances are computed on the basis of sales value. They provide the sales manager an idea of the effect of various factors affecting sales such as prices, quantity and sales mix on the overall sales value.

The sales value variances are more or less similar to material cost variances or labour cost variances.

Sales value variance: It is the difference between the budgeted sales and actual sales. The variance can be bifurcated into sales price variance and sales volume variance.

- Sales price variance* : Actual quantity of Sales (Actual price – Budgeted price) or Actual sales minus actual quantity at budgeted prices.
- Sales volume variances:* Budgeted price (Actual quantity – Budgeted quantity) or Actual quantity at budgeted price minus budgeted sales.



Standard Costing

Computation of variances: Let us now proceed to study with illustrations the method of computation of major variances described earlier. In all the problems illustrated in the following pages, 'F' means favourable variance and 'A' means adverse variance.

Direct material variances:

Illustration

The standard and actual figures of product 'Z' are as under:

	<i>Standard</i>	<i>Actual</i>
Material quantity	50 units	45 units
Material price per unit	Re. 1.00	Re. 0.80

Calculate material cost variances.

Solution

The variances may be calculated as under:

- (a) Standard cost = Std. qty × Std. price = 50 units × Re.1.00 = Rs.50
(b) Actual cost = Actual qty. × Actual price = 45 units × Re. 0.80 = Rs. 36

Variances:

- (i) Price variance = Actual qty (Std. price – Actual price)
= 45 units (Re. 1.00 – Re. 0.80) = Rs.9 (F)
(ii) Usage variance = Std. price (Std. qty – Actual qty.)
= Re.1 (50 units – 45 units) = Rs.5 (F)
(iii) Material cost variance = Standard cost – Actual cost
(Total variance) = Rs. 50 – Rs.36 = Rs. 14 (F)

Direct labour variances:

Illustration

The standard and actual figures of a firm are as under

Standard time for the job	1,000 hours
Standard rate per hour	Re. 0.50
Actual time taken	900 hours
Actual wages paid	Rs. 360

Compute the variances

Solution

- (a) Std. labour cost Rs.
(1,000 hours × Re. 0.50) 500



Cost Accounting

- (b) Actual wages paid 360
(c) Actual rate per hour: Rs. 360/900 hours = Re. 0.40

Variances

- (i) Rate variance = Actual time (Std. rate – Actual rate)
= 900 hours (Re.0.50 – Re.0.40) = Rs. 90 (F)
- (ii) Efficiency variance = Std. rate per hr. (Std. time – Actual time)
= Re. 0.50 (1,000 hrs. – 900 hrs.) = Rs. 50 (F)
- (iii) Total labour cost variance = Std. labour cost – Actual labour cost
= Rs.140(F)

Overhead variances:

Illustration

XYZ Company has established the following standards for factory overheads.

Variable overhead per unit:	Rs. 10/-
Fixed overheads per month	Rs. 1,00,000

Capacity of the plant 20,000 units per month.

The actual data for the month are as follows:

Actual overheads incurred	Rs. 3,00,000
Actual output (units)	15,000 units

Required:

Calculate overhead variances viz :

- (i) Production volume variance
(ii) Overhead expense variance

Solution

Unutilised capacity	:	20,000 units less 15,000 units
		= 5,000 units
Std fixed overheads per unit	=	Rs. 5 per unit
Production volume variance	=	5,000 units × Rs. 5
	=	Rs. 25,000 (Adverse)
Std variable overheads for actual production	:	Rs. 10 × 15,000 units
	=	Rs. 1,50,000
Std fixed overheads	=	Rs. 1,00,000
Total overheads on standards for actual production	=	Rs. 2,50,000



Standard Costing

Actual overheads incurred = Rs. 3,00,000
 Overhead expense variance = Rs. 50,000 (Adverse)

Sale variances

Illustration

Compute the sales variances from the following figures: -

Product	Budgeted	Quantity	Actual	Actual
	Quantity	Budgeted Price	Quantity	Price
		Rs.	Rs.	Rs.
A	2,000	2.50	2,400	3.00
B	1,500	5.00	1,400	4.50
C	1,000	7.50	1,200	7.00
D	500	10.00	400	10.50

Solution

Basic calculation:

Product price	Budgeted price	Actual Price	Budgeted quantity sales	Actual Quantity Sales	Budgeted sales	Actual Sales at Budgeted Price	Actual Sales
	a	b	c	d	e = a × c	f = (a × d)	g = (b × d)
	Rs.	Rs.			Rs.	Rs.	Rs.
A	2.50	3.00	2,000	2,400	5,000	6,000	7,200
B	5.00	4.50	1,500	1,400	7,500	7,000	6,300
C	7.50	7.00	1,000	1,200	7,500	9,000	8,400
D	10.00	10.50	500	400	5,000	4,000	4,200
			5,000	5,400	25,000	26,000	26,100

Computation of Variances

Sales price variance = Actual quantity (Actual price – Budgeted price)
 = Actual sales – Standard sales
 = Rs. 26,100 – Rs. 26,000 = Rs. 100(F)

Sales volume variance = Budgeted price (Actual quantity – Budgeted quantity)
 = Std. sales – Budgeted sales
 = Rs. 26,000 – Rs. 25,000 = Rs. 1,000 (F)

Total variance = Actual sales – Budgeted sales
 = Rs. 26,100 – Rs. 25,000 = Rs. 1,100 (F)



8.8 PREPARATION OF OPERATING STATEMENT UNDER STANDARD COSTING – REPORTING OF VARIANCES

Computation of variances and their reporting is not the final step towards the control of various elements of cost. It demands an analysis of variances from the side of the executives, to ascertain the correct reasons for their occurrence. After knowing the exact reasons, it becomes their responsibility to take necessary steps so as to stop the reoccurrence of adverse variances in future. To enhance the utility of such a reporting system it is necessary that such a system of reporting should not only be prompt but should also facilitate the concerned managerial level to take necessary steps. Variance reports should be prepared after keeping in view its ultimate use and its periodicity. Such reports should highlight the essential cost deviations and possibilities for their improvements. In fact the variance reports should give due regard to the following points:-

- (i) The concerned executives should be informed about what the cost performance should have been.
- (ii) How close the actual cost performance is with reference to standard cost performance.
- (iii) The analysis and causes of variances.
- (iv) Reporting should be based on the principle of management by exception.
- (v) The magnitude of variances should also be stated.

Standard cost reports: Standard cost reports showing the details of the variances are prepared for control purposes. Two such reports are illustrated below:

- (a) **Standard Costing Profit & Loss statement:** A standard costing profit and loss statement will show the variance of each type under each element of cost department wise and is illustrated as below:

Standard Costing Profit and Loss Report Month _____ 20_____				
Particulars	Total	Dept. A	Dept. B	Dept. C
A.	Sales value			
B.	Less: Standard cost of sales			
C.	Standard profit			
D.	Add / Deduct variances			
	Materials :			
	Price			
	Usage			
	Labour : Rate of pay			
	Efficiency			



Overhead : Expense
Production volume
Total

E. Actual profit

The adverse variance may be shown in red or in parenthesis.

The following case study shall help you understand the mechanics of a standard costing system.

8.9 STANDARD COSTING AT GLOBAL COMMUNICATION LTD.

8.9.1 About Global Communications : Global Communication Ltd. (GCL), manufacturers of Telephone Exchanges, had been incorporated in the early 90s and has since grown rapidly. Today it is considered as one of the largest Telecom Company in the country. Till only a few months back, being the only manufacturer of such products, GCL was enjoying monopoly and huge Gross Profit Margins to its credit. Costing was hence not thought to be important, except to facilitate statutory Financial Audits. However, the Telecom revolution changed the scenario in no time, with more business houses venturing into Exchange production. Sensing competition, the management had been quick to hire the services of Mr. Ravi Shankar in order to help implement a relevant Costing System for its plant located at Kanpur. The system was to be such, so as to fulfil the requirements of Material and Expenses Control, facilitate Statutory Audit, help in Pricing Decisions and provide for the day-to-day requirements of Excise, etc. Since the variable cost component within the production process was quite high a Standard Costing System was thought off to be most appropriate.

The Manufacturing Process

GCL manufactures two types of Exchanges, viz.

1. Exch 007
2. Exch 009

Both the Exchanges are produced on separate Production Lines; however, the process of manufacture is strikingly similar. Raw Material Cost comprises about 75% of the total Product Cost and is the only identifiable Variable Cost.

Production is carried out by two departments – Assembly and Testing. Raw material is issued in lots for 100 units of Finished Goods to the Assembly department. Various electronic components are inserted into the Printed Circuit Boards (PCBs) over here. About 40% of the insertions done by the Assembly department are automated, the rest



Cost Accounting

being done by hand. The inserted components are then soldered manually. PCBs are plate shaped metallic sheets having tracks over the surface. These tracks facilitate the electronic connectivity between various components inserted at different parts of the sheets. Thirty-six such populated PCBs are finally assembled in a Rack, which is transferred to the Testing department for quality check and approval. If found OK, the production is said to be complete. In case there is any wastage on the floor (either in Testing or Assembly departments), the material is replaced by the stores on receipt of a replacement slip duly signed by the Assembly or Testing department's supervisor. The defective component so replaced is handed back to the stores. However there are no records maintained for such scrap generated, as it does not carry any significant economic value.

The mechanics of the system as explained by Ravi : In due course, the system was designed and presented in a meeting attended by almost all senior personnel's of the Factory. Ravi used an OHP to present a few slides, which have been shown as Exhibits below. The mechanics of the system was described by Ravi as follows:

"A spread sheet for the *components of cost* for each of the 1800 Raw Materials shall be drawn as shown in **Exhibit 1**. A *standard amount* for each of these components of cost for every single raw material shall have to be established in the beginning of the financial year. The sum total of all these *estimated cost components* shall give 'Standard Cost of each individual Raw Material' and would serve as an input for the estimated Raw Material cost (also known as BOM cost i.e., 'Bill of Material cost') in the Standard Cost Sheet. There shall be two cost sheets pertaining to the two exchanges being manufactured in the factory. The cost sheets shall be drawn on the capacity available to the company and not the budgeted production since the Company has frequently produced to capacity, especially when nearing the close of the three previous financial years.

Hence, projections of overheads shall be done as if GCL would be attaining 100% capacity utilization. The Bill of Material shall be extended to incorporate other columns as shown in Exhibit 2. This extended version of the BOM shall be known as **Direct Material Control Statement (DMCS)** and shall be used to calculate net usage and net price variances. Two such statements would be prepared, one each for the two Exchanges. The usage and price variances shall be calculated by using the rejection slips generated in the production department/lines for identifying actual consumption (in quantity) of raw material during a particular month. Since the Rejection Slips shall bear the production lot nos., the quantity of raw material identified in them shall need to be added to the quantity estimated to be consumed for that particular production lot no. actual price of each of the raw



Standard Costing

material consumed shall be provided by the accounts department and shall be inserted manually in column No.7 of the DMCS. Standard overheads on actual production for each of the two exchanges shall be arrived at with the help of the projected figures of the respective **Cost Sheets (Exhibit 3)**. Such standard overheads on actual production shall be compared with the factory trial balance in order to arrive at the overhead expense variance. Standard fixed cost per unit as projected by the two cost sheets shall be utilized to calculate the production volume variance. The sales price variance shall reflect the difference between the actual and the standard selling price on actual sales. Finally, adding all these five variances to the standard profit (The difference between the estimated standard selling price and the estimated cost per unit of each of the two exchanges) shall help arrive at the actual profit. This profit shall then be reconciled with the financial accounting profit as shown by the accounts department. The reporting pattern shall be as shown below.

Period of reporting	Type of report
Daily	Production volume variance and daily standard profit based on daily production.
Monthly	<ul style="list-style-type: none">• Statement of profit and loss based on standard profit adjusted with the above mentioned five variances.• Reconciliation of the costing profit with the financial accounting profit.• Direct material control statement incorporating usage and material price variances.



Cost Accounting

COMPONENTS OF COST



Exhibit 1

RM	FOB/ Basic	Insurance	Freight	CIF	Custom Duties	Inland components of cost e.g. local freight, insurance, etc.	Purchase Cost (7% of landed cost)	Total Standard Cost
RM1								
To								
RM1800								

Exhibit 2

DIRECT RAW MATERIAL CONTROL STATEMENT

Std Cost of RM / Ut of Fin Good (1) * (2)	RM	Std Qty of RM /ut of FG (1)	Std Cost/ut of RM 1- 1800 (2)	Std Qty of RM 1 - 1800 on Actual Prdn (Act Prd * (1)	Actual Qty of RM on Actual Prdn	Actual Price of RM	Usage Varian ce	Price Variance
	RM1							
	-							
	RM1800							
Total Std Cost								

Exhibit 3

COST SHEET ON MAXIMUM CAPACITY

Description	Total Cost	Total Fixed Cost	Total Variable Cost	Fixed Cost/Unit	Variable Cost/Unit	Total Cost/Unit
BOM Cost Salary Other Expenses						
Total Factory Cost						



The Proposed System: A Critical Appraisal

The presentation being over, the dais was thrown open to suggestions. The system was appreciated by one and all; however the following suggestions were made by the various functional managers.

- ◆ Purchase cost to be loaded over, as a percentage of the raw material cost shall not help arrive at the exact incidence of cost. According to the production manager, “in case I buy a Re. 1/- resistor and a Rs. 5000/- IC from the same vendor at the same time, will it not be wrong to consider different production overhead burden on the two concerned components?”
- ◆ The mechanics of calculating the actual quantity of raw material consumed may not give accurate results. Opined the finance manager “in case I use the rejection slips to understand the extra material consumed, I shall not be sure of the exact figures. This shall necessitate the need of scrap accounting, which at present does not exist”.
- ◆ The purchase manager was sceptical about the mechanics of calculating the raw material purchase price variance. “In case the usage variance is abnormal, a small adverse variance in the purchase price shall be blown out of proportion”.
- ◆ The accounts manager highlighted the need of an integrated accounting system rather than the proposed use of the accounting trial balance as it existed on date, “without production accounting the control of material is difficult. Year after year we are having problems reconciling purchases with the stock. Since it is difficult to physically identify the WIP every month end, the only alternative left is an integrated accounting system with an efficient cycle count (perpetual inventory check)”

Questions

1. The raw material price variance is calculated on the actual quantity of raw material consumed? Suggest a modification to satisfy the concerns raised by the purchase manager.
2. How could an integrated accounting system be of help?

8.10 ACCOUNTING PROCEDURE FOR STANDARD COST

The standard cost operations can be recorded in the books of account. Two important accounting procedures for standard costs are:-

- (i) **Single Plan** : The main purpose of standard costing is cost control. To achieve this purpose, the variances should be analysed according to their causes. Analysis should be timely so that much time is not lost in taking corrective action wherever needed. In the partial



Cost Accounting

plan, variances are analysed at the end of period. The single plan system envisages the posting of all items in the debit side of the work-in-progress account at the standard cost leaving the credit side to represent the standard cost of finished production and work-in-progress. This system enables the ascertainment of variances as and when the transaction is posted to work-in-progress account. In other words, the analysis of variances is done from the original documents like invoices, labour sheets, etc., and this method of analysis is known as analysis at source. Since, the single plan system contemplates the analysis of variances at source, the installation of this system requires more planning so that effective documentation at each stage is introduced for proper recording and analysis of variance. Thus for example, the issue of bill of materials to the stores enables the storekeeper to calculate the standard value of materials. If any material is requisitioned beyond the standard, he can mark the same for material usage variance account. In the production department, as and when the finished output is recorded, the standard waste and actual waste can be compared and necessary entries can be made by the shop supervisors for posting the excessive usage to appropriate variance accounts.

Scheme of entries: So far as materials are concerned, material price variances are recorded at the time of receipt of the material and the material quantity variances are recorded as far as possible when excess materials are used. The entries will be as illustrated below:

1. Dr. Material Control A/c
 Dr. or Cr. Material Price Variance A/c
 Cr. Creditors A/c.

This entry enables the firm to debit the material control account with the actual purchases at standard cost and credit the creditor's account at the actual cost of actual prices thereby transferring the variances to price variance account.

2. Dr. Work-in-progress Control A/c
 Dr. or Cr. Material Usage Variances A/c
 Cr. Material Control A/c

This entry charges the work-in-progress control account with the standard cost of standard quantity and credit the material control account at the standard cost of actual issue, the variance being transferred to usage variance account.

3. Dr. Wages Control A/c
 Dr./Cr. Labour Rate Variances A/c
 Cr. Cash A/c



This entry is passed to record the wages at standard rate thereby transferring rate variances to the appropriate account.

4. Dr. Work-in-progress Control A/c
 Dr. or Cr. Overhead Expense Variances A/c
 Cr. Overhead Expense Control A/c.

(ii) Partial plan: This system uses current standards in which the inventory will be valued at current standard cost figure. Under this method the work-in-progress account is charged at the actual cost of production for the month and is credited with the standard cost of the month's production of finished product. The closing balance of work-in-progress is also shown at standard cost. The balance after making the credit entries represent the variance from standard for the month. The analysis of the variance is done after the end of the month. This method is simple in operation because variances are analysed after the end of month but may present difficulties if the firm makes a variety of products.

Recapitulation :

- (1) Current standards are used in both the systems.
- (2) Under the partial plan, material stocks are carried at actual cost whereas the same are carried out at standard cost under the single plan.
- (3) The work-in-progress and finished goods are valued at standard cost under both the methods.
- (4) *Computation of variances :*
 - (a) In partial plan, material price variance is computed on material used in finished goods and work-in-progress whereas in single plan it is computed on the material quantity purchased.
 - (b) The partial plan is suitable where simple analysis of variance is sufficient at the end of the period whereas the single plan is preferred if frequent detailed analysis of variance is desired, as (a) the comparison of actual with standard cost of each operation or operator or (b) the daily reporting of standard cost of excess material used.

8.11 DISPOSITION OF VARIANCES

There is no unanimity of opinion in regard to disposition of variances. The following are the various methods:—

- (a) Write off all variances to profit and loss account or cost of sales every month.



- (b) Distribute the variance prorata to cost of sales, work-in-progress and finished good stocks.
- (c) Write off quantity variance to profit and loss account but the price variances may be spread over cost of sales, work-in-progress and finished goods stocks. The reason behind apportioning price variances to inventories and cost of sales is that they represent cost although they are described as variance.

8.12 ADVANTAGES AND CRITICISM OF STANDARD COSTING

8.12.1 Advantages of Standard Costing: following are the advantages of standard costing.

- (i) It serves as a basis for measuring operating performance and cost control. By setting standards, proper classification and determination of variances, is possible. This serves as a signal for prompt corrective action. This system provides for reporting on the principle of exception. The basis of this principle is that only matters which are not proceeding according to plan are reported upon. This enables the managers to concentrate upon essential matters and leave the non-essentials to take care of themselves. By using special forms, any excessive time taken, extra material used or additional services consumed can be brought to light as part of the ordinary routine. In other words, if the variances are negligible, it means that the performance is more or less in accordance with the standards. Significant variances which warrant the attention of the manager are brought to his knowledge.
- (ii) It aids price fixing. Standard costing can be used to predict costs. Although actual cost may vary from day to day, standard costs will remain stable over a period of time and, where demand for a product is elastic, this information can be used as a basis for fixing the selling price.
- (iii) Introduction of standard costing facilitates evaluation of jobs and introduction of incentives. Job values can be determined by the use of evaluation and scale of wages fixed according to the responsibility involved in each job.
- (iv) Standard costing facilitates the estimation of the cost of new products with greater accuracy.
- (v) It serves as a basis for inventory valuation. Standard costs are used for inventory valuation because actual costs are not typical and less clerical work is involved in carrying standard value into inventory records than actual value. A further advantage of this procedure is that material stock can be recorded in terms of quantities only.
- (vi) Standard costing is also used for the measurement of profits. The question of correct approach of calculating profit is very much related to stock valuation and to the methods of



dealing with the absorption of fixed overheads. Standard costing will eliminate any variations in profit due to changes in the values of stock holding from period to period and will thus provide a true basis for the measurement of profit.

(vii) Standard costing greatly aids business planning, budgeting and managerial decision making. Standard costs being pre-determined costs, are particularly useful in planning and budgeting.

(viii) Standard costing aids in standardisation of products, operations and processes. Since standards are laid down for each product, its components, materials, operations, processes etc., it improves the overall production efficiency and reduces costs.

(ix) It provides objectives and targets to be achieved by each level of management and defines the responsibilities of departmental managers. Standard costs are pre-determined on the basis of reasonable and achievable level of output. The departmental head, therefore, comes to know what is expected of him and his level of performance in comparison to the targets can be seen from the variance reports. Thus the system serves as an incentive to the departmental head to achieve the targets set by the company.

(x) Standard costing sets a uniform basis for comparison of all elements of costs. Since care is taken in setting standards, the standards become unchanging units of comparison. The standard hour may be used as a basic unit to compare dissimilar products or processes.

(xi) The maximum use of working capital, plant facilities and current assets is assured because wastage of materials and loss due to idle time are closely controlled.

8.12.2 Criticism of Standard Costing: The following are some of the criticism which may be levelled against the standard costing system. The arguments have been suitably answered as stated against each by advocates of the standard costing and hence they do not invalidate the usefulness of the system to business enterprises.

(i) *Variation in price:* One of the chief problem faced in the operation of the standard costing system is the precise estimation of likely prices or rate to be paid. The variability of prices is so great that even actual prices are not necessarily adequately representative of cost. But the use of sophisticated forecasting techniques should be able to cover the price fluctuation to some extent. Besides this, the system provides for isolating uncontrollable variances arising from variations to be dealt with separately.

(ii) *Varying levels of output:* If the standard level of output set for pre-determination of standard costs is not achieved, the standard costs are said to be not realised. However, the statement that the capacity utilisation cannot be precisely estimated for absorption of



Cost Accounting

overheads may be true only in some industries of jobbing type. In vast majority of industries, use of forecasting techniques, market research, etc., help to estimate the output with reasonable accuracy and thus the variation is unlikely to be very large. Prime cost will not be affected by such variation and, moreover, variance analysis helps to measure the effects of idle time.

(iii) *Changing standard of technology*: In case of industries that have frequent technological changes affecting the conditions of production, standard costing may not be suitable. This criticism does not affect the system of standard costing. Cost reduction and cost control is a cardinal feature of standard costing because standards once set do not always remain stable. They have to be revised.

(iv) *Attitude of technical people*: Technical people are accustomed to think of standards as physical standards and, therefore, they will be misled by standard costs. Since technical people can be educated to adopt themselves to the system through orientation courses, it is not an insurmountable difficulty.

(v) *Mix of products*: Standard costing presupposes a pre-determined combination of products both in variety and quantity. The mixture of materials used to manufacture the products may vary in the long run but since standard costs are set normally for a short period, such changes can be taken care of by revision of standards.

(vi) Standards may be either too strict or too liberal because they may be based on (a) theoretical maximum efficiency, (b) attainable good performance or (c) average past performance. To overcome this difficulty the management should give thought to the selection of a suitable type of standard. The type of standard most effective in the control of costs is one which represents an attainable level of good performance.

(vii) Standard costs cannot possibly reflect the true value in exchange. If previous historical costs are amended roughly to arrive at estimates for ad hoc purposes, they are not standard costs in the strict sense of the term and hence they cannot also reflect true value in exchange. In arriving at standard costs, however, the economic and technical factors, internal and external, are brought together and analysed to arrive at quantities and prices which reflect optimum operations. The resulting costs, therefore, become realistic measures of the sacrifices involved.



8.13 Miscellaneous Illustrations

Illustration 1

NXE Manufacturing Concern furnishes the following information:

Standard:	Material for 70 kg finished products	100 kg.
	Price of material	Re. 1 per kg.
Actual:	Output	2,10,000 kg.
	Material used	2,80,000 kg.
	Cost of Materials	Rs. 2,52,000

Calculate: (a) Material usage variance, (b) Material price variance, (c) Material cost variance.

Solution:

$$\text{Standard Quantity for actual output (SQ)} = 2,10,000 \text{ kg} \times \frac{100 \text{ kg}}{70 \text{ kg}} = 3,00,000 \text{ kg.}$$

$$\text{Actual Price (AP)} = (\text{Rs. } 2,52,000 \div 2,80,000 \text{ kg}) = \text{Re. } 0.90 \text{ per kg.}$$

$$\begin{aligned} \text{(a) Material Usage Variance} &= (\text{SQ} - \text{AQ}) \times \text{SP} \\ &= (3,00,000 - 2,80,000) \times 1 \\ &= \text{Rs. } 20,000 \text{ (F)} \end{aligned}$$

$$\begin{aligned} \text{(b) Material Price Variance} &= (\text{SP} - \text{AP}) \times \text{AQ} \\ &= (1 - 0.90) \times 2,80,000 \\ &= \text{Rs. } 28,000 \text{ (F)} \end{aligned}$$

$$\begin{aligned} \text{(c) Material Cost Variance} &= (\text{SQ} \times \text{SP}) - (\text{AQ} \times \text{AP}) \\ &= (3,00,000 \times 1) - (2,80,000 \times 0.90) \\ &= \text{Rs. } 48,000 \text{ (F)} \end{aligned}$$

$$\begin{aligned} \text{Check} \quad \text{MCV} &= \text{MPV} + \text{MUV} \\ \text{Rs. } 48,000 \text{ (F)} &= \text{Rs. } 28,000 \text{ (F)} + \text{Rs. } 20,000 \text{ (F)} \end{aligned}$$



Cost Accounting

Illustration 2

For making 10 kg. of CEMCO, the standard material requirements is:

Material	Quantity	Rate per kg. (Rs.)
A	8	6.00
B	4	4.00

During April, 1,000 kg of CEMCO were produced. The actual consumption of materials is as under:

Material	Quantity (Kg.)	Rate per kg. (Rs.)
A	750	7.00
B	500	5.00

Calculate (A) Material Cost Variance; (b) Material Price Variance; (c) Material usage Variance.

Solution:

Basic Calculations

	Standard for 1000 kg.			Actual for 1000 kg.		
	Qty.	Rate	Amount	Qty.	Rate	Amount
	Kg.	Rs.	Rs.	Kg.	Rs.	Rs.
A	800	6	4,800	750	7	5,250
B	400	4	1,600	500	5	2,500
Total	1,200		6,400	1,250		7,750

Calculation of Variances:

(a) Material Cost Variance	= SC for actual output – AC	
MCV	= 6,400 – 7,750	
	= Rs.1,350 (A)	
(b) Material Price Variance	= (SP – AP) × AQ	
A	= (6 – 7) × 750	= Rs. 750 (A)
B	= (4 – 5) × 500	= <u>Rs. 500 (A)</u>
MPV		= <u>Rs.1,250 (A)</u>



Standard Costing

(c) Material Usages Variance	= (SQ – AQ) × SP	
A	= (800 – 750) × 6	= Rs. 300 (F)
B	= (400 – 500) × 4	= <u>Rs. 400 (A)</u>
MUV		= <u>Rs.100 (A)</u>

Check

MCV	= MPV + MUV
1,350 (A)	= 1,250 (A) + 100 (A)

Illustration 3

The standard cost of a chemical mixture is as follows:

40% material A at Rs.20 per kg.

60% material B at Rs.30 per kg.

A standard loss of 10% of input is expected in production. The cost records for a period showed the following usage :

90 kg material A at a cost of Rs.18 per kg.

110 kg material B at a cost of Rs.34 per kg.

The quantity produced was 182 kg. of good product.

Calculate all material variances.

Solution:

Basic Calculation

Material	Standard for 180 kg. output			Actual for 182 kg. output		
	Qty. Kg.	Rate Rs.	Amount Rs.	Qty Kg.	Rate Rs.	Amount Rs.
A	80	20	1,600	90	18	1,620
B	<u>120</u>	30	<u>3,600</u>	<u>110</u>	34	<u>3,740</u>
Total	200		5,200	200		5,360
Less: Loss	20	–	–	18	–	–
	180		5,200	182		5,360

$$\text{Std. cost of actual output} = \text{Rs.} 5,200 \times \frac{182}{180} = \text{Rs.} 5,257.78$$

Calculation of Variances



Cost Accounting

1. Material Cost Variance = (SC of actual output – AC)
 = (5,227.78 – 5,360) = Rs.102.22 (A)
2. Material Price Variance = (SP – AP) × AQ
 Material A = (20 – 18) × 90 = Rs.180.00 (F)
 Material B = (30 – 34) × 110 = Rs.440.00 (A)
 MPV = Rs.260.00 (A)
3. Material Usage Variance = (SQ for actual output – AQ) × SP
 Material A = $\left(80 \times \frac{182}{180} - 90\right) \times 20$ = Rs.182.22 (A)
 Material B = $\left(120 \times \frac{182}{180} - 110\right) \times 30$ = Rs.340.00 (F)
 MUV = Rs.157.78 (F)

Check

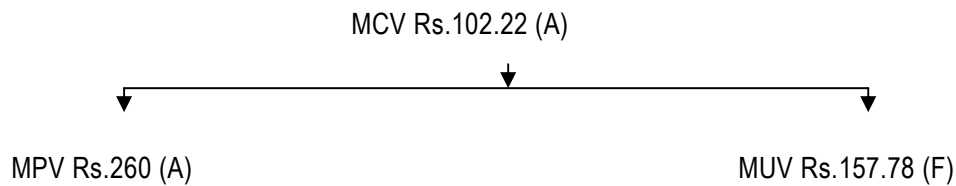


Illustration 4

J.K. Ltd. manufactures NXE by mixing three raw materials. For every batch of 100 kgs. of NXE, 125 kgs. of raw materials are used. In April, 2008, 60 batches were prepared to produce an output of 5,600 kgs. of NXE. The standard and actual particulars for April, 2008, are as follows :

Raw Materials	Standard		Actual		Quantity of Raw Materials Purchased Kg.
	Mix %	Price per kg. Rs.	Mix %	Price per Kg. Rs.	
A	50	20	60	21	5,000
B	30	10	20	8	2,000
C	20	5	20	6	1,200

Calculate all variances.



Standard Costing

Solution:

Actual material used = 125 kg × 60 = 7,500 kg.

Actual cost of actual material used (AQ × AR)			(Rs.)
A	60%	4,500 kg × Rs.21 =	94,500
B	20%	1,500 kg × Rs. 8 =	12,000
C	20%	<u>1,500</u> kg × Rs. 6 =	<u>9,000</u>
		<u>7,500</u>	<u>1,15,500</u>

Standard cost of actual material used (AQ × SR)			(Rs.)
A		4,500 kg × Rs.20 =	90,000
B		1,500 kg × Rs.10 =	15,000
C		<u>1,500</u> kg × Rs. 5 =	<u>7,500</u>
		<u>7,500</u>	<u>1,12,500</u>

Standard cost of material, if it had been used in standard proportion (Standard Proportion × Standard Rate)			(Rs.)
A	50%	3,750 kg × Rs.20 =	75,000
B	30%	2,250 kg × Rs.10 =	22,500
C	20%	<u>1,500</u> kg × Rs. 5 =	<u>7,500</u>
		<u>7,500</u>	<u>1,05,000</u>

Standard cost of production (SQ for actual production × SR)

Standard cost of output for 100 kg:			(Rs.)
A		62.50 kg × Rs.20 =	1,250
B		37.50 kg × Rs.10 =	375
C		<u>25.00</u> kg × Rs. 5 =	<u>125</u>
		<u>125.00</u>	<u>1,750</u>

Standard cost for output of 5,600 kg.

$$= \frac{1,750}{100} \text{ kg} \times 5,600 \text{ kg} = \text{Rs. } 98,000$$



Cost Accounting

Material Price Variance = Actual cost of actual material used – Standard cost of actual material used = Rs.1,15,500 – Rs.1,12,500 = Rs. 3,000 (A)

Material Usage Variance = Standard cost of actual material used – Standard cost of production = Rs.1,12,500 – Rs. 98,000 = Rs.14,500 (A)

Note:

Material Price Variance can be calculated at the time of purchase as well. In that case, material variance will be as follows:

Actual cost of material used

A	5,000 kg × Rs.21	= Rs.	1,05,000
B	2,000 kg × Rs. 8	= Rs.	16,000
C	1,200 kg × Rs. 6	= Rs.	<u>7,200</u>
			<u>1,28,200</u>

Standard cost of material used

A	5,000 kg × Rs.20	= Rs.	1,00,000
B	2,000 kg × Rs.10	= Rs.	20,000
C	1,200 kg × Rs. 5	= Rs.	<u>6,000</u>
			<u>1,26,000</u>

Material Price variance (if calculated at the time of purchase)

= Actual cost of actual material used – Standard cost of actual material used

= Rs.1,28,200 – Rs.1,26,000 = Rs. 2,200 (A)

Illustration 5

The following standards have been set to manufacture a product:

Direct Material:	Rs.
2 units of A @ Rs.4 per unit	8.00
3 units of B @ Rs.3 per unit	9.00
15 units of C @ Rs.1 per unit	<u>15.00</u>
	32.00
Direct Labour: 3 hrs @ Rs.8 per hour	<u>24.00</u>
Total standard prime cost	<u>56.00</u>



Standard Costing

The company manufactured and sold 6,000 units of the product during the year. Direct material costs were as follows:

12,500 units of A at Rs.4.40 per unit

18,000 units of B at Rs.2.80 per unit

88,500 units of C at Rs.1.20 per unit

The company worked 17,500 direct labour hours during the year. For 2,500 of these hours, the company paid at Rs.12 per hour while for the remaining, the wages were paid at standard rate. Calculate materials price variance and usage variance and labour rate and efficiency variances.

Solution:

For Material Cost Variances

Actual cost of material used (AQ × AR)

A	12,500 units × Rs.4.40 =	Rs. 55,000
B	18,000 units × Rs.2.80 =	Rs. 50,400
C	88,500 units × Rs.1.20 =	Rs. <u>1,06,200</u>
		<u>2,11,600</u>

Standard cost of material used (AQ × SR)

A	12,500 units × Rs.4.00 =	Rs. 50,000
B	18,000 units × Rs.3.00 =	Rs. 54,000
C	88,500 units × Rs.1.00 =	Rs. <u>88,500</u>
		<u>1,92,500</u>

Standard material cost of production : (SQ for actual production × SR)

$$= 6,000 \text{ units} \times \text{Rs. } 32$$

$$= \text{Rs. } 1,92,000$$

Variances:

Material Price Variance = Actual cost of material used – Standard cost of material used

$$= \text{Rs. } 2,11,600 - \text{Rs. } 1,92,500$$

$$= \text{Rs. } 19,100$$



Cost Accounting

Material Usage Variance = Standard cost of material used – Standard material cost of production = Rs. 1,92,500 – Rs. 1,92,000
= Rs. 500 (A)

For Labour Cost Variance :

Actual wages paid to workers (AH × AR)

2,500 hrs × Rs.12 =	Rs. 30,000
15,000 hrs × Rs. 8 =	Rs. <u>1,20,000</u>
	<u>1,50,000</u>

Standard cost for actual hours (AH × SR)

17,500 hrs × Rs.8 = Rs.1, 40,000

Standard labour cost of output achieved (Actual output × SR of labour per unit)

= 6,000 units × Rs.24 = Rs.1, 44,000

Variances :

Labour Rate Variance : Actual wages paid to workers – Standard cost for actual hours
= Rs.1,50,000 – Rs.1,40,000
= Rs.10,000 (A)

Labour Efficiency Variance : Standard cost for actual hours – Standard labour cost of output achieved
= Rs.1,40,000 – Rs.1,44,000
= Rs.4,000 (F)

Illustration 6

The following information was obtained from the records of a manufacturing unit using standard costing system.

	<i>Standard</i>	<i>Actual</i>
Production	4,000 units	3,800 units
Working days	20	21
Fixed Overhead	Rs. 40,000	Rs. 39,000
Variable Overhead	12,000	12,000

You are required to calculate the following overhead variance:



- (a) Variable overhead variance
- (b) Fixed overhead variances
 - (i) Expenditure variances
 - (ii) Volume variance

Solution:

(a) For Variable Overhead Variance:

Actual variable overhead = Rs.12, 000

Standard variable overhead for production (Budgeted output × Std. variable overhead rate per unit) = $(12,000 \div 4,000) \times 3,800$

= Rs.11, 400

Variable overhead variance: Actual variable overhead – Standard variable overhead

= Rs.12, 000 – Rs.11, 400

= 600 (A)

(b) For Fixed Overhead Variance:

Actual fixed overhead incurred = Rs. 39, 000

Budgeted fixed overhead for the period = Rs. 40, 000

Standard fixed overhead for production (Standard output for actual time × Standard Fixed Overhead per unit)

= $(Rs.40, 000 \div 4,000 \text{ units}) \times 3,800 \text{ units}$

= Rs.38, 000.

Variances:

(i) Fixed Overhead Expenditure Variances:

Actual fixed overhead – Budgeted fixed overhead

= Rs.39, 000 – Rs.40, 000 = 1,000 (F)

(ii) Fixed Overhead Volume Variance : Budgeted fixed overhead – Standard fixed overhead

= Rs.40, 000 – Rs.38, 000 = Rs.2, 000 (A)

(iii) Fixed Overhead Variance : Actual fixed overhead – Standard fixed overhead

= Rs.39, 000 – Rs.38, 000 = Rs.1, 000 (A)



Illustration 7

A company has a normal capacity of 120 machines, working 8 hours per day of 25 days in a month. The fixed overheads are budgeted at Rs.1, 44,000 per month. The standard time required to manufacture one unit of product is 4 hours.

In April, 2008, the company worked 24 days of 840 machine hours per day and produced 5,305 units of output. The actual fixed overheads were Rs.1, 42,000.

Compute:

- (i) Expense variance
- (ii) Volume variance
- (iii) Total fixed overheads variance.

Solution:

Working Notes:

	<i>Budget</i>	<i>Actual</i>
1. Working hours per month	24,000	20,160
2. Production units per month = (Budget 24,000 ÷ 4 hrs, Actual given)	6,000	5,305
3. Standard fixed overhead rate per unit = Rs.1,44,000 ÷ 6,000 = Rs. 24		
4. Standard fixed overhead rate per hour = Rs.1,44,000 ÷ 24,000 = Rs.6		
5. Standard fixed overhead rate per day = Rs.1,44,000 ÷ 25 = Rs. 5,760		

Fixed Overhead Variances:

Actual Fixed overhead incurred = Rs.1, 42,000 (given)

Budgeted fixed overhead for the period or standard fixed overhead allowance = Rs.1, 44,000.

Standard fixed overhead for production (Standard output for actual time × Standard Fixed Overhead per unit)

= 5,305 × Rs.24 = Rs.1, 27,320.

Variances:

- (i) F.O. Expenditure Variance = (Actual Fixed overhead – Budgeted fixed overhead)
= 1, 42,000 – 1, 44,000 = Rs. 2, 000 (F)
- (ii) Total Volume Variance = (Budgeted fixed overhead - Standard fixed overhead)
= 1, 44,000 – 1, 27,320 = Rs.16, 680 (A)



Standard Costing

$$\begin{aligned} \text{(iii) Fixed overhead variance} &= (\text{Actual Fixed overhead} - \text{Standard fixed overhead}) \\ &= 1,42,000 - 1,27,320 \\ &= \text{Rs.14,680 (A)} \end{aligned}$$

Alternatively:

$$\text{Expenditure Variance} + \text{Volume Variance} = 2,000 \text{ (F)} + 16,680 \text{ (A)} = \text{Rs.14,680 (A)}$$

Illustration 8

S.V. Ltd. has furnished the following data:

	Budget	Actual, July (2008)
No. of working days	25	27
Production in units	20,000	22,000
Fixed overheads	Rs. 30,000	Rs. 31,000

Budgeted fixed overhead rate is Re.1.00 per hour. In July, 2008, the actual hours worked were 31,500.

Calculate the following variances:

- (i) Volume variance.
- (ii) Expenditure variance.
- (iii) Total overhead variance.

Solution: For Fixed Overhead Variances

Actual fixed overhead incurred	Rs. 31,000
Budgeted fixed overhead for the period or standard fixed overhead	30,000
Standard fixed overhead for production (Standard output for actual time × Standard Fixed Overhead per unit) (Rs. 30,000 ÷ 20,000 units) × 22,000	33,000

Computation of Variances:

- (i) *Fixed overhead expenditure variance:*
= Actual fixed overhead – Budgeted fixed overhead
= Rs.31,000 – Rs.30,000 or Rs. 1,000 (A)
- (ii) *Fixed overhead volume variance:*
= Budgeted fixed overhead – Standard fixed overhead



Cost Accounting

= Rs. 30,000 – Rs.33,000 or Rs. 3,000 (F)

(iii) *Fixed overhead variance* :

= Actual fixed overhead – Standard fixed overhead

= Rs. 31,000 – 33,000 or Rs. 2,000 (F)

Illustration 9

The following data has been collected from the cost records of a unit for computing the various fixed overhead variances for a period:

Number of budgeted working days	25
Budgeted man-hours per day	6,000
Output (budgeted) per man-hour (in units)	1
Fixed overhead cost as budgeted	Rs. 1,50,000
Actual number of working days	27
Actual man-hours per day	6,300
Actual output per man-hour (in-units)	0.9
Actual fixed overhead incurred	Rs. 1,56,000

Calculate fixed overhead variances:

- (a) Expenditure Variance
- (b) Volume Variance,
- (c) Fixed Cost Variance.

Solution:

For Fixed overhead Variances:

Actual fixed overhead incurred = Rs.1,56,000

Budgeted fixed overhead for the period = 1,50,000

Standard fixed overhead for production (Standard output for actual time × Standard Fixed Overhead per unit)

(6,300 hrs × 27 days × 0.9) × (Rs.1,50,000 ÷ Rs.1,50,000 units)

= Rs.1,53,090



Standard Costing

(a) Fixed Overhead Expenditure Variance	=	Actual fixed overhead – Budgeted fixed overhead	
	=	Rs. 1,56,000 – 1,50,000 =	Rs. 6,000 (A)
(b) Fixed Overhead Volume Variance	=	Budgeted fixed overhead – Standard fixed overhead	
	=	Rs. 1,50,000 – 1,53,090 =	Rs. 3,090 (F)
(c) Fixed Overhead Variance	=	Actual fixed overhead – Standard fixed overhead	
	=	Rs. 1,56,000 – 1,53,090 =	Rs. 2,910 (A)

Illustration 10

Following information is available from the records of a factory :

	<i>Budget</i>	<i>Actual</i>
Fixed overhead for June, 2008	Rs.10,000	Rs.12,000
Production in June, 2008 (units)	2,000	2,100
Standard time per unit (hours)	10	–
Actual hours worked in June	–	22,000

Compute:

- Fixed overhead cost variance,
- Expenditure variance,
- Volume variance.

Solution:

For fixed overhead variances:

Actual F.O. incurred (given)	Rs.12,000
Budgeted F.O. for the period	Rs.10,000
Standard F.O. for production (Standard output for actual time × Standard Fixed Overhead per unit)	
2,100 units × {Rs.10,000 ÷ 2,000 units}	Rs.10,500

- (i) Fixed Overhead Variance = Actual F.O. – Standard F.O.
= Rs.12,000 – 10,500
= Rs.1,500 (A)



Cost Accounting

- (ii) F.O. Expenditure Variance = Actual F.O. – Budgeted F.O.
= Rs.12,000 – Rs.10,000
= Rs.2,000 (A)
- (iii) F.O. Volume Variance = Budgeted F.O. – Standard F.O.
= Rs.10,000 – 10,500
= Rs.500 (F)

Illustration 11

XYZ Ltd. has furnished you the following information for the month of August, 2008:

	<i>Budget</i>	<i>Actual</i>
Output (units)	30,000	32,500
Hours	30,000	33,000
Fixed overhead	Rs. 45,000	50,000
Variable overhead	Rs. 60,000	68,000
Working days	25	26

Calculate overhead variances.

Solution:

Basic Calculations:

$$\text{Standard hours per unit} = \frac{\text{Budgeted hours}}{\text{Budgeted units}} = \frac{30,000}{30,000} = 1 \text{ hour}$$

$$\text{Std. hrs. for actual output} = 32,500 \text{ units} \times 1 \text{ hr} = 32,500$$

$$\text{Standard overhead rate per hour} = \frac{\text{Budgeted overhead}}{\text{Budgeted hours}}$$

$$\text{For fixed overhead} = \frac{45,000}{30,000} = \text{Rs.1.50 per hour}$$

$$\text{For variable overhead} = \frac{60,000}{30,000} = \text{Rs.2 per hour}$$

$$\text{Std. F.O. rate per day} = \text{Rs.45,000} \div 25 \text{ days} = \text{Rs.1,800}$$

$$\text{Recovered overhead} = \text{Std. hrs. for actual output} \times \text{St. rate}$$



Standard Costing

For fixed overhead = 32,500 hrs. × Rs.1.50 = Rs.48,750

For variable overhead = 32,500 hrs. × Rs.2 = Rs.65,000

Standard overhead = Actual hours × Std. rate

For fixed overhead = 33,000 × 1.50 = Rs.49,500

For variable overhead = 33,000 × 2 = Rs.66,000

Revised budget hours = $\frac{\text{Budgeted hours}}{\text{Budgeted days}} \times \text{Actual days}$

$$= \frac{30,000}{25} \times 26 = 31,200 \text{ hours}$$

Revised budgeted overhead (for fixed overhead) = 31,200 × 1.50 = Rs.46,800

Calculation of variances

Fixed Overhead Variances:

(i) F.O. cost Variance = Recovered Overhead – Actual Overhead
= 48,750 – 50,000
= Rs.1,250 (A)

(ii) F.O. Expenditure Variance = Budgeted Overhead – Actual Overhead
= 45,000 – 50,000
= Rs. 5,000 (A)

(iii) F.O. Volume Variance = Recovered Overhead – Budgeted Overhead
= 48,750 – 45,000
= Rs. 3,750 (F)

Variable Overhead Variances

(i) V.O. Cost variance = Recovered Overhead – Actual Overhead
= 65,000 – 68,000
= Rs. 3,000 (A)

(ii) V.O. Expenditure Variance = Standard Overhead – Actual Overhead
= 66,000 – 68,000
= Rs. 2,000 (A)



Cost Accounting

$$\begin{aligned} \text{(iii) V.O. Efficiency Variance} &= \text{Recovered Overhead} - \text{Standard Overhead} \\ &= 65,000 - 66,000 \\ &= \text{Rs.1,000 (A)} \end{aligned}$$

Check

$$\begin{aligned} \text{(i) F.O. Cost Variance} &= \text{Expenditure variance} + \text{Volume variance} \\ 1,250 \text{ (A)} &= 5,000 \text{ (A)} + 3,750 \text{ (F)} \\ \text{(ii) V.O. Cost Variance} &= \text{Expenditure Variance} + \text{Efficiency Variance} \\ 3,000 \text{ (A)} &= 2,000 \text{ (A)} + 1,000 \text{ (A)}. \end{aligned}$$

8.14 Self Examination Questions

Multiple Choice Questions

- The bookkeeping entries in a standard cost system when the actual price for raw material is less than the standard price are,
 - Debit raw material control account
Credit material price variance account
 - Debit WIP control account
Credit raw material control account
 - Debit raw material price variance account
Credit raw material control account
 - Debit WIP control account
Credit raw material price variance account
- A standard which assumes efficient level of operations, but which includes allowance for factors such as waste and machine downtime is known as an
 - Ideal standard
 - Normal standard
 - Attainable standard
 - Neither a nor b nor c
- The standard raw material cost for producing one unit of a finished product is Rs. 27. Standard raw material usage for every unit of finished product is 3 kg. If 200 units were produced and Rs. 5,518 was paid for 620 kg. of raw material then the direct material price variance is



- (a) Rs. 62 (F)
 - (b) Rs. 72(A)
 - (c) Rs. 100(F)
 - (d) Rs. 100(A)
4. The direct material usage variance computed from details of the above question is
- (a) Rs. 200 (F)
 - (b) Rs. 200(A)
 - (c) Rs. 180(F)
 - (d) Rs. 180(A)
5. If fixed production overheads are under absorbed by Rs. 50,000 and the actual expenditure was Rs. 55,000 lower than what was budgeted then the fixed production overhead volume variance is
- (a) Rs. 1,10,000(F)
 - (b) Rs. 1,05,000(A)
 - (c) Rs. 1,10,000(A)
 - (d) NIL
6. The direct material usage variance for last period was Rs. 3,400 adverse. What reasons could have contributed such a variance
- (a) Output was higher than budgeted
 - (b) The purchase department bought poor quality material
 - (c) The original standard usage was set extremely high
 - (d) An old inefficient machine was causing excess wastage
7. During a period 850 assemblies were made with a nil rate variance and a Rs. 4,400 adverse efficiency variance. If the standard labour hours per assembly are 24 with a Rs. 8 per hour standard labour cost, how many actual labour hours were worked?
- (a) 19,000 hrs
 - (b) 20,000 hrs
 - (c) 20,440 hrs
 - (d) 20,950 hrs



Cost Accounting

8. During a period 25,600 labour hours were worked at a standard rate of Rs. 7.50 per hour. The direct labour efficiency variance was Rs. 8,250 (A). How many standard hours were produced?
- (a) 24,500
(b) 25,000
(c) 24,000
(d) 25,500
9. Standard price of material per kg is Rs. 20, standard usage per unit of production is 5 kg. Actual usage of producing 100 units is 520 kg all of which was purchased @ Rs. 22 per kg. Material price variance is
- (a) Rs. 1,040 (A)
(b) Rs. 2,000 (A)
(c) Rs. 400 (A)
(d) neither a nor b nor c
10. The actual and standard direct material costs for producing a specified quantity of product are as follows:
- | | | |
|----------|-------------------------|--------------|
| Actual | 51,000 kgs. at Rs. 5.05 | Rs. 2,57,550 |
| Standard | 50,000 kgs. at Rs. 5.00 | Rs. 2,50,000 |
- the direct material price variance is,
- (a) RS 50 (A)
(b) RS. 2,500 (A)
(c) Rs 2,550 (A)
(d) Rs. 7,550 (A)

Answers to Multiple Choice Questions

1.a. 2.c. 3.a. 4.d. 5.b. 6.b&c 7.d 8.a 9.a 10.c

Short Answer Type Questions

1. Explain briefly how standards are compiled for material and labour costs for a product.
2. How are variances disposed off in a standard costing system? Discuss briefly.
3. In group A, the names of variances are given and in group B, examples of the reasons for cost variances are given. Match them.



Standard Costing

- | Group A | Group B |
|--------------------------------|--|
| A. Material Price Variance. | (1) A non-standard mixture used |
| B. Labour Rate Variance. | (2) Changes in basic price of raw materials. |
| C. Overhead Volume Variance. | (3) Poor working conditions. |
| D. Materials Usage Variance. | (4) Using skilled labour in place of unskilled labour. |
| E. Labour Efficiency Variance. | (5) Slackness in production |
4. Explain briefly the nature and purpose of material and labour variances.
5. The following are the two journal entries for the transaction noted below. State the plan to which these entries are applicable.
- (a) Standard Clearing A/c Dr.
 To Material Control A/c
 For charging the actual quantity of material consumed at standard price.
- (b) Material Control A/c Dr.
 Dr. or Cr. Material Control Variance A/c
 To Creditors

(For charging the standard cost of material to material control account there by transferring the price variance to price variance account.)

Long Answer Type Questions

1. Discuss the different type of standards known to you. In case a company, for the purposes of estimating its standard cost of product, switches over to ideal standards from the existing normal standards, would the standard cost of the concerned product increase or decrease? Discuss.
2. What are the basic objectives in the use of standard costs? How can standards be used by management to help control costs?
3. "Calculation of variances in standard costing is not an end in itself, but a means to an end." Discuss.
4. Standard profits need to be reconciled with material, labour, overhead and sales variances to arrive at actual profits. Discuss.



Cost Accounting

5. Discuss the various advantages and criticisms levelled against standard costing.

Numerical Questions

1. Compute the material variances from the following data.

Actual quantity consumed	100 Kgs.
Actual price per kg.	Rs. 19
Standard price per kg.	Rs. 20

Production in standard units is 45 units; one standard unit requires 2 kg. of material.

2. The standard time per unit is 2 hours at Re. 1/- per hour. During a period, 500 units are made and the records showed the actual payment of wages of Rs. 1,800 for 1200 hours worked. Compute the labour cost variances.
3. The following Bill of Material relates to a Product called 'ABAB', the maximum capacity per month of which is 200 Units.

Material description	Std Quantity	Std. Cost
A	1 Kg	Rs. 2000 per Kg.
B	10 Nos.	Rs. 200 per Unit
C	2 Litres	Rs. 50 per litre

Budgeted Fixed Expenses per month equal Rs. 1.5 Lakhs. The budgeted Selling Price of the product is Rs. 6,000. Other variable costs (apart from Raw Material) are budgeted at Rs. 1,000 per Unit. In a particular month 175 Units of this product are produced and sold. The Fixed Costs incurred in the concerned month were Rs. 2 Lakhs whereas the variable cost expenditure was Rs. 900 per Unit. You are required to:

- (a) Compute the Standard Cost of the product.
- (b) Calculate production volume and variable overhead variances.



Standard Costing

4. The following Bill of Material relates to '1+7 ASCS', a product manufactured by ABC Ltd.

<i>Raw Material</i>	<i>Standard Quantity per Unit of 1+ 7 ASCS (Nos.)</i>	<i>Standard Cost per Unit of raw material (Rs.)</i>
PCB	10	1000
IC	05	900
Relay	15	100
Transformer	10	500
Rack	01	4000

The maximum capacity of the factory manufacturing this product is 200 Units per month. Budgeted Fixed Costs per month are Rs. 30,00,000. Raw material is the only variable cost. Budgeted selling price is Rs. 60,000 per Unit. Issue price of RM may be assumed to be the actual price.

From the following actual results of a particular month, you are required to calculate relevant variances and the actual profits made.

Actual production and sales	:	150 Units of '1+ 7 ASCS'
Actual Fixed expenses	:	Rs. 31,00,000
Actual Selling price per Unit	:	Rs. 59,000.

	<i>Opening Stock on floor (raw material)</i>	<i>Closing Stock on floor (raw material)</i>	<i>Issues during the month (raw material)</i>
PCB	100	200	1800 @Rs 1100/Ut
IC	50	100	900 @ Rs 1000/Ut
Relay	250	250	2250 @Rs 90/Ut
Transformer	1000	700	1200 @Rs 500/Ut
Rack	100	100	150 @ Rs 4100/Ut



Cost Accounting

Answers to Numerical Questions.

1. Usage variance Rs. 200 (A)
 Price variance Rs. 100 (F)
2. Efficiency variance Rs. 200 (A)
 Rate variance Rs. 600 (A)
3. Standard cost : Rs. 5,850 per unit
 Variable Overhead variance : (Rs. 17,500).
 Production volume variance : (Rs. 18,750).
4. Production Volume Variance : (Rs 7,50,000)
 Usage Variance : (Rs 2,90,000)
 Price Variance : (Rs 2,47,500)
 Fixed Expense Variance : (Rs 1,00,000)
 Selling Price Variance : (Rs 1,50,000)
 Profit : Rs 14,62,500

CHAPTER 9

MARGINAL COSTING

Learning Objectives

When you have finished studying this chapter, you should be able to

- ◆ Understand the difference between absorption costing and marginal costing
- ◆ Understand the concept of contribution and contribution to sales ratio.
- ◆ Understand the method of computation of break-even point, both mathematically and also with the help of a graph.
- ◆ Understand the basic limitations of break even analysis

9.1 INTRODUCTION

Marginal costing is not a distinct method of costing like job costing, process costing, operating costing, etc., but a special technique used for managerial decision making. Marginal costing is used to provide a basis for the interpretation of cost data to measure the profitability of different products, processes and cost centres in the course of decision making. It can, therefore, be used in conjunction with the different methods of costing such as job costing, process costing, etc., or even with other techniques such as standard costing or budgetary control.

In marginal costing, cost ascertainment is made on the basis of the nature of cost. It gives consideration to behaviour of costs. In other words, the technique has developed from a particular conception and expression of the nature and behaviour of costs and their effect upon the profitability of an undertaking.

In the orthodox or total cost method, as opposed to marginal costing method, the classification of costs is based on functional basis. Under this method the total cost is the sum total of the cost of direct material, direct labour, direct expenses, manufacturing overheads, administration overheads, selling and distribution overheads. In this system, other things being equal, the total cost per unit will remain constant only when the level of output or mixture is the same from period to period. Since these factors are continually fluctuating, the actual total cost will vary from one period to another. Thus, it is possible for the costing department to say one day that an item costs Rs. 20 and the next day it costs Rs. 18. This situation arises because of changes in volume of output and the



peculiar behaviour of fixed expenses included in the total cost. Such fluctuating manufacturing activity, and consequently the variations in the total cost from period to period or even from day to day, poses a serious problem to the management in taking sound decisions. Hence, the application of marginal costing has been given wide recognition in the field of decision making.

9.2 THEORY OF MARGINAL COSTING

The theory of marginal costing is that in relation to a given volume of output, additional output can normally be obtained at less than proportionate cost because within limits the aggregate of certain items of cost will tend to remain fixed and only the aggregate of the remainder will tend to rise proportionately with increase in output. Conversely, a decrease in the volume of output will normally be accompanied by a less than proportionate fall in the aggregate cost.

The theory of marginal costing may therefore be explained in three steps:

- (i) If the volume of output increases, the average cost per unit will, in the normal circumstances, be reduced. Conversely, if the output is reduced, the average cost per unit will go up. If the factory produces 1,000 units at a total cost of Rs. 3,000 and if by increasing the output by one unit, the cost goes up to Rs. 3,002, the marginal cost of the additional output is Rs. 2.
- (ii) If the increase in output is more than one unit say 20 units, the total increase in cost to produce these units is Rs. 3,045, the average marginal cost is Rs. 2.25 per unit is as under:

$$\frac{\text{Additional cost}}{\text{Additional units}} = \frac{\text{Rs. 45}}{20 \text{ units}} = \text{Rs. 2.25}$$

- (iii) The ascertainment of marginal cost is based on the classification and segregation of costs into fixed and variable costs.

9.3 DEFINITIONS

In order to appreciate the concept of marginal costing, it is necessary to study the definition of marginal costing and certain other terms associated with this technique. The important terms have been defined as follows:

1. *Marginal costing* : The ascertainment of marginal cost and of the effect on profit of changes in volume or type of output by differentiating between fixed costs and variable costs.



2. *Marginal cost*: The amount at any given volume of output by which aggregate variable costs are changed if the volume of output is increased by one unit. In practice this is measured by the total variable cost attributable to one unit. Marginal cost can precisely be the sum of prime cost and variable overhead.

Note: In this context a unit may be a single article, a batch of articles, an order, a stage of production capacity, a process or a department. It relates to the change in output in particular circumstances under consideration.

3. *Direct costing*: Direct costing is the practice of charging all direct cost to operations, processes or products, leaving all indirect costs to be written off against profits in the period in which they arise. Under direct costing the stocks are valued at direct costs, i.e., costs whether fixed or variable which can be directly attributable to the cost units.

In general, the terms marginal costing and direct costing are used as synonymous. However, direct costing differs from marginal costing in that some fixed costs considered direct are charged to operations, processes or products, whereas in marginal costing only variable costs are considered. Marginal costing is mainly concerned with providing of information to management to assist in decision making and for exercising control. Marginal costing is considered to be a technique with a broader meaning than direct costing. Marginal costing is also known as 'variable costing' or 'out of pocket costing'.

4. *Differential cost* : It may be defined as "the increase or decrease in total cost or the change in specific elements of cost that result from any variation in operations". It represents an increase or decrease in total cost resulting out of :

- (a) producing or distributing a few more or few less of the products;
- (b) a change in the method of production or of distribution;
- (c) an addition or deletion of a product or a territory; and
- (d) selection of an additional sales channel.

Differential cost, thus includes fixed and semi-variable expenses. It is the difference between the total costs of two alternatives. It is an *ad hoc* cost determined for the purpose of choosing between competing alternatives, each with its own combination of income and costs.

5. *Incremental cost* : It is defined as, "the additional costs of a change in the level or nature of activity". As such for all practical purposes there is no difference between incremental cost and differential cost. However, from a conceptual point of view, differential cost refers to both incremental as well as decremental cost. Incremental cost and differential cost calculated from the same data will be the same. In practice, therefore, generally no distinction is made between differential cost and incremental cost. One aspect which is worthy to note is that incremental cost is not the same at all levels.



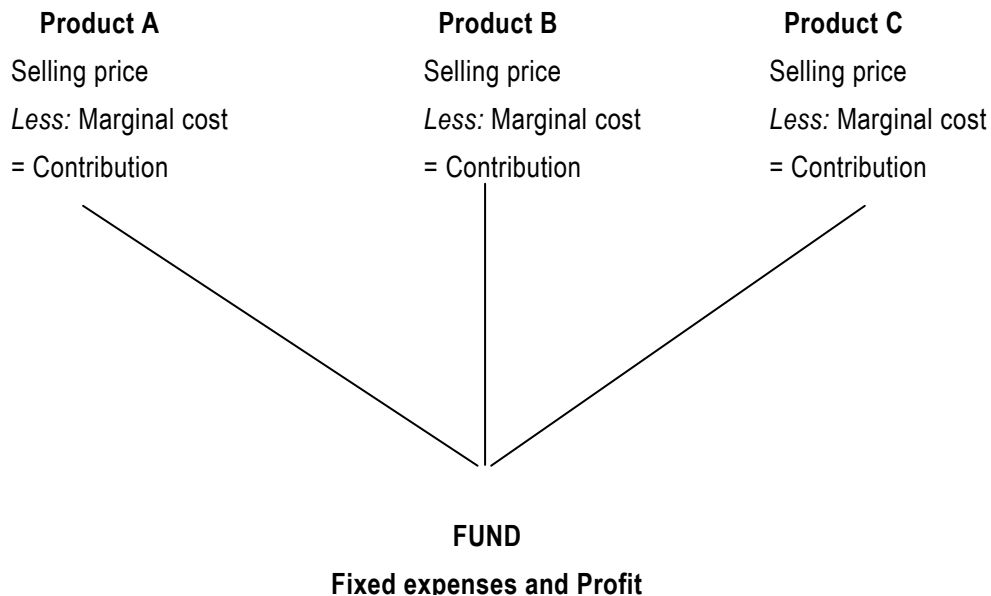
Cost Accounting

Incremental cost between 50% and 60% level of output may be different from that which is arrived at between 80% and 90% level of output. Differential cost or incremental cost analysis deals with both short-term and long-term problems. This analysis is more useful when various alternatives or various capacity levels are being considered. Differential costs or incremental costs can be easily identified by preparing a flexible budget as shown below:

Example

Description	Activity Level				
	50%	60%	70%	80%	
Units	500	600	700	800	
	Rs.	Rs.	Rs.	Rs.	
Variable costs	5,000	6,000	7,000	8,000	
Semi-variable costs		1,500	1,600	1,650	1,700
Fixed costs	<u>2,500</u>	<u>2,500</u>	<u>2,500</u>	<u>3,000</u>	
Total costs	9,000	10,100	11,150	12,700	
Differential costs/Incremental costs			1,100	1,050	1,550

6. *Contribution* : Contribution or the contributory margin is the difference between sales value and the marginal cost. It is obtained by subtracting marginal cost from sales revenue of a given activity. It can also be defined as excess of sales revenue over the variable cost. The difference between sales revenue and marginal/variable cost is considered to be the contribution towards fixed expenses and profit of the entire business. The contribution concept is based on the theory that the profit and fixed expenses of a business is a 'joint cost' which cannot be equitably apportioned to different segments of the business. In view of this difficulty the contribution serves as a measure of efficiency of operations of various segments of the business. The contribution forms a fund for fixed expenses and profit as illustrated below:



7. *Key factor* : Key factor or Limiting factor is a factor which at a particular time or over a period limits the activities of an undertaking. It may be the level of demand for the products or services or it may be the shortage of one or more of the productive resources, e.g., labour hours, available plant capacity, raw material's availability etc. Examples of Key Factors or Limiting Factors are:

- (a) Shortage of raw material.
- (b) Shortage of labour.
- (c) Plant capacity available.
- (d) Sales capacity available.
- (e) Cash availability.

9.4 ASCERTAINMENT OF MARGINAL COST

Under marginal costing, fixed expenses are treated as period costs and are therefore, charged to profit and loss account. In order to ascertain the marginal cost, we classify the expenses as under:

1. *Variable expenses* : Apart from prime costs which are variable, the overhead expenses



that change in proportion to the change in the level of activity are also variable expenses. Thus when expenses go up or come down in proportion to a change in the volume of output, such that, with every increase of 20% in output, expenses also go up by 20% or vice versa, these expenses are known as variable expenses. Variable expenses fluctuate in total with fluctuations in the level of output but tend to remain constant per unit of output. Examples of such expenses are raw material, power, commission paid to salesmen as a percentage of sales, etc.

2. *Fixed expenses* : Fixed expenses or constant expenses are those which do not vary in total with the change in volume of output for a given period of time. Fixed cost per unit of output will, however, fluctuate with changes in the level of production. Examples of such expenses are managerial remuneration, rent, taxes, etc. There may, however, be different levels of fixed costs at different levels of output, as for example, where after certain level of output extra expenditure may be needed. In the case of introduction of additional shift working, fixed expenses will be incurred, say, for the appointment of additional supervisors. Fixed expenses are treated as period costs and are therefore charged to profit and loss account.

3. *Semi-variable expenses* : These expenses (also known as semi-fixed expenses) do not change within the limits of a small range of activity but may change when the output reaches a new level in the same direction in which the output changes. Such increases or decreases in expenses are not in proportion to output. An example of such an expense is delivery van expense. Semi-variable expenses may remain constant at 50% to 60% level of activity and may increase in total from 60% to 70% level of activity. These expenses can be segregated into fixed and variable by using any one of the method, as given under next heading. Depreciation of plant and machinery depends partly on efflux of time and partly on wear and tear. The former is fixed and the latter is variable. The total cost is arrived at by merging these three type of expenses.

9.5 SEPARATING FIXED AND VARIABLE COSTS – Please Refer to Chapter 1

Uses of segregation of cost

Segregation of all expenses into fixed and variable elements is the essence of marginal costing. The primary objective of the classification of expenses into fixed and variable elements is to find out the marginal cost for various types of managerial decisions. A number of such decisions will be discussed later in the chapter-3of this book. The other uses of it are as below:

(i) *Control of expenses* : The classification of expenses helps in controlling expenses. Fixed expenses are said to be sunk costs as these are incurred irrespective of the level of production activity and they are regarded as uncontrollable expenses. Since variable expenses vary with the production they are said to be controllable. By this classification,



Marginal Costing

therefore, responsibility for incurring variable expenses is determined in relation to activity and hence the management is able to control these expenses. The departmental heads always try to keep these expenses within limits set by the management.

(ii) *Preparation of budget estimates:* This distinction between fixed and variable cost also helps the management to estimate precisely, the budgeted expenses to gauge the actual efficiency of the business, by comparing the actual with budgets. This can be illustrated by means of the following example.

Example

A firm which produced 1,000 units in June incurred the following expenses.

	Rs.
Variable expenses	2,000
Semi-variable expenses (60% variable)	2,000
Fixed expenses	<u>6,000</u>
Total	<u>10,000</u>

If in July, the units are expected to increase to 1,200, it will be wrong to estimate the expenses at Rs. 12,000. The estimate for 1,200 units will have to be prepared as under:

		Rs.
Variable expenses	$\frac{\text{Rs. } 2,000 \times 1,200 \text{ units}}{1,000 \text{ units}}$	2,400
<i>Semi-variable expenses:</i>		
Variable component	$\text{Rs. } 2,000 \times \frac{60}{100} \times \frac{1,200 \text{ units}}{1,000 \text{ units}}$	1,440
Fixed component	$\text{Rs. } 2,000 \times \frac{40}{100}$	800
Fixed expenses		6,000
Total		10,640

If the actual expenses are Rs. 11,000, it is not correct to say that there has been a saving of Rs. 1,000 i.e. (Rs. 12,000 – Rs. 11,000) but that the firm has overspent Rs. 360 i.e., Rs. 11,000 – Rs. 10,640. Thus, managerial control is possible.



9.6 DISTINCTION BETWEEN MARGINAL AND ABSORPTION COSTING

The main points of distinction between marginal costing and absorption costing are as below:

	<i>Marginal costing</i>	<i>Absorption costing</i>
1.	Only variable costs are considered for product costing and inventory valuation.	Both fixed and variable costs are considered for product costing and inventory valuation.
2.	Fixed costs are regarded as period costs. The Profitability of different products is judged by their P/V ratio.	Fixed costs are charged to the cost of production. Each product bears a reasonable share of fixed cost and thus the profitability of a product is influenced by the apportionment of fixed costs.
3.	Cost data presented highlight the total contribution of each product.	Cost data are presented in conventional pattern. Net profit of each product is determined after subtracting fixed cost along with their variable costs.
4.	The difference in the magnitude of opening stock and closing stock does not affect the unit cost of production.	The difference in the magnitude of opening stock and closing stock affects the unit cost of production due to the impact of related fixed cost.

9.6.1 Presentation of Information: In absorption costing the classification of expenses is based on functional basis whereas in marginal costing it is based on the nature of expenses. In absorption costing, the fixed expenses are distributed over products on absorption costing basis, that is, based on a pre-determined level of output. Since fixed expenses are constant, such a method of recovery will lead to over or under-recovery of expenses depending on the actual output being greater or lesser than the estimate used for recovery. This difficulty will not arise in marginal costing because the contribution is used as a fund for meeting fixed expenses.

The presentation of information to management under the two costing techniques is as under:



Marginal Costing

(a) Under Absorption Costing

<i>Description</i>	<i>Product A</i>	<i>Product B</i>	<i>Total</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Sales value			
Less: Direct material			
Direct labour			
Factory overheads			
GROSS PROFIT			
Less: Administration expenses			
Selling & distribution expenses			
NET PROFIT			

(b) Under Marginal Costing

<i>Description</i>	<i>Product A</i>	<i>Product B</i>	<i>Total</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Sales value			
Less: Direct material			
Direct labour			
Variable factory overheads			
Variable selling & distribution expenses			
CONTRIBUTION			
Less: Fixed factory overheads			
Administration overheads			
Fixed selling & distribution expenses			
NET PROFIT			

It is evident from the above that under marginal costing technique the contributions of various products are pooled together and the fixed overheads are met out of such total contribution. The total contribution is also known as gross margin. The contribution minus fixed expenses yields net profit. In absorption costing technique cost includes fixed overheads as well.

Illustration

WONDER LTD. manufactures a single product, ZEST. The following figures relate to ZEST for a one-year period:



Cost Accounting

Activity Level	50%	100%
Sales and production (units)	400	800
	<i>Rs. lakhs</i>	<i>Rs. lakhs</i>
Sales	8.00	16.00
Production costs:		
Variable	3.20	6.40
Fixed	1.60	1.60
Selling and administration costs:		
Variable	1.60	3.20
Fixed	2.40	2.40

The normal level of activity for the year is 800 units. Fixed costs are incurred evenly throughout the year, and actual fixed costs are the same as budgeted. There were no stocks of ZEST at the beginning of the year.

In the first quarter, 220 units were produced and 160 units were sold.

Required :

- What would be the fixed production costs absorbed by ZEST if absorption costing is used?
- What would be the under/over-recovery of overheads during the period?
- What would be the profit using absorption costing?
- What would be the profit using marginal costing?
- Why is there a difference between the answers to (c) and (d)?

Solution

- Fixed production costs absorbed:*

Budgeted fixed production costs	<i>Rs.</i> 1,60,000
Budgeted output (normal level of activity 800 units)	
Therefore, the absorption rate : $1,60,000/800 = \text{Rs. } 200$ per unit	
During the first quarter, the fixed production cost absorbed by ZEST would be $(220 \text{ units} \times \text{Rs. } 200)$	44,000
- Under/over-recovery of overheads during the period:*

Actual fixed production overhead	<i>Rs.</i> 40,000
$(1/4 \text{ of Rs. } 1,60,000)$	



Marginal Costing

Absorbed fixed production overhead		44,000
Over-recovery of overheads		4,000
(c) <i>Profit for the Quarter (Absorption Costing)</i>	Rs.	Rs.
Sales revenue (160 units × Rs. 2,000) : (A)		3,20,000
Less : Production costs		
Variable (220 units × Rs. 800)	1,76,000	
Fixed overheads absorbed (220 units × Rs. 200)	<u>44,000</u>	
Total (220 units × Rs. 1,000)	2,20,000	
Less : Closing stock (60 units × Rs. 1,000)	<u>60,000</u>	
Production cost of 160 units	1,60,000	
Variable sales & admn. costs (160 units × Rs. 400)	64,000	
Fixed selling & admn. costs (1/4 of Rs. 2,40,000)	60,000	
Total cost of sales of 160 units : (B)		<u>2,84,000</u>
Unadjusted profit : {(A) – (B)}		36,000
Add: Overheads over absorbed		4,000
Actual profit		<u>40,000</u>
(d) <i>Profit for the Quarter (Marginal costing)</i>	Rs.	Rs.
Sales revenue (160 units × Rs. 2,000) : (A)		3,20,000
Variable production costs (220 units × Rs. 800)	1,76,000	
Less: Closing stock (60 units × Rs. 800)	<u>48,000</u>	
Variable production cost of 160 units	1,28,000	
Add: Variable selling & admn. costs	<u>64,000</u>	
Total variable cost of sales of 160 units : (B)		<u>1,92,000</u>
Contribution : {(A) – (B)}		1,28,000
Less: Fixed production cost incurred	40,000	
Fixed selling & admn. costs incurred	<u>60,000</u>	<u>1,00,000</u>
Actual profit		28,000

9.7 ADVANTAGES AND LIMITATIONS OF MARGINAL COSTING

Advantages of Marginal Costing

1. The marginal cost remains constant per unit of output whereas the fixed cost remains constant in total. Since marginal cost per unit is constant from period to period within a short span of time, firm decisions on pricing policy can be taken. If fixed cost is included,



Cost Accounting

the unit cost will change from day to day depending upon the volume of output. This will make decision making task difficult.

2. Overheads are recovered in costing on the basis of pre-determined rates. If fixed overheads are included on the basis of pre-determined rates, there will be under-recovery of overheads if production is less or if overheads are more. There will be over-recovery of overheads if production is more than the budget or actual expenses are less than the estimate. This creates the problem of treatment of such under or over-recovery of overheads. Marginal costing avoids such under or over recovery of overheads.
3. Advocates of marginal costing argues that under the marginal costing technique, the stock of finished goods and work-in-progress are carried on marginal cost basis and the fixed expenses are written off to profit and loss account as period cost. This shows the true profit of the period.
4. Marginal costing helps in the preparation of break-even analysis which shows the effect of increasing or decreasing production activity on the profitability of the company.
5. Segregation of expenses as fixed and variable helps the management to exercise control over expenditure. The management can compare the actual variable expenses with the budgeted variable expenses and take corrective action through analysis of variances.
6. Marginal costing helps the management in taking a number of business decisions like make or buy, discontinuance of a particular product, replacement of machines, etc.

Limitations of Marginal Costing

1. It is difficult to classify exactly the expenses into fixed and variable category. Most of the expenses are neither totally variable nor wholly fixed. For example, various amenities provided to workers may have no relation either to volume of production or time factor.
2. Contribution of a product itself is not a guide for optimum profitability unless it is linked with the key factor.
3. Sales staff may mistake marginal cost for total cost and sell at a price; which will result in loss or low profits. Hence, sales staff should be cautioned while giving marginal cost.
4. Overheads of fixed nature cannot altogether be excluded particularly in large contracts, while valuing the work-in-progress. In order to show the correct position fixed overheads have to be included in work-in-progress.
5. Some of the assumptions regarding the behaviour of various costs are not necessarily true in a realistic situation. For example, the assumption that fixed cost will remain static



throughout is not correct. Fixed cost may change from one period to another. For example salaries bill may go up because of annual increments or due to change in pay rate etc. The variable costs do not remain constant per unit of output. There may be changes in the prices of raw materials, wage rates etc. after a certain level of output has been reached due to shortage of material, shortage of skilled labour, concessions of bulk purchases etc.

6. Marginal costing ignores time factor and investment. For example, the marginal cost of two jobs may be the same but the time taken for their completion and the cost of machines used may differ. The true cost of a job which takes longer time and uses costlier machine would be higher. This fact is not disclosed by marginal costing.

9.8 MARGINAL COST EQUATION

The contribution theory explains the relationship between the variable cost and selling price. It tells us that selling price minus variable cost of the units sold is the contribution towards fixed expenses and profit. If the contribution is equal to fixed expenses, there will be no profit or loss and if it is less than fixed expenses, loss is incurred. Since the variable cost varies in direct proportion to output, therefore if the firm does not produce any unit, the loss will be there to the extent of fixed expenses. These points can be described with the help of following marginal cost equation: $S \times U - V \times U = F + P$

Where,

S = Selling price per unit

V = Variable cost per unit

U = Units

F = Fixed expenses

P = Profit

9.9 COST-VOLUME-PROFIT ANALYSIS

As the name suggests, cost volume profit (CVP) analysis is the analysis of three variables cost, volume and profit. Such an analysis explores the relationship between costs, revenue, activity levels and the resulting profit. It aims at measuring variations in cost and volume.

CVP analysis is based on the following assumptions:

1. Changes in the levels of revenues and costs arise only because of changes in the number of product (or service) units produced and sold – for example, the number of television sets produced and sold by Sony Corporation or the number of packages



Cost Accounting

delivered by Overnight Express. The number of output units is the only revenue driver and the only cost driver. Just as a cost driver is any factor that affects costs, a revenue driver is a variable, such as volume, that causally affects revenues.

2. Total costs can be separated into two components; a fixed component that does not vary with output level and a variable component that changes with respect to output level. Furthermore, variable costs include both direct variable costs and indirect variable costs of a product. Similarly, fixed costs include both direct fixed costs and indirect fixed costs of a product
3. When represented graphically, the behaviours of total revenues and total costs are linear (meaning they can be represented as a straight line) in relation to output level within a relevant range (and time period).
4. Selling price, variable cost per unit, and total fixed costs (within a relevant range and time period) are known and constant.
5. The analysis either covers a single product or assumes that the proportion of different products when multiple products are sold will remain constant as the level of total units sold changes
6. All revenues and costs can be added, subtracted, and compared without taking into account the time value of money. (Refer to the FM study material for a clear understanding of time value of money).

9.9.1 The Breakeven Point : The word contribution has been given its name because of the fact that it literally contributes towards the recovery of fixed costs and the making of profits. The contribution grows along with the sales revenue till the time it just covers the fixed cost. This point where neither profits nor losses have been made is known as a break-even point. This implies that in order to break even the amount of contribution generated should be exactly equal to the fixed costs incurred. Hence, if we know how much contribution is generated from each unit sold we shall have sufficient information for computing the number of units to be sold in order to break even. Mathematically,

$$\text{Break even point in units} = \frac{\text{Fixed costs}}{\text{Contribution per unit}}$$

Let us consider an example of a company (ABC Ltd) manufacturing a single product, incurring variable costs of Rs 300 per unit and fixed costs of Rs 2, 00,000 per month. If the product sells for Rs 500 per unit, the breakeven point shall be calculated as follows;



Marginal Costing

$$\text{Break even point in units} = \frac{\text{Fixed costs}}{\text{Contribution per unit}} = \frac{\text{Rs. 2,00,000}}{\text{Rs. 200}} = 1,000 \text{ units}$$

9.9.2 Margin of Safety : The margin of safety can be defined as the difference between the expected level of sale and the breakeven sales. The larger the margin of safety, the higher are the chances of making profits. In the above example if the forecast sale is 1,700 units per month, the margin of safety can be calculated as follows,

$$\begin{aligned} \text{Margin of safety} &= \text{Projected sales} - \text{Breakeven sales} \\ &= 1,700 \text{ units} - 1,000 \text{ units} \\ &= 700 \text{ units or } 41 \% \text{ of sales.} \end{aligned}$$

The Margin of Safety can also be calculated by identifying the difference between the projected sales and breakeven sales in units multiplied by the contribution per unit. This is possible because, at the breakeven point all the fixed costs are recovered and any further contribution goes into the making of profits.

9.9.3 Contribution to Sales Ratio(Profit Volume Ratio) : This ratio is usually expressed in percentage. It can be calculated for the product in the example of ABC Ltd. which we have used above as follows,

$$\begin{aligned} \text{Contribution to sales ratio (C/S ratio)} &= \text{Rs } 200/\text{Rs } 500 \times 100\% \\ &= 40\% \end{aligned}$$

A higher contribution to sales ratio implies that the rate of growth of contribution is faster than that of sales. This is because, once the breakeven point is reached, profits shall grow at a faster rate when compared to a product with a lesser contribution to sales ratio.

Assuming that the products variable cost and selling price are constant, the contribution to sales ratio can also be utilised in computing the breakeven point as shown below,

$$\text{Breakeven point in sales} = \frac{\text{Fixed costs}}{\text{C/S ratio}} = \frac{\text{Rs. 2,00,000}}{.40} = \text{Rs. 5,00,000}$$

Rs. 5,00,000 sales equals 1,000 units being sold as has been computed while identifying breakeven point in units as shown above.

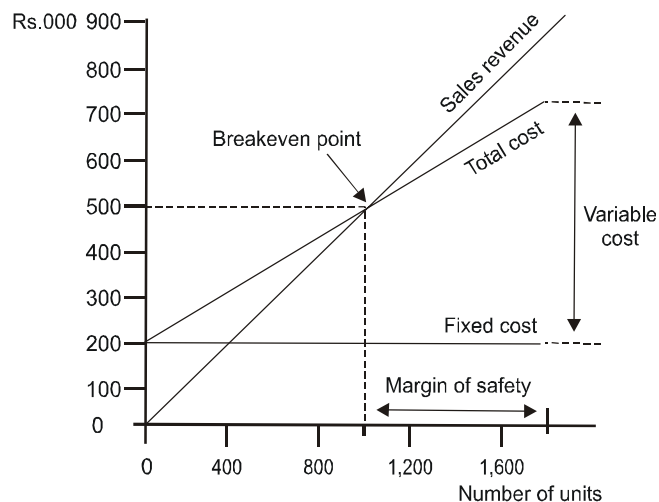
9.9.4 Breakeven Chart : A breakeven chart records costs and revenues on the vertical axis and the level of activity on the horizontal axis. The making of the breakeven chart would require you to select appropriate axes. Subsequently, you will need to mark costs/revenues on the Y axis whereas the level of activity shall be traced on the X axis. Lines representing (i) Fixed costs (horizontal line at Rs. 2,00,000 for ABC Ltd), (ii) Total costs at maximum level of activity (joined to the Yaxis where the Fixed cost of Rs.



Cost Accounting

2,00,000 is marked) and (iii) Revenue at maximum level of activity (joined to the origin) shall be drawn next. The breakeven point is that point where the sales revenue line intersects the total cost line. Other measures like the margin of safety and profit can also be measured from the chart.

The breakeven chart for ABC Ltd is drawn below.



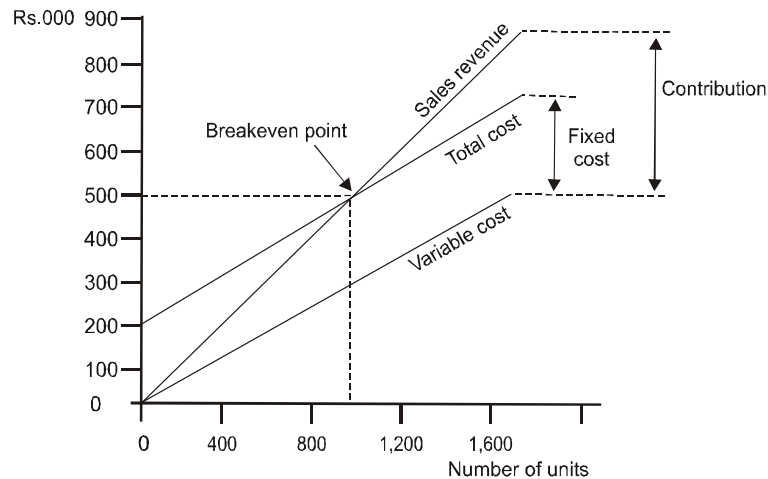
Contribution Breakeven chart

It is not possible to use a breakeven chart as described above to measure contribution. This is one of its major limitations especially so because contribution analysis is literally the backbone of marginal costing. To overcome such a limitation, accountants frequently resort to the making of a contribution breakeven chart which is based on the same principles as a conventional breakeven chart except for that it shows the variable cost line instead of the fixed cost line. Lines for Total cost and Sales revenue remain the same. The breakeven point and profit can be read off in the same way as with a conventional chart. However it is also possible to read the contribution for any level of activity.

Using the same example of ABC Ltd as for the conventional chart, the total variable cost for an output of 1,700 units is $1,700 \times \text{Rs. } 300 = \text{Rs. } 5,10,000$. This point can be joined to the origin since the variable cost is nil at zero activity.



Marginal Costing

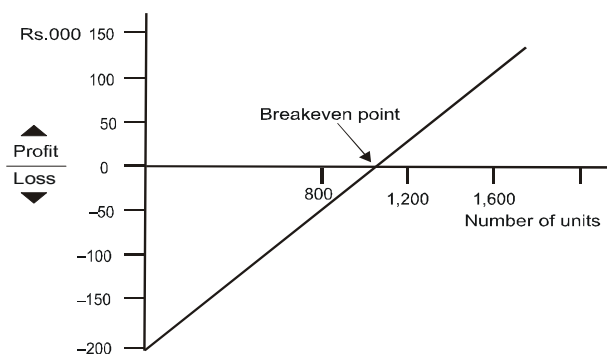


The contribution can be read as the difference between the sales revenue line and the variable cost line.

Profit-volume chart

This is also very similar to a breakeven chart. In this chart the vertical axis represents profits and losses and the horizontal axis is drawn at zero profit or loss.

In this chart each level of activity is taken into account and profits marked accordingly. The breakeven point is where this line intersects the horizontal axis. A profit-volume graph for our example (ABC Ltd) will be as follows,



The loss at a nil activity level is equal to Rs. 2,00,000, i.e. the amount of fixed costs. The second point used to draw the line could be the calculated breakeven point or the calculated profit for sales of 1,700 units.



Advantages of the profit-volume chart

The biggest advantage of the profit-volume chart is its capability of depicting clearly the effect on profit and breakeven point of any changes in the variables. The following example illustrates this characteristic,

Example:

A manufacturing company incurs fixed costs of Rs. 3,00,000 per annum. It is a single product company with annual sales budgeted to be 70,000 units at a sales price of Rs. 300 per unit. Variable costs are Rs. 285 per unit.

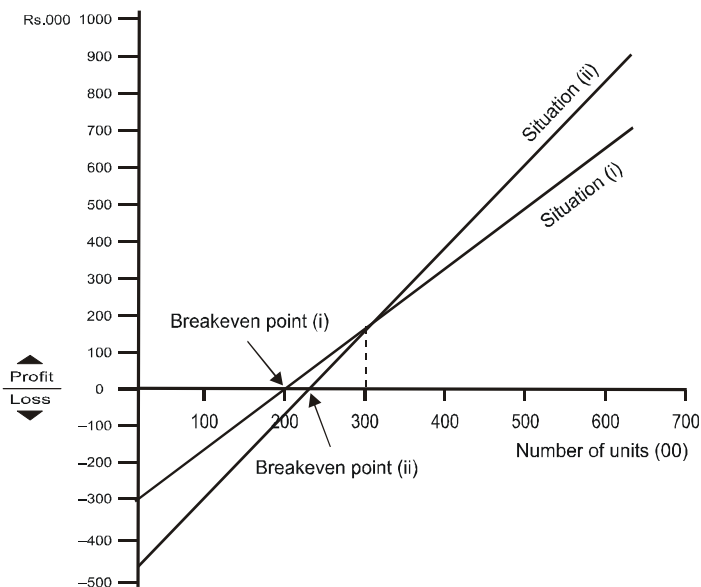
- (i) Draw a profit volume graph, and use it to determine the breakeven point.

The company is deliberating upon an increase in the selling price of the product to Rs.350 per unit. This shall be required in order to improve the quality of the product. It is anticipated that despite increase in the selling price the sales volume shall remain unaffected, however, the fixed costs shall increase to Rs. 4,50,000 per annum and the variable costs to Rs. 330 per unit.

- (ii) Draw on the same graph as for part (a) a second profit volume graph and give your comments.

Solution:

Figure showing changes with a profit-volume chart





Marginal Costing

Working notes (i)

The profit for sales of 70,000 units is Rs. 7,50,000.

	<i>Rs.'000</i>
Contribution 70,000 × Rs.(300 – 285)	1050
Fixed costs	<u>300</u>
Profit	<u>750</u>

This point is joined to the loss at zero activity, Rs. 3,00,000 i.e., the fixed costs.

Working notes (ii)

The profit for sales of 70,000 units is Rs. 9,50,000.

	<i>Rs.'000</i>
Contribution 70,000 × Rs. (350 – 330)	1400
Fixed costs	<u>450</u>
Profit	<u>950</u>

This point is joined to the loss at zero activity, Rs. 4,50,000 i.e., the fixed costs.

Comments:

It is clear from the graph that there are larger profits available from option (ii). It also shows an increase in the break-even point from 20,000 units to 22,500 units, however, the increase of 2,500 units may not be considered large in view of the projected sales volume. It is also possible to see that for sales volumes above 30,000 units the profit achieved will be higher with option (ii). For sales volumes below 30,000 units option (i) will yield higher profits (or lower losses).

9.9.6 The Limitations of Breakeven Analysis: The limitations of the practical applicability of breakeven analysis and breakeven charts stem mostly from the assumptions underlying CVP which have been mentioned above. Assumptions like costs behaving in a linear fashion or sales revenue remain constant at different sales levels or the stocks shall remain constant period after period are unrealistic. Similarly, the assumption that the only factor which influences costs is the 'activity level achieved' is erroneous because other factors like inflation also have a bearing on costs.



9.10 Miscellaneous Illustrations

Illustration 1

You are given the following particulars calculate:

- (a) Break-even point
- (b) Sales to earn a profit of Rs. 20,000
 - i. Fixed cost Rs. 1,50,000
 - ii. Variable cost Rs. 15 per unit
 - iii. Selling price is Rs. 30 per unit

Solution:

(a) B.E.P. = Fixed Cost / Contribution per unit
= 1,50,000 / 15
= 10,000 Units

(b) Sales to earn a Profit of Rs. 20,000 = FC + (Desired Profit/Contribution per unit) X S.P.
= (1,50,000 + 20,000)/15 X 30
= (1,70,000/15) x 30
= Rs. 3,40,000

Illustration 2

If P/V ratio is 60% and the Marginal cost of the product is Rs. 20. What will be the selling price?

Solution:

Variable Cost = 100 – P/V Ratio
= 100 – 60 = 40

If Variable cost is 40, then selling price = 100

If Variable cost is 20, then selling price = (100/40) x 20 = Rs. 50

Illustration 3

A Ltd. Maintains margin of safety of 37.5% with an overall contribution to sales ratio of 40%. Its fixed costs amount to Rs. 5 lakhs.



Calculate the following:

- i. Break-even sales
- ii. Total sales
- iii. Total variable cost
- iv. Current profit
- v. New 'margin of safety' if the sales volume is increased by 7 ½ %.

Solution:

(i) We know that: $BES \times P/V \text{ Ratio} = \text{Fixed Cost}$

$$BES \times 40\% = \text{Rs. } 5,00,000$$

$$BES = \text{Rs. } 12,50,000$$

(ii) Total Sales = BES + MS

$$S = \text{Rs. } 12,50,000 + 0.375S$$

$$S - 0.375S = \text{Rs. } 12,50,000$$

$$S = \text{Rs. } 20,00,000$$

(iii) Contribution to Sales Ratio = 40%

Therefore, Variable cost to Sales Ratio = 60%

$$\text{Variable cost} = 60\% \text{ of sales}$$

$$= 60\% \text{ of } 20,00,000$$

$$\text{Variable cost} = 12,00,000$$

(iv) Current Profit = Sales – (V.C. + F.C.)

$$= \text{Rs. } 20,00,000 - (12,00,000 + 5,00,000)$$

$$= \text{Rs. } 3,00,000$$

(v) If sales value is increased by 7 ½ %

$$\text{New Sales value} = \text{Rs. } 20,00,000 \times 1.075$$

$$= \text{Rs. } 21,50,000$$



Cost Accounting

$$\begin{aligned}\text{New Margin of Safety} &= \text{New Sales value} - \text{BES} \\ &= \text{Rs. } 21,50,000 - \text{Rs. } 12,50,000 \\ &= \text{Rs. } 9,00,000\end{aligned}$$

Illustration 4

The ratio of variable cost to sales is 70%. The break-even point occurs at 60% of the capacity sales. Find the capacity sales when fixed costs are Rs. 90,000. Also compute profit at 75% of the capacity sales.

Solution:

Variable cost to sales = 70%

Contribution to sales = 30%

Or P/V Ratio 30%

We know that: $\text{BES} \times \text{P/V Ratio} = \text{Fixed Cost}$

$$\text{BES} \times 0.30 = \text{Rs. } 90,000$$

$$\text{Or BES} = \text{Rs. } 3,00,000$$

It is given that break-even occurs at 60% capacity.

$$\begin{aligned}\text{Capacity sales} &= \text{Rs. } 3,00,000 / 0.60 \\ &= \text{Rs. } 5,00,000\end{aligned}$$

Computation of profit of 75% Capacity

75% of capacity sales (i.e. Rs. 5,00,000 x 0.75)	= Rs. 3,75,000
Less: Variable cost (i.e. Rs. 3,75,000 x 0.70)	= Rs. <u>2,62,500</u>
	= Rs. 1,12,500
Less: Fixed Cost	= Rs. <u>90,000</u>
Profit	= Rs. <u>22,500</u>

Illustration 5

Aries Co. has recorded the following data in the two most recent periods:

Total cost of production	Volume of Production
Rs.	(Units)
14,600	800
19,400	1200

What is the best estimate of the firm's fixed costs per period?



Solution:

Variable Cost per unit = Change in Total Cost / Change in Production
= (Rs. 19,400 – Rs. 14,600)/(1200 units – 800 units)
= 4800/400
= Rs. 12 per unit

Total variable cost for 1200 units = 1200 units x Rs. 12
= Rs. 14,400

Total fixed cost = Total cost – Total Variable Cost
= 19400 – 14400
= Rs. 5000

Illustration 6

A company has a P/V ratio of 40%. By what percentage must sales be increased to offset: 20% reduction in selling price?

Solution:

Suppose - Sales = (100 units @ Rs. 1 each)	100
Less: Contribution (40% of sales)	<u>40</u>
Variable Cost	<u>60</u>
When selling price reduced by 20%	Rs.
New Sales	80
Less: Variable Cost	<u>60</u>
New Contribution	<u>20</u>

In order to maintain the same contribution, the volume of sales should be
= (40/20) x 80 = Rs. 160

Thus, if selling price reduced by 20%, the sales will have to be increased by 60% i.e. from Rs. 100 to Rs. 160.

Illustration 7

A company has made a profit of Rs. 50,000 during the year 2006-07. If the selling price and marginal cost of the product are Rs. 15 and Rs. 12 per unit respectively, find out the amount of margin of safety.



Cost Accounting

Solution:

$$\begin{aligned} \text{P/V Ratio} &= (C/S) \times 100 \\ &= [(15 - 12)/15] \times 100 \\ &= (3/15) \times 100 \\ &= 20\% \end{aligned}$$

$$\begin{aligned} \text{Marginal of Safety} &= (\text{Profit}) / (\text{P/V Ratio}) \\ &= 50,000 / 20\% \\ &= \text{Rs. } 2,50,000 \end{aligned}$$

Illustration 8

A company earned a profit of Rs. 30,000 during the year 2008. If the marginal cost and selling price of the product are Rs.8 and Rs.10 per unit respectively, find out the amount of margin of safety.

Solution:

$$\text{P/V ratio} = \frac{S - V}{S} = \frac{10 - 8}{10} = 20\%$$

$$\text{Margin of safety} = \frac{\text{Profit}}{\text{P/V ratio}} = \frac{30,000}{20\%} = \text{Rs. } 1,50,000$$

Illustration 9

- (a) If margin of safety is Rs. 2,40,000 (40% of sales) and P/V ratio is 30% of AB Ltd, calculate its (1) Break even sales, and (2) Amount of profit on sales of Rs.9,00,000.
- (b) X Ltd. has earned a contribution of Rs.2,00,000 and net profit of Rs.1,50,000 of sales of Rs.8,00,000. What is its margin of safety?

Solution:

$$(a) \text{ Total Sales} = 2,40,000 \times \frac{100}{40} = \text{Rs. } 6,00,000$$

$$\text{Contribution} = 6,00,000 \times 30\% = \text{Rs. } 1,80,000$$

$$\text{Profit} = \text{M/S} \times \text{P/V ratio} = 2,40,000 \times 30\% = \text{Rs. } 72,000$$

$$\begin{aligned} \text{Fixed cost} &= \text{Contribution} - \text{Profit} \\ &= 1,80,000 - 72,000 = \text{Rs. } 1,08,000 \end{aligned}$$



Marginal Costing

$$\begin{aligned} (1) \quad \text{Break-even Sales} &= \frac{F}{\text{P/V ratio}} = \frac{1,08,000}{30\%} = \text{Rs. } 3,60,000 \\ (2) \quad \text{Profit} &= (\text{Sales} \times \text{P/V ratio}) - \text{Fixed cost} \\ &= (9,00,000 \times 30\%) - 1,08,000 = \text{Rs. } 1,62,000 \\ (b) \quad \text{P/V ratio} &= \frac{C}{S} = \frac{2,00,000}{8,00,000} = 25\% \\ \text{Margin of safety} &= \frac{\text{Profit}}{\text{P/V ratio}} = \frac{1,50,000}{25\%} = \text{Rs. } 6,00,000 \end{aligned}$$

Alternatively :

$$\begin{aligned} \text{Fixed cost} &= \text{Contribution} - \text{Profit} \\ &= \text{Rs. } 2,00,000 - \text{Rs. } 1,50,000 = \text{Rs. } 50,000 \\ \text{B.E. Point} &= \text{Rs. } 50,000 \div 25\% = \text{Rs. } 2,00,000 \\ \text{Margin of Safety} &= \text{Actual sales} - \text{B.E. sales} \\ &= 8,00,000 - 2,00,000 = 6,00,000 \end{aligned}$$

Illustration 10

A company sells its product at Rs.15 per unit. In a period if it produces and sells 8,000 units, it incurs a loss of Rs.5 per unit. If the volume is raised to 20,000, it earns a profit of Rs.4 per unit. Calculate the break-even point.

Solution:

	Sales Rs.	Profit/Loss Rs.
At 8,000 units	1,20,000	(-) 40,000
At 20,000 units	<u>3,00,000</u>	(+) <u>80,000</u>
Difference	<u>1,80,000</u>	<u>1,20,000</u>

$$\text{P/V ratio} = \frac{\text{Difference in Profit}}{\text{Difference in Sales}} = \frac{1,20,000}{1,80,000} = \frac{2}{3}$$

$$\text{Fixed cost} = (\text{S} \times \text{P/V ratio}) - \text{Profit} = (3,00,000 \times 2/3) - 80,000 = \text{Rs. } 1,20,000$$



Cost Accounting

Break-even point = $F \div P/V = 1,20,000 \div 2/3 = \text{Rs.}1,80,000$.

Illustration 11

A company has three factories situated in north, east and south with its Head Office in Mumbai. The management has received the following summary report on the operations of each factory for a period :

(Rs. in '000)

	Sales		Profit	
	Actual	Over/(Under) Budget	Actual	Over/(Under) Budget
North	1,100	(400)	135	(180)
East	1,450	150	210	90
South	1,200	(200)	330	(110)

Calculate for each factory and for the company as a whole for the period :

- (i) the fixed costs. (ii) break-even sales.

Solution:

Calculation of P/V Ratio

Rs. '000

	Sales	Profit
North : Actual	1,100	135
Add : Under budgeted	<u>400</u>	<u>180</u>
Budgeted	<u>1,500</u>	<u>315</u>

$$P/V \text{ ratio} = \frac{\text{Difference in Profit}}{\text{Difference in Sales}} = \frac{315 - 135}{1,500 - 1,100} = \frac{180}{400} \times 100 = 45\%$$

Rs. '000

	Sales	Profit
East : Actual	1,450	210
Less : Over budgeted	<u>150</u>	<u>90</u>
Budgeted	<u>1,300</u>	<u>120</u>

$$P/V \text{ ratio} = \frac{90}{150} \times 100 = 60\%$$



Marginal Costing

	Rs. '000	
	Sales	Profit
South : Actual	1,200	330
Add : Under budgeted	<u>200</u>	<u>110</u>
Budgeted	<u>1,400</u>	<u>440</u>

$$\text{P/V ratio} = \frac{110}{200} \times 100 = 55\%$$

Calculation of fixed cost

Fixed Cost	= (Actual sales × P/V ratio) – Profit
North	= (1,100 × 45%) – 135= 360
East	= (1,450 × 60%) – 210= 660
South	= (1,200 × 55%) – 330= <u>330</u>
Total Fixed Cost	<u>1,350</u>

Calculation of break-even sales (in Rs.'000)

$$\text{B.E. Sales} = \frac{\text{Fixed Cost}}{\text{P/V ratio}}$$

$$\text{North} = \frac{360}{45\%} = 800$$

$$\text{East} = \frac{660}{60\%} = 1,100$$

$$\text{South} = \frac{330}{55\%} = \underline{600}$$

$$\text{Total} \quad \underline{2,500}$$

Illustration 12

PQR Ltd. has furnished the following data for the two years :

	2006	2007
Sales	Rs. 8,00,000	?
Profit/Volume Ratio (P/V ratio)	50%	37.5%
Margin of Safety sales as a % of total sales	40%	21.875%



Cost Accounting

There has been substantial savings in the fixed cost in the year 2007 due to the restructuring process. The company could maintain its sales quantity level of 2006 in 2007 by reducing selling price.

You are required to calculate the following:

- (i) Sales for 2007 in Rs.
- (ii) Fixed cost for 2007
- (iii) Break-even sales for 2007 in Rupees.

Solution:

In 2006, PV ratio = 50%

Variable cost ratio = 100% - 50% = 50%

Variable cost in 2006 = Rs. 8,00,000 × 50% = Rs. 4,00,000

In 2007, sales quantity has not changed. Thus variable cost in 2007 is Rs. 4,00,000.

In 2007, P/V ratio = 37.50%

Thus, Variable cost ratio = 100% - 37.5% = 62.5%

(i) Thus sales in 2007 = $\frac{4,00,000}{62.5\%} = \text{Rs. } 6,40,000$

At break-even point, fixed costs is equal to contribution.

In 2007, Break-even sales = 100% - 21.875% = 78.125%

(ii) Break-even sales = 6,40,000 × 78.125% = Rs. 5,00,000

(iii) Fixed cost = B.E. sales × P/V ratio
= 5,00,000 × 37.50% = Rs. 1,87,500.

Illustration 13

		<i>Rs.</i>
(i) Ascertain profit, when sales	=	2,00,000
Fixed Cost	=	40,000
BEP	=	1,60,000
(ii) Ascertain sales, when fixed cost	=	20,000
Profit	=	10,000
BEP	=	40,000



Solution:

We know that: B.E. Sales \times P/V Ratio = Fixed Cost

or Rs. 1,60,000 \times P/V ratio = Rs. 40,000

P/V ratio = 25%

We also know that Sales \times P/V Ratio = Fixed Cost + Profit

or Rs. 2,00,000 \times 0.25 = Rs. 40,000 + Profit

or Profit = Rs. 10,000

(ii) Again B.E. Sales \times P/V ratio = Fixed Cost

or Rs. 40,000 \times P/V Ratio = Rs. 20,000

or P/V ratio = 50%

We also know that: Sales \times P/V ratio = Fixed Cost + Profit

or Sales \times 0.50 = Rs. 20,000 + Rs. 10,000

or Sales = Rs. 60,000.

Illustration 14

A company sells its product at Rs. 15 per unit. In a period, if it produces and sells 8,000 units, it incurs a loss of Rs. 5 per unit. If the volume is raised to 20,000 units, it earns a profit of Rs. 4 per unit. Calculate break-even point both in terms of rupees as well as in units.

Solution:

We know that $S - V = F + P$

\therefore Suppose variable cost = x

Fixed Cost = y

In first situation :

$$15 \times 8,000 + 8,000 x = y - 40,000 \quad (1)$$

In second situation :

$$15 \times 20,000 + 20,000 x = y + 80,000 \quad (2)$$

$$\text{or } 1,20,000 - 8,000 x = y - 40,000 \quad (3)$$

$$3,00,000 - 20,000 x = y + 80,000 \quad (4)$$

From (3) & (4) we get $x = \text{Rs. } 5$.



Cost Accounting

Variable cost per unit = Rs. 5

Putting this value in 3rd equation:

$$1,20,000 - (8,000 \times 5) = y - 40,000$$

or $y = \text{Rs. } 1,20,000$

Fixed Cost = Rs. 1,20,000

$$\text{P/V ratio} = \frac{S - V}{S} = \frac{15 - 5}{15} \times 100 = \frac{200}{3} = 66 \frac{2}{3} \%.$$

Suppose break-even sales = x

$$15x - 5x = 1,20,000 \quad (\text{at BEP, contribution will be equal to fixed cost})$$

$$x = 12,000 \text{ units.}$$

Or Break-even sales in units = 12,000

Break-even sales in rupees = $12,000 \times 15 = \text{Rs. } 1,80,000$.

Illustration 15

You are given the following data for the year 2007 of Rio Co. Ltd:

Variable cost	60,000	60%
Fixed cost	30,000	30%
Net profit	<u>10,000</u>	<u>10%</u>
Sales	<u>1,00,000</u>	100%

Find out (a) Break-even point, (b) P/V ratio, and (c) Margin of safety. Also draw a break-even chart showing contribution and profit.

Solution:

$$\text{P/V ratio} = \frac{S - V}{S} = \frac{1,00,000 - 60,000}{1,00,000} = 40\%$$

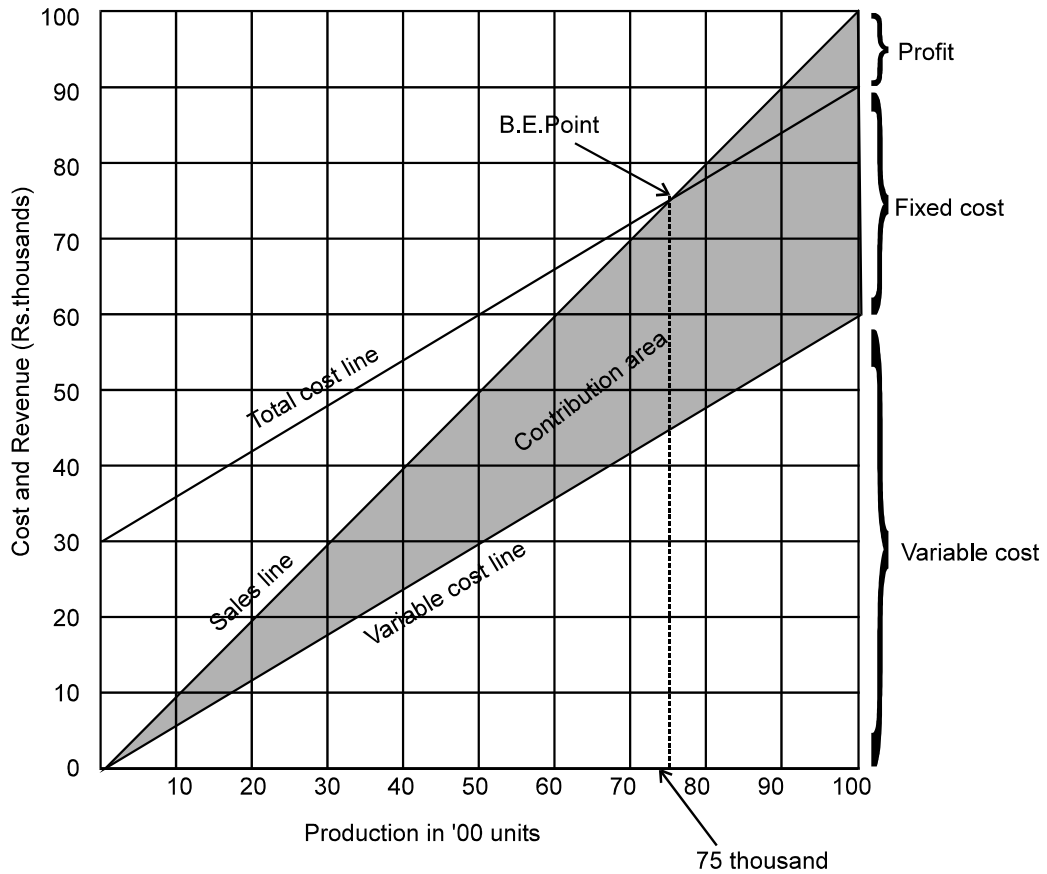
$$\text{Break Even Point} = \frac{F}{\text{P/V ratio}} = \frac{30,000}{40\%} = \text{Rs. } 75,000$$

Margin of safety = Actual Sales – BE point = $1,00,000 - 75,000 = \text{Rs. } 25,000$

Break even chart showing contribution is shown below:



Marginal Costing



Break-even chart

Illustration 16

- (a) You are given the following data for the coming year for a factory.

Budgeted output	8,00,000 units
Fixed expenses	40,00,000
Variable expenses per unit	Rs. 100
Selling price per unit	Rs. 200

Draw a break-even chart showing the break-even point.

- (b) If price is reduced to Rs. 180, what will be the new break-even point?



Cost Accounting

Solution:

(a) Contribution = S – V = Rs. 200 – Rs. 100 = Rs. 100 per unit.

$$\text{B.E. Point} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{40,00,000}{\text{Rs. } 100} = 40,000 \text{ units}$$

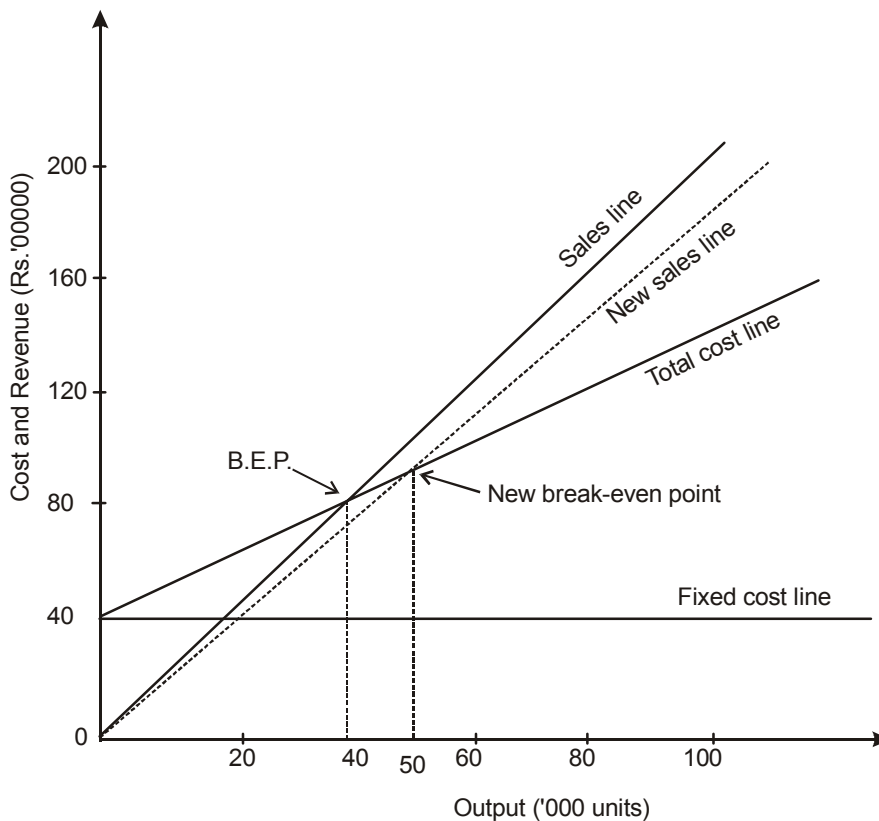
(b) When selling price is reduced

New selling price = Rs. 180

New Contribution = Rs. 180 – Rs. 100 = Rs. 80 per unit.

$$\text{New B.E. Point} = \frac{\text{Rs. } 40,00,000}{\text{Rs. } 80} = 50,000 \text{ units.}$$

The break-even chart is shown below:



Break-even chart



Marginal Costing

Illustration 17

You are given the following data :

	<i>Sales</i>	<i>Profit</i>
Year 2006	Rs. 1,20,000	8,000
Year 2007	Rs. 1,40,000	13,000

Find out –

- (i) P/V ratio,
- (ii) B.E. Point,
- (iii) Profit when sales are Rs.1,80,000,
- (iv) Sales required earn a profit of Rs.12,000,
- (v) Margin of safety in year 2007.

Solution:

	<i>Sales</i>	<i>Profit</i>
Year 2006	Rs. 1,20,000	8,000
Year 2007	Rs. <u>1,40,000</u>	<u>13,000</u>
Difference	Rs. <u>20,000</u>	<u>5,000</u>

$$(i) \text{ P/V Ratio} = \frac{\text{Difference in profit}}{\text{Difference in Sales}} \times 100 = \frac{5,000}{20,000} \times 100 = 25 \%$$

	Rs.
Contribution in 2006 (1,20,000 × 25%)	30,000
Less : Profit	<u>8,000</u>
Fixed Cost*	<u>22,000</u>

$$* \text{Contribution} = \text{Fixed cost} + \text{Profit}$$

$$\therefore \text{Fixed cost} = \text{Contribution} - \text{Profit}$$

$$(ii) \text{ Break-even point} = \frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{22,000}{25\%} = \text{Rs. } 88,000$$



Cost Accounting

(iii) Profit when sales are Rs.1,80,000	Rs.
Contribution (Rs.1,80,000 × 25%)	45,000
Less: Fixed cost	<u>22,000</u>
Profit	<u>23,000</u>

(iv) Sales to earn a profit of Rs.12,000

$$\frac{\text{Fixed cost} + \text{Desired profit}}{\text{P/V ratio}} = \frac{22,000 + 12,000}{25\%} = \text{Rs.1,36,000}$$

(v) Margin of safety in 2007 –

$$\begin{aligned}\text{Margin of safety} &= \text{Actual sales} - \text{Break-even sales} \\ &= 1,40,000 - 88,000 = \text{Rs. } 52,000.\end{aligned}$$

Illustration 18

A company had incurred fixed expenses of Rs. 4,50,000, with sales of Rs.15,00,000 and earned a profit of Rs.3,00,000 during the first half year. In the second half, it suffered a loss of Rs.1,50,000.

Calculate:

- The profit-volume ratio, break-even point and margin of safety for the first half year.
- Expected sales volume for the second half year assuming that selling price and fixed expenses remained unchanged during the second half year.
- The break-even point and margin of safety for the whole year.

Solution:

(i) In the First half year

$$\begin{aligned}\text{Contribution} &= \text{Fixed cost} + \text{Profit} \\ &= 4,50,000 + 3,00,000 = \text{Rs. } 7,50,000\end{aligned}$$

$$\text{P/V ratio} = \frac{C}{S} = \frac{7,50,000}{15,00,000} = 50\%$$

$$\text{Break-even point} = \frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{4,50,000}{50\%} = \text{Rs. } 9,00,000$$



Marginal Costing

$$\begin{aligned}\text{Margin of safety} &= \text{Actual sales} - \text{Break-even point} \\ &= 15,00,000 - 9,00,000 = \text{Rs. } 6,00,000\end{aligned}$$

(ii) In the second half year

$$\begin{aligned}\text{Contribution} &= \text{Fixed cost} - \text{Loss} \\ &= 4,50,000 - 1,50,000 = \text{Rs. } 3,00,000\end{aligned}$$

$$\text{Expected sales volume} = \frac{\text{Fixed cost} - \text{Loss}}{\text{P/V ratio}} = \frac{3,00,000}{50\%} = \text{Rs. } 6,00,000$$

(iii) For the whole year

$$\text{B.E. point} = \frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{4,50,000 \times 2}{50\%} = \text{Rs. } 18,00,000$$

$$\text{Margin of safety} = \frac{\text{Profit}}{\text{P/V ratio}} = \frac{3,00,000 - 1,50,000}{50\%} = \text{Rs. } 3,00,000.$$

Illustration 19

Mr. X has Rs. 2,00,000 investments in his business firm. He wants a 15 per cent return on his money. From an analysis of recent cost figures, he finds that his variable cost of operating is 60 per cent of sales, his fixed costs are Rs. 80,000 per year. Show computations to answer the following questions:

- (i) What sales volume must be obtained to break even?
- (ii) What sales volume must be obtained to get 15 per cent return on investment?
- (iii) Mr. X estimates that even if he closed the doors of his business, he would incur Rs. 25,000 as expenses per year. At what sales would he be better off by locking his business up?

Solution:

	Rs.
Suppose sales	100
Variable cost	<u>60</u>
Contribution	<u>40</u>
P/V ratio	40%
Fixed cost	= Rs. 80,000



Cost Accounting

- (i) Break-even point = Fixed Cost \div P/V ratio = 80,000 \div 40% or Rs. 2,00,000
- (ii) 15% return on Rs. 2,00,000 30,000
Fixed Cost 80,000
Contribution required 1,10,000
Sales volume required = Rs. 1,10,000 \div 40% or Rs. 2,75,000
- (iii) Fixed cost even if business is locked up = Rs. 25,000
Minimum sales required to meet this cost: Rs. 25,000 \div 40% or Rs. 62,500
Mr. X will be better off if the sale is more than Rs. 62,500.

Illustration 20

A single product company sells its product at Rs. 60 per unit. In 2006, the company operated at a margin of safety of 40%. The fixed costs amounted to Rs. 3,60,000 and the variable cost ratio to sales was 80%.

In 2007, it is estimated that the variable cost will go up by 10% and the fixed cost will increase by 5%.

Find the selling price required to be fixed in 2007 to earn the same P/V ratio as in 2006.

Assuming the same selling price of Rs. 60 per unit in 2007, find the number of units required to be produced and sold to earn the same profit as in 2006.

Solution:

1. PV Ratio in 2006

	Rs.
Selling price per unit	60
Variable cost (80% of Selling Price)	<u>48</u>
Contribution	<u>12</u>
P/V Ratio	20%

2. No. of units sold in 2006

$$\begin{aligned}\text{Break-even point} &= \text{Fixed cost} \div \text{Contribution per unit} \\ &= \text{Rs. } 3,60,000 \div \text{Rs. } 12 = 30,000 \text{ units.}\end{aligned}$$



Marginal Costing

Margin of safety is 40%. Therefore, break-even sales will be 60% of units sold.

$$\begin{aligned}\text{No. of units sold} &= \text{Break-even point in units} \div 60\% \\ &= 30,000 \div 60\% = 50,000 \text{ units.}\end{aligned}$$

3. Profit earned in 2006

	Rs.
Total contribution (50,000 × Rs. 12)	6,00,000
Less: Fixed cost	<u>3,60,000</u>
	<u>2,40,000</u>
Selling price to be fixed in 2007	
Revised variable cost (Rs. 48 × 1.10)	52.80
Revised fixed cost (3,60,000 × 1.05)	3,78,000
P/V Ratio (Same as of 2006)	20%
Variable cost ratio to selling price	80%

Therefore revised selling price per unit = Rs. 52.80 ÷ 80% = Rs. 66.

No. of units to be produced and sold in 2007 to earn the same profit

We know that Fixed Cost plus profit =	Contribution
	Rs.
Profit in 2006	2,40,000
Fixed cost in 2007	<u>3,78,000</u>
Desired contribution in 2007	<u>6,18,000</u>

Contribution per unit = Selling price per unit – Variable cost per unit.

$$= \text{Rs. } 66 - \text{Rs. } 52.80 = \text{Rs. } 13.20.$$

No. of units to be produced in 2007 = Rs. 6,18,000 ÷ Rs. 13.20 = 46,818 units.

Illustration 21

XYZ Ltd. has a production capacity of 2,00,000 units per year. Normal capacity utilisation is reckoned as 90%. Standard variable production costs are Rs.11 per unit. The fixed costs are Rs.3,60,000 per year. Variable selling costs are Rs.3 per unit and fixed selling costs are Rs.2,70,000 per year. The unit selling price is Rs.20.



Cost Accounting

In the year just ended on 30th June, 2006, the production was 1,60,000 units and sales were 1,50,000 units. The closing inventory on 30th June was 20,000 units. The actual variable production costs for the year were Rs. 35,000 higher than the standard.

- (i) Calculate the profit for the year
 - (a) by absorption costing method and
 - (b) by marginal costing method.
- (ii) Explain the difference in the profits.

Solution:

Income Statement (Absorption Costing) for the year ending 30th June 2006

	Rs.
Sales (1,50,000 units @ Rs.20)	<u>30,00,000</u>
Production Costs :	
Variable (1,60,000 units @ Rs.11)	17,60,000
Add :Increase	<u>35,000</u>
Fixed (1,60,000 units @ Rs.2*)	<u>3,20,000</u>
Cost of Goods Produced	21,15,000
Add :Opening stock (10,000 units @ Rs.13)*	<u>1,30,000</u>
	22,45,000
Less :Closing stock $\left(\frac{\text{Rs.21,15,000}}{1,60,000 \text{ units}} \times 20,000 \text{ units} \right)$	<u>2,64,375</u>
Cost of Goods Sold	19,80,625
Add :Under absorbed fixed production overhead (3,60,000 – 3,20,000)	<u>40,000</u>
	20,20,625
Add :Non-production costs :	
Variable selling costs (1.50,000 units @ Rs.3)	4,50,000
Fixed selling costs	<u>2,70,000</u>
Total cost	<u>27,40,625</u>
Profit (Sales – Total Cost)	<u>2,59,375</u>



Marginal Costing

* Working Notes :

1. Fixed production overhead are absorbed at a pre-determined rate based on normal capacity, i.e. $\text{Rs.}3,60,000 \div 1,80,000 \text{ units} = \text{Rs.} 2$.
2. Opening stock is 10,000 units, i.e., 1,50,000 units + 20,000 units – 1,60,000 units. It is valued at Rs.13 per unit, i.e., Rs.11 + Rs.2 (Variable + fixed).

Income Statement (Marginal Costing) for the year ended 30th June, 2006

	Rs.
Sales (1,50,000 units @ Rs.20)	<u>30,00,000</u>
Variable production cost (1,60,000 units @ Rs.11 + Rs.35,000)	17,95,000
Variable selling cost (1,50,000 units @ Rs.3)	<u>4,50,000</u>
	22,45,000
Add : Opening Stock (10,000 units @ Rs.11)	<u>1,10,000</u>
	23,55,000
Less : Closing stock $\left(\frac{\text{Rs.}17,95,000}{1,60,000 \text{ units}} \times 20,000 \text{ units} \right)$	<u>2,24,375</u>
Variable cost of goods sold	<u>21,30,625</u>
Contribution (Sales – Variable cost of goods sold)	<u>8,69,375</u>
Less : Fixed cost – Production	3,60,000
– Selling	<u>2,70,000</u>
Profit	<u>2,39,375</u>

	Rs.
Reasons for Difference in Profit:	
Profit as per absorption costing	2,59,375
Add : Op. stock under –valued in marginal costing (Rs.1,30,000 – 1,10,000)	<u>20,000</u>
	2,79,375
Less : Cl. Stock under –valued in marginal closing (Rs.2,64,375 – 2,24,375)	<u>40,000</u>
Profit as per marginal costing	<u>2,39,375</u>



9.11 Self Examination Questions

Multiple Choice Questions

1. A company makes and sells a single product. If the fixed cost incurred in making and selling the product increase:
 - a. The breakeven point will increase
 - b. The breakeven point will decrease
 - c. The breakeven point will remain the same
 - d. Neither a nor b nor c
2. ABC Ltd manufactures a single product which it sells for Rs. 20 per unit. Fixed costs are Rs. 60,000 per annum. The contribution to sales ratio is 40 percent. ABC Ltd breakeven point in units is
 - a. 7,500
 - b. 8,000
 - c. 7,000
 - d. 7,400
3. ABC Ltd sells a single product for Rs. 9 per unit. The variable cost is Rs. 6 per unit and the fixed cost total Rs. 54,000 per month. In a period when the actual sales were Rs.1,80,000, ABC Ltd. Margin of Safety , in units was
 - a. 16,000
 - b. 18,000
 - c. 2,000
 - d. 17,000
4. Variable costs are budgeted to be 60% of the sales value whereas the fixed costs are estimated as 10% of the sales value. If the company increases its selling price by 10% and fixed cost per unit, variable cost per unit and the sales volume remain the same, the effect of the contribution will be
 - a. An increase by 3%
 - b. An increase by 10%
 - c. A increase by 25%
 - d. A increase by 30%



Marginal Costing

5. ABC Ltd plans to produce and sell 4,000 units of product C each month, at a selling price of Rs. 18 per unit. The unit cost comprises of Rs. 8 variable cost and Rs. 4 fixed cost. Calculate the monthly margin of safety, as a percentage of planned sales
 - a. 60%
 - b. 70%
 - c. 65%
 - d. 75%
6. Product X generates a contribution to sales ratio of 30%. Fixed costs directly attributable to X amount to Rs. 75,000 per month. Calculate the sales revenue required to achieve a monthly profit of Rs. 15,000
 - a. Rs. 2,00,000
 - b. Rs. 2,76,000
 - c. Rs. 3,00,000
 - d. Rs. 2,50,000
7. Which of the statements about the profit – volume graph are true?
 - a. The profit lines passes through the origin
 - b. Other things being equal, the angle of the profit line becomes steeper when the selling price increases
 - c. Contribution cannot be read directly from the chart
 - d. Fixed costs are shown as line parallel to the horizontal axis
8. When comparing the profits reported under marginal and absorption costing during a period when the level of stocks increased
 - a. Absorption costing profits will be higher and closing stock valuations lower than those under marginal costing
 - b. Absorption profits will be higher and closing stock valuations higher than those under marginal costing
 - c. Marginal costing profits will be higher and closing stock valuations lower than those under absorption costing
 - d. Marginal costing profits will be lower and closing stock valuations higher than those under absorption costing.



Cost Accounting

9. A company made 17,500 units at a total cost of Rs. 16 each. Three quarters of the cost were variable and one quarter fixed. 15,000 units were sold at Rs. 25 each. There were no opening stocks. By how much will profit calculated under absorption costing differ from the profit if marginal costing principles were used?
 - a. Absorption costing profit will be Rs. 22,500 less.
 - b. Absorption costing profit would be Rs. 10,000 greater.
 - c. Absorption costing profit would be Rs. 1,35,000 greater.
 - d. Costing profit would be Rs. 10,000 less.
10. A Rs. 1,30,000 absorption costing profit was made in a particular period which had an opening and closing stock of 15,000 and 20,000 units respectively. If the fixed overhead absorption rate is Rs. 8 per unit, the marginal costing profit would be
 - a. Rs. 90,000
 - b. Rs. 1,30,000
 - c. Rs. 1,70,000
 - d. Impossible to calculate

Answers to Multiple Choice Questions

1.a. 2.a. 3.c. 4.c. 5.a. 6.c 7.d 8.b 9.a 10.b

Short Answer Type Questions

1. What is a marginal cost?
2. What is contribution? How is it related to profit.
3. What is a limiting or key factor. Give examples.
4. Why is it important to classify costs as fixed and variable.
5. What is a marginal cost equation?

Long Answer Type Questions

1. Differentiate between absorption costing and marginal costing.
2. What are the advantages and disadvantages of marginal costing?
3. Critically discuss the assumptions underlying CVP analysis.
4. How is a traditional breakeven chart different from the contribution breakeven chart. Discuss.
5. What is a profit volume chart? State its advantages.



Numerical Questions

1. The Ward Company sold 1,00,000 units of its product at Rs. 20 per unit. Variable costs are Rs. 14 per unit (manufacturing costs of Rs. 11 and selling costs of Rs. 3). Fixed costs are incurred uniformly throughout the year and amount to Rs. 7,92,000 (manufacturing costs of Rs. 500,000 and selling costs of Rs. 292,000). There are no beginning or ending inventories.

Required:

Determine the following:

- The break-even point for this product
 - The number of units that must be sold to earn an income of Rs. 60,000 for the year (before income taxes)
 - The number of units that must be sold to earn an after-tax income of Rs. 90,000, assuming a tax-rate of 40 percent.
 - The break-even point for this product after a 10 percent increase in wages and salaries (assuming labour costs are 50 percent of variable costs and 20 percent of fixed costs).
2. ABC Ltd is planning a concert in a remote village in India. The following costs have been estimated,

	<i>Rs.</i>
Rent of premises	1,300
Advertising	1,000
Printing of tickets	250
Ticket sellers , security	400
Wages of ABC Ltd personnel employed at the concert	600
Fee to artist	1,000

There are no variable costs of staging the concert. The company is considering a selling price for tickets at either Rs. 4 or Rs. 5 each.

Required:



Cost Accounting

- (a) Calculate the number of tickets that must be sold at each price in order to breakeven.
- (b) Recalculate, the number of tickets which must be sold at each price in order to breakeven, if the artist agrees to change from a fixed fee of Rs. 1,000 to a fee equal to 25% of the gross sales proceeds.
- (c) Calculate the level of ticket sales, for each price, at which the company would be indifferent as between the fixed and percentage fee alternatives.
- (d) Comment on the factors which you think the company might consider in choosing between the fixed fee and percentage fee alternative.

Answers to Numerical Questions.

- 1.
 - (a) 1,32,000 units
 - (b) 1,42,000 units
 - (c) 1,57,000 units
 - (d) 1,52,423 units
- 2.
 - (a) At price of Rs. 4 BES = 1,138 tickets
At price of Rs. 5 BES = 910 tickets.
 - (b) At price of Rs. 4 BES = 1,183 tickets
At price of Rs. 5 BES = 947 tickets.
 - (c) 800 tickets.

CHAPTER 10

BUDGETS AND BUDGETARY CONTROL

Learning Objectives

When you have finished studying this chapter, you should be able to

- ◆ Understand the objectives and importance of budgeting and budgetary control
- ◆ Understand the Advantages and disadvantages of budgetary control
- ◆ Differentiate between various types of budgets.
- ◆ Understand the process of preparation of budgets

10.1 INTRODUCTION

Budgetary control and standard costing systems are two essential tools frequently used by business executives for the purpose of planning and control. In the case of budgetary control, the entire exercise starts with the setting up of budgets or targets and ends with the taking of an action, in case the actual figures differed with the budgetary ones.

The Chartered Institute of Management Accountants of England and Wales has defined the terms 'budget' and 'budgetary control' as follows :

Budget: "A financial and/or quantitative statement, prepared and approved prior to a defined period of time of the policy to be pursued during that period for the purpose of attaining a given objective. It may include income, expenditure and employment of capital".

Budgetary Control : "Budgetary control is the establishment of budgets relating to the responsibilities of executives of a policy and the continuous comparison of the actual with the budgeted results, either to secure by individual action the objective of the policy or to provide a basis for its revision."

Budgets are usually, set up in the light of past experience after taking into account the changes that are expected to occur in the future. It is, therefore, to be expected that actual figures will correspond to the budget unless there is some important change in the conditions. In fact, it must be the constant endeavour of the management to see that



actual performance does correspond with the budget concerned. Since budgets assume the optimum efficiency attainable, the system of budgetary control helps to increase efficiency and enables the concern to achieve the targets which are considered attainable.

10.2 OBJECTIVES OF BUDGETING

The process of budgeting is initiated with the establishment of specific targets of performance and is followed by executing plans to achieve such desired goals and from time to time comparing actual results with the targets of performances/goals. These targets include both the overall business targets as well as the specific targets for the individual units within the business. Establishing specific targets for future operations is part of the planning function of management, while executing actions to meet the goals is the directing function of management.

10.2.1 Planning : A set of targets/goals is often necessary to guide and focus individual and group actions. For example, students set academic goals, batsmen runs, employees set career goals, and business set financial goals. In the same way, budgeting supports the planning process by requiring all organisational units to establish their targets for the upcoming period. The targets, in turn, motivate individuals and groups to perform at high levels. Using the budget to communicate these expectations throughout the organization has helped many a companies to reduce expenses during a severe business recession.

Planning not only motivates employees to attain goals but also improves overall decision making. During the planning phase of the budget process, all viewpoints are considered, options identified, and cost reduction opportunities assessed. This process may reveal opportunities or threats that were not known prior to the budget planning process.

10.2.2 Directing: Once the budget plans are in place, they can be used to direct and coordinate operations in order to achieve the stated targets. For example, your target to receive “90%” in an exam would result in certain activities, such as reading books, completing assignments, participating in class, and studying for exams. Such actions are fairly easy to direct and coordinate. A business, however, is much more complex and requires more formal direction and coordination. The budget is one way to direct and coordinate business activities and units to achieve stated targets of performance. The budgetary units of an organisation are called responsibility centers. Each responsibility center is led by a manager who has the authority over and responsibility for the unit's performance.



Budgets and Budgetary Control

10.2.3 Controlling: As time passes, the actual performance of an operation can be compared against the planned targets. This provides prompt feedback to employees about their performance. If necessary, employees can use such feedback to adjust their activities in the future. For example, a salesperson may be given a quota to achieve Rs10,00,000 in sales for a particular period. If the actual sales are only Rs 8,75,000, the salesperson can use this feedback about underperformance to change sales tactics and improve future sales. Feedback is not only helpful to individuals, but it can also redirect a complete organisation, For example, McDonalds" Corporation recently decided to reverse its growth plans by closing stores and pulling out of a few countries as a result of reporting its first quarterly loss since becoming a public company in 1965.

Comparing actual results to the plan also helps prevent unplanned expenditures. The budget encourages employees to establish their spending priorities. For example, committees in professional Institutes have budgets to support faculty travel to conferences and meetings. The travel budget communicates to the officer the upper limit on travel. Often, desired travel exceeds the budget. Thus, the budget requires the officer to prioritise travel-related opportunities.

10.3 BUDGETARY CONTROL

It can be defined as "the establishment of budgets relating to the responsibilities of executives to the requirements of a policy, and the continuous comparison of actual with budgeted results either to secure by individual action the objective of that policy or to provide a base for its revision".

The salient features of such a system are the following :

- (i) Determining the objectives to be achieved, over the budget period, and the policy or policies that might be adopted for the achievement of these ends.
- (ii) Determining the variety of activities that should be undertaken for the achievement of the objectives.
- (iii) Drawing up a plan or a scheme of operation in respect of each class of activity, in physical as well as monetary terms for the full budget period and its parts.
- (iv) Laying out a system of comparison of actual performance by each person, section or department with the relevant budget and determination of causes for the discrepancies, if any.



- (v) Ensuring that corrective action will be taken where the plan is not being achieved and, if that be not possible, for the revision of the plan.

In brief, it is a system to assist management in the allocation of responsibility and authority, to provide it with aid for making, estimating and planning for the future and to facilitate the analysis of the variation between estimated and actual performance. In order that budgetary control may function effectively, it is necessary that the concern should develop proper basis of measurement or standards with which to evaluate the efficiency of operations, *i.e.*, it should have in operation a system of standard costing. Beside this, the organisation of the concern should be so integrated that all lines of authority and responsibility are laid, allocated and defined. This is essential since the system of budgetary control postulates separation of functions and division of responsibilities and thus requires that the organisation shall be planned in such a manner that every one, from the Managing Director down to the Shop Foreman, will have his duties properly defined.

10.3.1 Objectives of Budgetary Control System : The objectives of a system of budgetary control are given below :

- (i) Portraying with precision the overall aims of the business and determining targets of performance for each section or department of the business.
- (ii) Laying down the responsibilities of each of the executives and other personnel so that every one knows what is expected of him and how he will be judged. Budgetary control is one of the few ways in which an objective assessment of executives or department is possible.
- (iii) Providing a basis for the comparison of actual performance with the predetermined targets and investigation of deviation, if any, of actual performance and expenses from the budgeted figures. This naturally helps in adopting corrective measures.
- (iv) Ensuring the best use of all available resources to maximise profit or production, subject to the limiting factors. Since budgets cannot be properly drawn up without considering all aspects usually there is good co-ordination when a system of budgetary control operates.
- (v) Co-ordinating the various activities of the business, and centralising control and yet enabling management to decentralise responsibility and delegate authority in the overall interest of the business.



Budgets and Budgetary Control

- (vi) Engendering a spirit of careful forethought, assessment of what is possible and an attempt at it. It leads to dynamism without recklessness. Of course, much depends on the objectives of the firm and the vigour of its management.
- (vii) Providing a basis for revision of current and future policies.
- (viii) Drawing up long range plans with a fair measure of accuracy.
- (ix) Providing a yardstick against which actual results can be compared.

10.3.2 Working of a Budgetary Control System : The responsibility for successfully introducing and implementing a Budgetary Control System rests with the Budget Committee acting through the Budget Officer. The Budget Committee would be composed of all functional heads and a member from the Board to preside over and guide the deliberations. The main responsibilities of the Budget Officer are :

- (i) to assist in the preparation of the various budgets by coordinating the work of the accounts department which is normally responsible to compile the budgets—with the relevant functional departments like Sales, Production, Plant maintenance etc.;
- (ii) to forward the budget to the individuals who are responsible to adhere to them, and to guide them in overcoming any practical difficulties in its working;
- (iii) to prepare the periodical budget reports for circulation to the individuals concerned;
- (iv) to follow-up action to be taken on the budget reports;
- (v) to prepare an overall budget working report for discussion at the Budget Committee meetings and to ensure follow-up on the lines of action suggested by the Committee;
- (vi) to prepare periodical reports for the Board meeting. Comparing the budgeted Profit and Loss Account and the Balance Sheet with the actual results attained.

It is necessary that every budget should be thoroughly discussed with the functional head before it is finalised. It is the duty of the Budget Officer to see that the periodical budget reports are supplied to the recipients at frequent intervals as far as possible. The efficiency of the Budget Officer, and through him of the Budget Committee, will be judged more by the smooth working of the system and the agreement between the actual figures and the budgeted figures. Budgets are primarily an incentive and a challenge for better performance; it is up to the Budget Officer to see that attention of the different functional heads is drawn to it to face the challenge in a successful manner.



10.3.3 Advantages of Budgetary Control System

1. The use of budgetary control system enables the management of a business concern to conduct its business activities in the efficient manner.
2. It is a powerful instrument used by business houses for the control of their expenditure. It infact provides a yardstick for measuring and evaluating the performance of individuals and their departments.
3. It reveals the deviations to management, from the budgeted figures after making a comparison with actual figures.
4. Effective utilisation of various resources like—men, material, machinery and money—is made possible, as the production is planned after taking them into account.
5. It helps in the review of current trends and framing of future policies.
6. It creates suitable conditions for the implementation of standard costing system in a business organisation.
7. It inculcates the feeling of cost consciousness among workers.

10.3.4 Limitations of Budgetary Control System : The limitations of budgetary control system are as follows :

1. Budgets may or may not be true, as they are based on estimates.
2. Budgets are considered as rigid document.
3. Budgets cannot be executed automatically.
4. Staff co-operation is usually not available during budgetary control exercise.
5. Its implementation is quite expensive.

10.3.5 Components of Budgetary Control System : The policy of a business for a defined period is represented by the master budget the details of which are given in a number of individual budgets called *functional budgets*. These functional budgets are broadly grouped under the following heads :

- (i) *Physical budgets* - Those budgets which contains information in terms of physical units about sales, production etc. for example, quantity of sales, quantity of production, inventories, and manpower budgets are physical budgets.
- (ii) *Cost budgets* - Budgets which provides cost information in respect of manufacturing,



Budgets and Budgetary Control

selling, administration etc. for example, manufacturing costs, selling costs, administration cost, and research and development cost budgets are cost budgets.

- (iii) *Profit budgets* - A budget which enables in the ascertainment of profit, for example, sales budget, profit and loss budget, etc.
- (iv) *Financial budgets* - A budget which facilitates in ascertaining the financial position of a concern, for example, cash budgets, capital expenditure budget, budgeted balance sheet etc.

10.4 DIFFERENT TYPES OF BUDGETS

Budgets may be classified by : Capacity, coverage they encompass, periods which they cover and conditions on which they are based.

BUDGET

<i>Capacity</i>		<i>Coverage</i>		<i>Period</i>		<i>Conditions</i>	
<i>Fixed Budgets</i>	<i>Flexible Budgets</i>	<i>Functional Budgets</i>	<i>Master term Budgets</i>	<i>Long term Budgets</i>	<i>Short term Budgets</i>	<i>Basic Budgets</i>	<i>Current Budgets</i>

Fixed budget - According to Chartered Institute of Management Accountants of England, “a fixed budget, is a budget designed to remain unchanged irrespective of the level of activity actually attained”. A **fixed budget** shows the expected results of a responsibility center for only one activity level. Once the budget has been determined, it is not changed, even if the activity changes. Fixed budgeting is used by many service companies and for some administrative functions of manufacturing companies, such as purchasing, engineering, and accounting. Fixed Budget is used as an effective tool of cost control. In case, the level of activity attained is different from the level of activity for budgeting purposes, the fixed budget becomes ineffective. Such a budget is quite suitable for fixed expenses. It is also known as a static budget.

Flexible budget - Unlike static budgets, **flexible budgets** show the expected results of a responsibility center for several activity levels. You can think of a flexible budget as a series of static budgets for different levels of activity. Such budgets are especially useful in estimating and controlling factory costs and operating expenses. It is more realistic and practicable because it gives due consideration to cost behaviour at different levels of activity. While preparing a flexible budget the expenses are classified into three



categories *viz.*

- (i) Fixed,
- (ii) Variable, and
- (iii) Semi-variable.

Semi-variable expenses are further segregated into fixed and variable expenses. Flexible budgeting may be resorted to under following situations:

- (i) In the case of new business venture due to its typical nature it may be difficult to forecast the demand of a product accurately.
- (ii) Where the business is dependent upon the mercy of nature e.g., a person dealing in wool trade may have enough market if temperature goes below the freezing point.
- (iii) In the case of labour intensive industry where the production of the concern is dependent upon the availability of labour.

Functional budgets - Budgets which relate to the individual functions in an organisation are known as Functional Budgets. For example, purchase budget; sales budget; production budget; plant-utilisation budget and cash budget.

Master budget - It is a consolidated summary of the various functional budgets. It serves as the basis upon which budgeted P & L A/c and forecasted Balance Sheet are built up.

Long-term budgets - The budgets which are prepared for periods longer than a year are called long-term budgets. Such budgets are helpful in business forecasting and forward planning. Capital expenditure budget and Research and Development budget are examples of long-term budgets.

Short-term budgets - Budgets which are prepared for periods less than a year are known as short-term budgets. Cash budget is an example of short-term budget. Such types of budgets are prepared in cases where a specific action has to be immediately taken to bring any variation under control, as in cash budgets.

Basic budgets - A budget which remains unaltered over a long period of time is called basic budget.

Current budgets - A budget which is established for use over a short period of time and is related to the current conditions is called current budget.



10.5 PREPARATION OF BUDGETS

(a) *Definition of objectives* - A budget being a plan for the achievement of certain operational objectives, it is desirable that the same are defined precisely. The objectives should be written out; the areas of control demarcated; and items of revenue and expenditure to be covered by the budget stated. This will give a clear understanding of the plan and its scope to all those who must cooperate to make it a success.

(b) *Location of the key (or budget) factor* - There is usually one factor (sometimes there may be more than one) which sets a limit to the total activity. For instance, in India today sometimes non-availability of power does not allow production to increase inspite of heavy demand. Similarly, lack of demand may limit production. Such a factor is known as key factor. For proper budgeting, it must be located and estimated properly.

(c) *Appointment of controller* - Formulation of a budget usually required whole time services of a senior executive; he must be assisted in this work by a Budget Committee, consisting of all the heads of department along with the Managing Director as the Chairman. The Controller is responsible for co-ordinating and development of budget programmes and preparing the manual of instruction, known as Budget manual. The Budget manual is a schedule, document or booklet which shows, in written forms the budgeting organisation and procedures. The manual should be well written and indexed so that a copy thereof may be given to each departmental head for guidance.

(d) *Budget period* - The period covered by a budget is known as budget period. There is no general rule governing the selection of the budget period. In practice the Budget Committee determines the length of the budget period suitable for the business. Normally, a calendar year or a period coterminous with the financial year is adopted. The budget period is then sub-divided into shorter periods—it may be months or quarters or such periods as coincide with period of trading activity.

(e) *Standard of activity or output* - For preparing budgets for the future, past statistics cannot be completely relied upon, for the past usually represents a combination of good and bad factors. Therefore, though results of the past should be studied but these should only be applied when there is a likelihood of similar conditions repeating in the future. Also, while setting the targets for the future, it must be remembered that in a progressive business, the achievement of a year must exceed those of earlier years. Therefore what was good in the past is only fair for the current year.



In budgeting, fixing the budget of sales and of capital expenditure are most important since these budgets determine the extent of development activity. For budgeting sales, one must consider the trend of economic activity of the country, reactions of salesmen, customers and employees, effect of price changes on sales, the provision for advertisement campaign plan capacity etc.

10.5.1 Functional budget - A functional budget is one which is related to function of the business as for example, production budget relating to the manufacturing function. Functional budgets are prepared for each function and they are subsidiary to the master budget of the business. The various types of functional budgets to be prepared will vary according to the size and nature of the business. The various commonly used functional budgets are :

- (i) Sales budget
- (ii) Production budget
- (iii) Plant utilisation budget
- (iv) Direct-material usage budget
- (v) Direct-material purchase budget
- (vi) Direct-labour (personnel) budget
- (vii) Factory overhead budget
- (viii) Production cost budget
- (ix) Ending-inventory budget
- (x) Cost-of-goods-sold budget
- (xi) Selling and distribution cost budget
- (xii) Administration expenses budget
- (xiii) Research and development cost budget
- (xiv) Capital expenditure budget
- (xv) Cash budget
- (xvi) Budget summaries/Master budget - Budgeted income statement and Budgeted balance sheet.



Budgets and Budgetary Control

The important functional budgets (also known as schedules to master budget) and the master budget are discussed and illustrated below :

Sales budget - Sales forecast is the commencement of budgeting and hence sales budget assumes primary importance. The quantity which can be sold may be the principal budget factor in many business undertakings. In any case in order to chalk out a realistic budget programme, there must be an accurate sales forecast. The sales budget indicates for each product (1) the quantity of estimated sales and (2) the expected unit selling price. These data are often reported by regions or by sales representatives.

In estimating the quantity of sales for each product, past sales volumes are often used as a starting point. These amounts are revised for factors that are expected to affect future sales, such as the factors listed below.

- ◆ backlog of unfilled sales orders
- ◆ planned advertising and promotion
- ◆ expected industry and general economic conditions
- ◆ productive capacity
- ◆ projected pricing
- ◆ findings of market research studies
- ◆ relative product profitability.
- ◆ competition.

Once an estimate of the sales volume is obtained, the expected sales revenue can be determined by multiplying the volume by the expected unit sales price. The sales budget represents the total sales in physical quantities and values for a future budget period. Sales managers are constantly faced with problem like anticipation of customer requirements, new product needs, competitor strategies and various changes in distribution methods or promotional techniques.

The purposes of sales budget is not to attempt to estimate or guess what the actual sales will be, but rather to develop a plan with clearly defined objectives towards which the operational effort is directed in order to attain or exceed the objective. Hence, sales budget is not merely a sales forecast. A budget is a planning and control document which shows what the management intends to accomplish. Thus, the sales budget is active rather than passive. A sales forecast, however, is a projection or estimate of the available customer demand. A forecast reflects the environmental or competitive situation facing



Cost Accounting

the company whereas the sales budget shows how the management intends to react to this environmental and competitive situation. A good budget hinges on aggressive management control rather than on passive acceptance of what the market appears to offer. If the company fails to make this distinction, the budget will remain more a figure-work exercise than a working tool of dynamic management control.

The sales budget may be prepared under the following classification or combination of classifications :

- (a) Products or groups of products.
- (b) Areas, towns, salesmen and agents.
- (c) Types of customers as for example: (i) Government, (ii) Export, (iii) Home sales, (iv) Retail depots.
- (d) Period—months, weeks, etc.

The format of a sales budget will be as under :

Last Year Total		Budget Year Total		Northern Region		Southern Region		Central Region	
Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
<i>Product X</i>									
1st quarter									
2nd quarter									
3rd quarter									
4th quarter									
<i>Product Y</i>									
Total									
Grand Total									

Example of sales budget:



Budgets and Budgetary Control

XYZ COMPANY

Sales Budget For the Year Ending March, 20....

	<i>Units</i>	<i>Selling price Per unit (Rs.)</i>	<i>Total (Rs.)</i>
Product A	5,000	75	3,75,000
Product B	10,000	80	8,00,000
			<hr/> 11,75,000

Production budget - Production budget shows the production for the budget period based upon :

- Sales budget,
- Production capacity of the factory,
- Planned increase or decrease in finished stocks, and
- Policy governing outside purchase.

Production budget is normally stated in units of output. Production should be carefully coordinated with the sales budget to ensure that production and sales are kept in balance during the period. The number of units to be manufactured to meet budgeted sales and inventory needs for each product is set forth in the *production budget*

The production facility available and the sales budget will be compared and coordinated to determine the production budget. If production facilities are not sufficient, consideration may be given to such factors as working overtime, introducing shift working, sub-contracting or purchasing of additional plant and machinery. If, however, the production facilities are surplus, consideration should be given to promote advertising, reduction of prices to increase the sales, sub-contracting of surplus capacity, etc.

One of the conditions to be considered in all the compilation of production budget is the level of stock to be maintained. The level of stocks will depend upon three factors viz. :

- seasonal industries in which stocks have to be built up during off season to cater to the peak season,
- a steady and uniform level of production to utilise the plant fully and to avoid retrenchment or lay-off of the workers, and



Cost Accounting

- (c) to produce in such a way that minimum stocks are maintained at any time to avoid locking up of funds in inventory.

Production budget can, therefore, show : (a) stabilised production every month, say, the maximum possible production or (b) stabilised minimum quantity of stocks which will reduce inventory costs.

In the case of stabilised production, the production facility will be fully utilised but the inventory carrying costs will vary according to stocks held. In the case of stabilised stocks method, however, the inventory carrying will be the lowest but there may be under-utilisation of capacity.

Example of production budget:

XYZ COMPANY

Production budget in units for the year ending March 31, 20....

	<i>Products</i>	
	<i>A</i>	<i>B</i>
Budgeted sales	5,000	10,000
Add : Desired closing stock	500	1,000
Total quantity required	5,500	11,000
Less : Opening stock	1,500	2,000
Units to be produced	4,000	9,000

Plant utilisation budget - Plant utilisation budget represents, in terms of working hours, weight or other convenient units of plant facilities required to carry out the programme laid down in the production budget. The main purposes of this budget are :

- To determine the load on each process, cost or groups of machines for the budget period.
- To indicate the processes or cost centres which are overloaded so that corrective action may be taken such as : (i) working overtime (ii) sub-contracting (iii) expansion of production facility, etc.
- To dovetail the sales production budgets where it is not possible to increase the capacity of any of the overloaded processes.
- Where surplus capacity is available in any of the processes, to make effort to boost sales to utilise the surplus capacity.



Budgets and Budgetary Control

Direct material usage budget - The steps involved in the compilation of direct materials usage budget are as under :

- (i) The quality standards for each item of material have to be specified. In this connection, standardisation of size, quality, colour, etc., may be considered.
- (ii) Standard requirement of each item of materials required should also be set. While setting the standard quality consideration should be given to normal loss in process. The standard allowance for normal loss may be given on the basis of past performance, test runs, technical estimates etc.
- (iii) Standard prices for each item of materials should be set after giving consideration to stock and contracts entered into.

After setting standards for quality, quantity and prices, the direct materials budget can be prepared by multiplying each item of material required for the production by the standard price.

Example of direct material usage budget is as under :

XYZ COMPANY

Direct material usage in units and Rs. for the year ending March 31, 20...

<i>Direct Materials</i>					
Type of material	Product A (4,000 units)	Product B (9,000 units)	Total direct material usage (Units)	Material cost per unit (Rs.)	Total cost of material used (Rs.)
X (12 units per finished product)	48,000	1,08,000	1,56,000	1.50	2,34,000
Y (4 units per product A & 2 units per product B)	16,000	18,000	34,000	2.50	85,000
				Total	3,19,000

Purchase budget - The production budget is the starting point for determining the estimated quantities of direct materials to be purchased. Multiplying these quantities by



Cost Accounting

the expected unit purchase price determines the total cost of direct materials to be purchased.

Two important considerations that govern purchase budgets are as follows:

- (a) Economic order quantity.
- (b) Re-order point with safety stocks to cover fluctuations in demand.

The direct material purchases budget helps management maintain inventory levels within reasonable limits, For this purpose, the timing of the direct materials purchases should be coordinated between the purchasing and production departments.

An example of material purchase budget is as under :

XYZ Company
Direct material purchase budget
for the year ending March 31, 20.....

	<i>Material X</i>	<i>Material Y</i>	<i>Total</i>
Desired closing stock (units)	3,000	500	
Units required for production	1,56,000	34,000	
<i>Add :</i>			
Total needs	1,59,000	34,500	
<i>Less: Opening stock (units)</i>	4,000	300	
Units to be purchased	1,55,000	34,200	
Unit price (Rs.)	1.50	2.50	
Purchase cost (Rs.)	2,32,500	85,500	3,18,000

Personnel (or Labour cost) budget - Once sales budget and Production budget are compiled and thereafter plant utilisation budget is settled, detailed amount of the various machine operations involved and services required can be arrived at. This will facilitate preparation of an estimate of different grades of labour required. From this the standard hours required to be worked can be prepared. The total labour complement thus budgeted can be divided into direct and indirect. Standard rates of wages for each grade of labour can be introduced and then the direct and indirect labour cost budget can be prepared.



Budgets and Budgetary Control

The advantages of labour budget are the following:

- (a) It defines the direct and indirect labour force required.
- (b) It enables the personnel department to plan ahead in recruitment and training of workers so that labour turnover can be reduced to the minimum.
- (c) It reveals the labour cost to be incurred in the manufacture, to facilitate preparation of manufacturing cost budgets and cash budgets for financing the wage bill.

Example of direct-labour cost budget:

XYZ COMPANY
Direct-labour cost budget
for the year ending March 31, 20...

	<i>Units to be produced</i>	<i>Direct labour hour, per unit</i>	<i>Total hours</i>	<i>Total budget cost (Rs.) @ Rs. 2 per hour</i>
Product A	4,000	7	28,000	56,000
Product B	9,000	10	90,000	1,80,000
			1,18,000	2,36,000

Production or Factory overhead budget - Production overheads consists of all items such as indirect materials, indirect labour and indirect expenses. Indirect expenses include power, fuel, fringe benefits, depreciation etc. These estimated factory overhead costs necessary for production make up the factory overhead cost budget. This budget usually includes the total estimated cost for each item of factory overhead. The production overhead budget is useful for working out the pre-determined overhead recovery rates. A business may prepare supporting departmental schedules, in which the factory overhead costs are separated into their fixed and variable cost elements. Such schedules enable department managers to direct their attention to those costs for which they are responsible and to evaluate performance

A careful study and determination of the behaviour of different types of costs will be essential in preparation of overhead budget. A few examples are given below to show how the expenses are estimated.

- (a) Fixed expenses are policy cost and hence they are based on policy matters.
- (b) For estimating indirect labour, work study is resorted to and a flexible estimate of



Cost Accounting

number of indirect workers required for each level of direct workers employed is made—for example, one supervisor for every twenty direct workers.

- (c) In regard to the estimate of consumption of indirect materials, the age and condition of the plant and machinery are taken into consideration.

Example of factory overhead budget :

XYZ COMPANY

Factory overhead budget for the year ending March 31, 20....

(Anticipated activity of 1,18,000 direct labour hours)

	Rs.	Rs.
Supplies	12,000	
Indirect labour	30,000	
Cost of fringe benefits	10,000	
Power (variable portion)	22,000	
Maintenance cost (variable portion)	15,000	
Total variable overheads		89,000
Depreciation	10,000	
Property taxes	2,000	
Property insurance	1,000	
Supervision	12,000	
Power (Fixed portion)	800	
Maintenance (Fixed portion)	3,200	
Total fixed overheads		29,000
Total factory overheads		1,18,000

Factory overhead recovery rate is :

$$\frac{\text{Rs. } 1,18,000}{1,18,000 \text{ labour hours}} = \text{Rs. } 1 \text{ per direct labour hour}$$

Production cost budget - Production cost budget covers direct material cost, direct labour cost and manufacturing expenses. After preparing direct material, direct labour and production overhead cost budget, one can prepare production cost budget.



Budgets and Budgetary Control

Ending Inventory budget - This budget shows the cost of closing stock of raw materials and finished goods, etc. This information is required to prepare cost-of-goods-sold budget and budgeted financial statements *i.e.*, budgeted income statement and budgeted balance sheet.

Example of ending inventory budget :

XYZ Company ending-inventory budget March 31, 20....

	<i>Units</i>	<i>Unit cost Rs.</i>	<i>Amount Rs.</i>	<i>Total Rs.</i>
Direct material				
X	3,000	1.50	4,500	
Y	500	2.50	1,250	5,750
Finished goods				
A	500	49.00*	24,500	
B	1,000	53.00*	53,000	77,500
Total				83,250

* Unit cost of finished goods have been computed as below :

	<i>Unit cost of input</i>	<i>Product A</i>		<i>Product B</i>	
	<i>(Rs.)</i>	<i>Units</i>	<i>Amount</i>	<i>Units</i>	<i>Amount</i>
	<i>(Rs.)</i>	<i>(Rs.)</i>		<i>(Rs.)</i>	
Material X	1.50	12	18.00	12.00	18.00
Material Y	2.50	4	10.00	2.00	5.00
Direct labour	2.00	7	14.00	10.00	20.00
Factory overhead	1.00	7	7.00	10.00	10.00
			49.00		53.00

Cost of goods sold budget - This budget covers direct material cost, direct labour cost, manufacturing expenses and cost of ending inventory of finished products. We present below the cost-of-goods-sold budget on the basis of the data taken from the various budgets already illustrated:



Cost Accounting

XYZ Company cost-of-goods-sold budget for the year ending March 31, 20....

	<i>Amount</i>
	<i>Rs.</i>
Direct materials used	3,19,000
Direct labour	2,36,000
Factory overhead	<u>1,18,000</u>
Total manufacturing costs	6,73,000
Add : Finished goods (opening)	<u>1,79,500*</u>
	8,52,500
Less : Finished goods (closing)	<u>77,500*</u>
Total cost of goods sold	<u>7,75,000</u>

*Assumed given

In the above budget if adjustments for opening and closing inventory of finished goods are not shown. The budget will be called production cost budget.

Selling and distribution cost budget - Selling and distribution are indispensable aspects of the profit earning function. At the same time, the pre-determination of these costs is also very difficult.

Selling cost is defined as the cost of seeking to create and stimulate demand and of securing orders. These costs are, therefore, incurred to maintain and increase the level of sales. All expenses connected with advertising, sales promotion, sales office, salesmen, credit collection, market research, after sales service, etc. are generally grouped together to form part of the responsibility of the sales manager. While making a budget, selling costs are divided into fixed and variable. Semi-variable costs should also be separated into variable and fixed elements. The problems faced in the preparation of selling cost budgets are :

- (i) heavy expenditure on selling and sales promotion may have to be incurred when the volume of sales is falling off. This will increase the percentage of such costs to total sales, and
- (ii) sometimes intensive sales and promotion efforts are called for in one year and the benefit of such efforts accrue in the subsequent years. This makes it difficult to establish a proportion of selling cost to sales.



Budgets and Budgetary Control

In spite of these problems, some relationship between selling cost and volume of sales has to be established and it is the duty of the Budget Controller to determine the amount of selling costs to be incurred to achieve the desired level of sales volume. Using the past experience as a guide, consideration should be given to the future trend of sales, possible changes in competition etc., in pre-determination of selling costs.

Distribution cost has been defined as the cost of the sequence of operations which begins with making the packet of product available for despatch and ends with making the re-conditioned return of empty package, if any available for re-use. It includes transport cost, storage and warehousing costs, etc.

Preparation of the advertising cost budget is the responsibility of the sales manager or advertisement manager. When preparing the advertisement cost budget consideration should be given to the following factors :

- (a) The best method of advertisement must be selected; costs will vary according to the method selected.
- (b) The maximum amount to be spent in a period, say one year, has to be decided.
- (c) Advertising and sales should be co-ordinated. It means that money should be spent on advertisement only when sufficient quantities of the product advertised are ready for sale.
- (d) An effective control over advertisement expenditure should be exercised and the effectiveness of the advertisement should be measured.

The choice of the method of advertising a product is based on the effectiveness of the money spent on advertisement in increasing or maintaining sales. If the output sold increases, the production cost will come down because of the economies of large scale production.

The amount to be spent on advertisement appropriation may be settled on the basis of the following factors:

- (i) A percentage on the total sales value of the budget period or on the expected profit may be fixed on the basis of past experience.
- (ii) A sum which is expected to be incurred by the competitors may be fixed to be spent during the budget period.
- (iii) A fixed sum per unit of output can be fixed and added to cost.



Cost Accounting

- (iv) An amount is fixed on the basis of the ability of the company to spend on advertising.
- (v) An advertisement plan is decided upon and the amount to be spent is determined.

Depending upon the nature of the product and the effectiveness of the media of the advertising the company prepares a schedule of various methods of advertisement, to be used for effective sales promotion. The number of advertisements (insertions) are determined and the cost calculated as per the rates applicable to each of the media selected. This is a sound method.

Example of selling and distribution cost budget:

**XYZ Company selling and distribution cost budget
for the year ending March 31, 20....**

	<i>Amount</i>
	<i>Rs.</i>
<i>Direct selling expenses</i>	
Salesmen's salaries	14,500
Salesmen's commission	7,000
Travelling expenses	19,000
	40,500
<i>Distribution expenses</i>	
Warehouse wages	6,000
Warehouse rent, rates, electricity	4,500
Lorry expenses	11,000
	21,500
<i>Sales office expenses</i>	
Salaries	16,000
Rent, rates, electricity	12,000
Depreciation	2,000
Stationery, postage and telephone	12,500
General expenses	3,000
	45,500
<i>Advertising</i>	
Press	4,500



Budgets and Budgetary Control

Radio and television	18,500
Shop window displays	4,000
	<u>27,000</u>
Total	<u>1,34,500</u>

Administrative expenses budget - The administrative expenses are mostly policy costs and are, therefore, fixed in nature. The most practical method to follow in preparing estimate of these expenses is to follow the past experience with due regard to anticipated changes either in general policy or the volume of business. To bring such expenses under control, it is necessary to review them frequently and to determine at regular intervals whether or not these expenses continue to be adjusted. Examples of such expenses are : audit fees, depreciation of office equipment, insurance, subscriptions, postage, stationery, telephone, telegrams, office supplies, etc.

**XYZ Company administrative expenses budget
for the year ending March 31, 20...**

	Rs.
Salaries of clerical staff	28,000
Executives salaries	8,000
Audit fee	600
Depreciation on office equipment	800
Insurance	250
Stationery	1,250
Postage and telegrams	950
Telephones	850
Miscellaneous	<u>5,300</u>
Total administrative expenses	<u>46,000</u>

Research and development expense budget - Research is required in order to develop and/or improve products and methods. When research results in definite benefit to the company, development function begins. After development, formal production can commence on commercial scale and then production function starts. Since the areas of research and development cannot be precisely defined, the costs incurred under both the functions are clubbed together as research and development costs. Research and



Development (R & D) plays a vital role in maintaining the business. For example, automobile manufacturers, and those who produce drugs, spend considerable sums on R & D to improve the products.

Research may be either pure research or applied research. Pure research increases knowledge whereas applied research aims at producing definite results like improved methods of production, etc.

Research and development expenses should be controlled carefully and hence a limit on the spending is placed, *i.e.*, the amount to be spent is carefully determined or allocated. The following are the methods of allocation of R & D expenses.

- (1) A percentage based on total sales value. This method is good if sales value is steady from year to year.
- (2) A percentage based on net profit.
- (3) A total sum is estimated on the basis of past experience and future R & D plans and policies.
- (4) A sum is fixed on the basis of cash resources available with the company.
- (5) All factors which affect the importance of R & D are considered. For example, factors like demand for existing products, competition, economic conditions, etc., are considered carefully and a sum is set as R & D budget.

Capital expenditure budget - The capital expenditure budget represents the planned outlay on fixed assets like land, building, plant and machinery, etc. during the budget period. This budget is subject to strict management control because it entails large amount of expenditure. The budget is prepared to cover a long period of years and it projects the capital costs over the period in which the expenditure is to be incurred and the expected earnings. The preparation of this budget is based on the following considerations :

- (i) Overhead on production facilities of certain departments as indicated by the plant utilisation budget.
- (ii) Future development plans to increase output by expansion of plant facilities.
- (iii) Replacement requests from the concerned departments.



Budgets and Budgetary Control

While preparing the capital expenditure budget, consideration should also be given to factors like sales potential to absorb the increased output, possibility of price reductions, increased costs of advertising and sales promotion to absorb increased output, etc.

The advantages of capital expenditure budget are the following :

- (1) It outlines the capital development programme and estimated capital expenditure during the budget period.
- (2) It enables the company to establish a system of priorities. When there is a shortage of funds, capital rationing becomes necessary.
- (3) It serves as a tool for controlling expenditure.
- (4) It provides the amount of expenditure to be incorporated in the future budget summaries for calculation of estimated return on capital employed.
- (5) This enables the cash budget to be completed. With other cash commitments capital expenditure commitment should also be considered for the completion of the budget.
- (6) It facilitates cost reduction programme, particularly when modernisation and renovation is covered by this budget.

10.5.2 Cash budget - Cash budget represents the cash requirements of the business during the budget period. It is the plan of receipts and payments of cash for the budget period, analysed to show the monthly flow of cash drawn up in such a way that the balance can be forecasted at regular intervals. The *cash budget* is one of the most important elements of the budgeted balance sheet. Information from the various operating budgets, such as the sales budget, the direct materials purchases budget, and the selling and administrative expenses budget, affects the cash budget. In addition, the capital expenditures budget, dividend policies, and plans for equity or long-term debt financing also affect the cash budget.

10.5.3 Master budget - When all the necessary functional budgets have been prepared, the budget officer will prepare the master budget which may consist of budgeted profit and loss account and budgeted balance sheet. These are in fact the budget summaries. When the master budget is approved by the board of directors, it represents a standard for the achievement of which all the departments will work. On the basis of the various budgets (schedules) prepared earlier in this study, we prepare below budgeted income statement and budgeted balance sheet.



Cost Accounting

Example of budgeted income statement :

XYZ Company Budgeted Income Statement For the Year Ending March 31, 20....

	Rs.	Amount Rs.
Sales		11,75,000
Less : Cost of goods sold		7,75,000
Gross margin		4,00,000
Less : Selling and distribution expenses	1,36,500	
Less : Administrative expenses	46,000	1,82,500
Profit before interest and taxes		2,17,500
Interest expenses (assumed)		50,000
Profit before tax		1,67,500
Income-tax (50% assumed)		83,750
Net profit		83,750

Example of budgeted balance sheet :

XYZ Company Budgeted Balance Sheet March 31, 20....

	Rs.	Rs.	Rs.
Share capital	3,50,000		
Retained income	1,29,000		4,79,000
<i>Represented by :</i>			
Plant and machinery	3,40,000		
Less : Provision for depreciation	60,000		2,80,000
Raw materials	5,750		
Finished goods	77,500		
Debtors	1,10,000		
Cash	37,750	2,31,000	
Less: Creditors		32000	1,99,000
			4,79,000



Budgets and Budgetary Control

Note : *Information not available in respect of share capital, opening balance of retained earnings, current assets and current liabilities, etc., has been assumed to complete the above balance sheet.*

10.5.4 Flexible budget : *Definition* - A flexible budget is defined as “a budget which, by recognising the difference between fixed, semi-variable and variable costs is designed to change in relation to the level of activity attained”. A fixed budget, on the other hand is a budget which is designed to remain unchanged irrespective of the level of activity actually attained. In a fixed budgetary control, budgets are prepared for one level of activity whereas in a flexible budgetary control system, a series of budgets are prepared one for each of a number of alternative production levels or volumes. Flexible budgets represent the amount of expenses that is reasonably necessary to achieve each level of output specified. In other words, the allowances given under flexible budgetary control system serve as standards of what costs should be at each level of output.

Need : The need for the preparation of the flexible budgets arises in the following circumstances :

- (i) seasonal fluctuations in sales and/or production, for example in soft drinks industry;
- (ii) a company which keeps on introducing new products or makes changes in the design of its products frequently;
- (iii) industries engaged in make-to-order business like ship building;
- (iv) an industry which is influenced by changes in fashion; and
- (v) general changes in sales.

Distinction between Fixed and Flexible Budget

Fixed Budget	Flexible Budget
1. It does not change with actual volume of activity achieved. Thus it is known as rigid or inflexible budget.	It can be recasted on the basis of activity level to be achieved. Thus it is not rigid.
2. It operates on one level of activity and under one set of conditions. It assumes that there will be no change in the prevailing conditions, which is unrealistic.	It consists of various budgets for different levels of activity
3. Here as all costs like - fixed, variable and semi-variable are related to only one	Here analysis of variance provide useful information as each cost is analysed



Cost Accounting

level of activity so variance analysis according to its behaviour. does not give useful information.

4. If the budgeted and actual activity levels differ significantly, then the aspects like cost ascertainment and price fixation do not give a correct picture. Flexible budgeting at different levels of activity, facilitates the ascertainment of cost, fixation of selling price and tendering of quotations.

5. Comparison of actual performance with budgeted targets will be meaningless specially when there is a difference between the two activity levels. It provides a meaningful basis of comparison of the actual performance with the budgeted targets.

Illustration

A factory which expects to operate 7,000 hours, *i.e.*, at 70% level of activity, furnishes details of expenses as under :

Variable expenses	Rs. 1,260
Semi-variable expenses	Rs. 1,200
Fixed expenses	Rs. 1,800

The semi-variable expenses go up by 10% between 85% and 95% activity and by 20% above 95% activity. Construct a flexible budget for 80, 90 and 100 per cent activities.

Solution

<i>Head of Account</i>	<i>Control basis</i>	<i>70%</i>	<i>80%</i>	<i>90%</i>	<i>100%</i>
Budgeted hours		7,000	8,000	9,000	10,000
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Variable expenses	V	1,260	1,440	1,620	1,800
Semi-variable expenses	SV	1,200	1,200	1,320	1,440
Fixed expenses	F	1,800	1,800	1,800	1,800
Total expenses		4,260	4,440	4,740	5,040
Recovery rate per hour		0.61	0.55	0.53	0.50

Conclusion :

We notice that the recovery rate at 70% activity is Re. 0.61 per hour. If in a particular month the factory works 8,000 hours, it will be incorrect to estimate the allowance as



Budgets and Budgetary Control

Rs. 4,880 @ 0.61. The correct allowance will be Rs. 4,440 as shown in the table. If the actual expenses are Rs. 4,500 for this level of activity, the company has not saved any money but has over-spent by Rs. 60 (Rs. 4,500 – Rs. 4,440).

Illustration

A department of Company X attains sale of Rs. 6,00,000 at 80 per cent of its normal capacity and its expenses are given below :

<i>Administration costs :</i>	<i>Rs.</i>
Office salaries	90,000
General expenses	2 per cent of sales
Depreciation	7,500
Rates and taxes	8,750
<i>Selling costs :</i>	
Salaries	8 per cent of sales
Travelling expenses	2 per cent of sales
Sales office expenses	1 per cent of sales
General expenses	1 per cent of sales
<i>Distribution costs :</i>	
Wages	15,000
Rent	1 per cent of sales
Other expenses	4 per cent of sales

Draw up flexible administration, selling and distribution costs budget, operating at 90 per cent, 100 per cent and 110 per cent of normal capacity.

Solution

Flexible Budget of Department....of Company 'X'

<i>Expenses</i>	<i>Basis</i>	<i>Level of activity</i>			
		80%	90%	100%	110%
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
(1)	(2)	(3)	(4)	(5)	(6)
Sales		6,00,000	6,75,000	7,50,000	8,25,000



Cost Accounting

Administration costs :

Office salaries	Fixed	90,000	90,000	90,000	90,000
General expenses	2% of sales	12,000	13,500	15,000	16,500
Depreciation	Fixed	7,500	7,500	7,500	7,500
Rates & taxes	Fixed	8,750	8,750	8,750	8,750
Total administration costs		1,18,250	1,19,750	1,21,250	1,22,750

Selling costs :

Salaries	8% of sales	48,000	54,000	60,000	66,000
Travelling expenses	2% of sales	12,000	13,500	15,000	16,500
Sales office expenses	1% of sales	6,000	6,750	7,500	8,250
General expenses	1% of sales	6,000	6,750	7,500	8,250
Total selling costs :		72,000	81,000	90,000	99,000

Distribution costs :

Wages	Fixed	15,000	15,000	15,000	15,000
Rent 1% of sales	6,000	6,750	7,500	8,250	
Other expenses	4% of sales	24,000	27,000	30,000	33,000
Total Distribution Cost		45,000	48,750	52,500	56,250
Total Admn., Selling & Dist. costs		2,35,250	2,49,500	2,63,750	2,78,000

Note : In the absence of information it has been assumed that office salaries, depreciation, rates and taxes and wages remain the same at 110% level of activity also. However, in practice some of these costs may change if present capacity is exceeded.

Illustration

Action Plan Manufacturers normally produce 8,000 units of their product in a month, in their Machine Shop. For the month of January, they had planned for a production of 10,000 units. Owing to a sudden cancellation of a contract in the middle of January, they could only produce 6,000 units in January.

Indirect manufacturing costs are carefully planned and monitored in the Machine Shop and the Foreman of the shop is paid a 10% of the savings as bonus when in any month



Budgets and Budgetary Control

the indirect manufacturing cost incurred is less than the budgeted provision.

The Foreman has put in a claim that he should be paid a bonus of Rs. 88.50 for the month of January. The Works Manager wonders how any one can claim a bonus when the Company has lost a sizeable contract. The relevant figures are as under :

<i>Indirect manufacturing normal month</i>	<i>Expenses for a January</i>	<i>Planned for January</i>	<i>Actuals in costs</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Salary of foreman	1,000	1,000	1,000
Indirect labour	720	900	600
Indirect material	800	1,000	700
Repairs and maintenance	600	650	600
Power 800	875	740	
Tools consumed	320	400	300
Rates and taxes	150	150	150
Depreciation	800	800	800
Insurance	100	100	100
	5,290	5,875	4,990

Do you agree with the Works Manager ? Is the Foreman entitled to any bonus for the performance in January ? Substantiate your answer with facts and figures.

Solution

Flexible Budget of "Action Plan Manufacturers" (for the month of January)

<i>Indirect manufacturing cost</i>	<i>Nature of cost</i>	<i>Expenses for a normal month</i>	<i>Planned expenses for January</i>	<i>Expenses as per flexible budget for the month of January</i>	<i>Actual expenses for January</i>	<i>Difference Increased (decreased) January</i>
			<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>(6) = (5) - (4)</i>
	<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>	<i>(5)</i>	<i>(6)</i>
Salary of foreman	Fixed	1,000	1,000	1,000	1,000	Nil
Indirect labour	Variable	720	900	540	600	60

(Refer to Working note 1)



Cost Accounting

Indirect material (Refer to Working note 2)	Variable	800	1,000	600	700	100
Repair and maintenance (Refer to Working note 3)	Semi-variable	600	650	550	600	50
Power (Refer to Working note 4)	Semi-variable	800	875	725	740	15
Tools consumed (Refer to Working note 5)	Variable	320	400	240	300	60
Rates and taxes	Fixed	150	150	150	150	Nil
Depreciation	Fixed	800	800	800	800	Nil
Insurance	Fixed	100	100	100	100	Nil
		5,290	5,875	4,705	4,990	285

Conclusion : The above statement of flexible budget clearly shows that the concern's expenses in the month of January have increased from Rs. 4,705 to Rs. 4,990. Under such circumstances the Foreman of the company is not at all entitled for any performance bonus in January.

Working notes :

1. Indirect labour cost per unit $\frac{\text{Rs } 720}{8,000} = 0.09\text{P}$.

Indirect labour for 6,000 units = $6,000 \times 0.09\text{P}$ = Rs. 540.

2. Indirect material cost per unit $\frac{\text{Rs } 800}{8,000} = 0.10\text{P}$

Indirect material for 6,000 units = $6,000 \times 0.10\text{P}$ = Rs. 600

3. According to high and low point method of segregating semi-variable cost into fixed and variable components, following formulae may be used.

$$\text{Variable cost of repair and maintenance per unit} = \frac{\text{Change in expense level}}{\text{Change in output level}}$$



Budgets and Budgetary Control

$$= \frac{\text{Rs } 650 - \text{Rs } 600}{2,000}$$

$$= 0.025 \text{ P.}$$

For 8,000 units

Total Variable cost of repair and maintenance = Rs. 200

Fixed repair & maintenance cost = Rs. 400

Hence at 6,000 units output level, total cost of repair and maintenance should be

$$= \text{Rs. } 400 + \text{Rs. } 0.025 \times 6,000 \text{ units}$$

$$= \text{Rs. } 400 + \text{Rs. } 150 = \text{Rs. } 550$$

4. Variable cost of power per unit = $\frac{\text{Rs } 875 - \text{Rs } 800}{2,000 \text{ units}} = 0.0375$

For 8,000 units

Total variable cost of power = Rs. 300

Fixed cost = Rs. 500

Hence, at 6,000 units output level, total cost of power should be

$$= \text{Rs. } 500 + \text{Rs. } 0.0375 \times 6,000 \text{ units}$$

$$= \text{Rs. } 500 + \text{Rs. } 225 + \text{Rs. } 725$$

5. Tools consumed cost for 8,000 units = Rs. 320

Hence, tools consumed cost for 6,000 units = $(\text{Rs. } 320/8,000 \text{ units}) \times 6,000 \text{ units}$

$$= \text{Rs. } 240$$



Cost Accounting

Illustration

A single product company estimated its sales for the next year quarterwise as under :

<i>Quarter</i>	<i>Sales (Units)</i>
I	30,000
II	37,500
III	41,250
IV	45,000

The opening stock of finished goods is 10,000 units and the company expects to maintain the closing stock of finished goods at 16,250 units at the end of the year. The production pattern in each quarter is based on 80% of the sales of the current quarter and 20% of the sales of the next quarter.

The opening stock of raw materials in the beginning of the year is 10,000 kg. and the closing stock at the end of the year is required to be maintained at 5,000 kg. Each unit of finished output requires 2 kg. of raw materials.

The company proposes to purchase the entire annual requirement of raw materials in the first three quarters in the proportion and at the prices given below :

<i>Quarter</i>	<i>Purchase of raw materials % to total</i>	<i>Price per kg.</i>
<i>annual requirement in quantity</i>	<i>Rs.</i>	
I	30%	2
II	50%	3
III	20%	4

The value of the opening stock of raw materials in the beginning of the year is Rs. 20,000. You are required to present the following for the next year, quarter wise :

- (i) Production budget (in units).
- (ii) Raw material consumption budget (in quantity).
- (iii) Raw material purchase budget (in quantity and value).
- (iv) Priced stores ledger card of the raw material using First in First out method.



Budgets and Budgetary Control

Solution

Working Note :	Total Annual Production (in units)
Sales in 4 quarters	1,53,750 units
Add : Closing balance	16,250 units
	1,70,000 units
Less : Opening balance	10,000 units
Total number of units to be produced in the next year	1,60,000

(i) **Production Budget (in units)**

	Quarters				Total
	I	II	III	IV	
	Units	Units	Units	Units	Units
Sales	30,000	37,500	41,250	45,000	1,53,750
Production in current quarter (80% of the sale of current quarter)	24,000	30,000	33,000	36,000	
Production for next quarter (20% of the sale of next quarter)	7,500	8,250	9,000	12,250*	
Total production	31,500	38,250	42,000	48,250	1,60,000

* Difference figure.

(ii) **Raw material consumption budget in quantity**

	Quarters				Total
	I	II	III	IV	
Units to be produced in each quarter: (A)	31,500	38,250	42,000	48,250	1,60,000
Raw material consumption p.u. (kg.): (B)	2	2	2	2	
Total raw material consumption (Kg.) : (A × B)	63,000	76,500	84,000	96,500	3,20,000



Cost Accounting

(iii) Raw material purchase budget (in quantity)

Raw material required for production (kg.)	3,20,000
Add : Closing balance of raw material (kg.)	5,000
	3,25,000
Less : Opening balance (kg.)	10,000
Material to be purchased (kg.)	3,15,000

Raw material purchase budget (in value)

Quarters	% of annual requirement (Qty.) for purchasing raw material (kg.)	Quantity of raw material to be purchased	Rate per kg. (Rs.)	Amount (Rs.)
(1)	(2)	(3)	(4)	(5) = (3) × (4)
I	30	94,500 (3,15,000 kg. × 30%)	2	1,89,000
II	50	1,57,500 (3,15,000 kg. × 50%)	3	4,72,500
III	20	63,000 (3,15,000 kg. × 20%)	4	2,52,000
Total :			3,15,000	9,13,500

(iv) Priced Stores Ledger Card (of the raw material using FIFO method)

	Quarters											
	I			II			III			IV		
	Kg.	Rate (Rs.)	Value (Rs.)	Kg.	Rate (Rs.)	Value (Rs.)	Kg.	Rate (Rs.)	Value (Rs.)	Kg.	Rate (Rs.)	Value (Rs.)
Opening balance : (A)	10,000	2	20,000	41,500	2	83,000	1,22,500	3	3,67,500	38,500	3	1,15,500
										63,000	4	2,52,000
Purchases : (B)	94,500	2	1,89,000	1,57,500	3	4,72,500	63,000	4	2,52,000	-	-	-
Consumption : (C)	63,000	2	1,26,000	41,500	2	83,000	84,000	3	2,52,000	38,500	3	1,15,500
				35,000	3	1,05,000				58,000	4	2,32,000
Balance : (D)	41,500	2	83,000	1,22,500	3	3,67,500	38,500	3	1,15,500	5,000	4	20,000
(D) = (A) + (B) - (C)							63,000	4	2,52,000			



Budgets and Budgetary Control

Illustration

A company is engaged in the manufacture of specialised sub-assemblies required for certain electronic equipments. The company envisages that in the forthcoming month, December, 2006, the sales will take a pattern in the ratio of 3 : 4 : 2 respectively of sub-assemblies, ACB, MCB and DP.

The following is the schedule of components required for manufacture :

Sub-assembly	Selling price	Base board	Component requirements		
			IC08	IC12	IC26
ACB	520	1	8	4	2
MCB	500	1	2	10	6
DP	350	1	2	4	8
Purchase price		Rs. 60	20	12	8

The direct labour time and variable overheads required for each of the sub-assemblies are :

	Labour hours per sub-assembly			Variable overheads per sub-assembly Rs.
	Grade A	Grade B		
ACB	8	16		36
MCB	6	12		24
DP	4	8		24
Direct wage rate per hour	Rs. 5	4		—

The labourers work 8 hours a day for 25 days a month.

The opening stocks of sub-assemblies and components for December, 2006 are as under:

Sub-assemblies		Components	
ACB	800	Base Board	1,600
MCB	1,200	IC08	1,200
DP	2,800	IC12	6,000
		IC26	4,000



Cost Accounting

Fixed overheads amount to Rs. 7,57,200 for the month and a monthly profit target of Rs. 12 lacs has been set.

The company is eager for a reduction of closing inventories for December, 2006 of sub-assemblies and components by 10% of quantity as compared to the opening stock. Prepare the following budgets for December 2006 :

- (i) Sales budget in quantity and value.
- (ii) Production budget in quantity
- (iii) Component usage budget in quantity.
- (iv) Component purchase budget in quantity and value.
- (v) Manpower budget showing the number of workers and the amount of wages payable.

Solution

Working Note :

1. *Statement showing contribution :*

<i>Sub assemblies</i>	<i>ABC</i>	<i>MCB</i>	<i>DP</i>	<i>Total</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Selling price per unit (p.u.) : (A)	520	500	350	
Marginal Cost p.u.				
<i>Components</i>				
Base board	60	60	60	
IC08	160	40	40	
IC12	48	120	48	
IC26	16	48	64	
<i>Labour</i>				
Grade A	40	30	20	
Grade B	64	48	32	
<i>Variable production overhead</i>	36	24	24	
Total marginal cost p.u. : (B)	424	370	288	
Contribution p.u. : (C) = (A) – (B)	96	130	62	
Sales ratio : (D)	3	4	2	
Contribution × Sales ratio : [(E) = (C) × (D)]	288	520	124	932



Budgets and Budgetary Control

2. Desired Contribution for the forthcoming month December, 2006

	Rs.
Fixed overheads	7,57,200
Desired profit	<u>12,00,000</u>
Desired contribution	<u>19,57,200</u>

3. Sales mix required i.e. number of batches for the forthcoming month December, 2006

Sales mix required = Desired contribution / contribution × Sales ratio

= Rs. 19,57,200 / 932 (Refer to Working notes 1 and 2)

= 2,100

Budgets for December, 2006

(i) Sales budget in quantity and value

Sub-assemblies	ACB	MCB	DP	Total
Sales (quantity) (2,100 × 3:4:2) (Refer to working note 3)	6,300	8,400	4,200	
Selling price p.u. (Rs.)	520	500	350	
Sales value (Rs.)	32,76,000	42,00,000	14,70,000	89,46,000

(ii) Production budget in quantity

Sub-assemblies	ACB	MCB	DP
Sales	6,300	8,400	4,200
Add : Closing stock	720	1,080	2,520
(Opening stock less 10%)	—	—	—
Total quantity required	7,020	9,480	6,720
Less : Opening stock	<u>800</u>	<u>1,200</u>	<u>2,800</u>
Production	<u>6,220</u>	<u>8,280</u>	<u>3,920</u>



Cost Accounting

(iii) Component usage budget in quantity

<i>Sub-assemblies</i>	<i>ACB</i>	<i>MCB</i>	<i>DP</i>	<i>Total</i>
Production	6,220	8,280	3,920	—
Base board (1 each)	6,220	8,280	3,920	18,420
Component IC08 (8 : 2 : 2)	49,760	16,560	7,840	74,160
	(6,220 × 8)	(8,280 × 2)	(3,920 × 2)	
Component IC12 (4 : 10 : 4)	24,880	82,800	15,680	1,23,360
	(6,220 × 4)	(8,280 × 10)	(3,920 × 4)	
Component IC26 (2 : 6 : 8)	12,440	49,680	31,360	93,480
	(6,220 × 2)	(8,280 × 6)	(3,920 × 8)	

(iv) Component Purchase budget in quantity and value

<i>Sub-assemblies</i>	<i>Base board</i>	<i>IC08</i>	<i>IC12</i>	<i>IC26</i>	<i>Total</i>
Usage in production	18,420	74,160	1,23,360	93,480	
Add : Closing stock	1,440	1,080	5,400	3,600	
(Opening stock less 10%)					
	19,860	75,240	1,28,760	97,080	
Less : Opening stock	1,600	1,200	16,000	4,000	
Purchase (Quantity)	18,260	74,040	1,22,760	93,080	
Purchase price (Rs.)	60	20	12	8	
Purchase value (Rs.)	10,95,600	14,80,800	14,73,120	7,44,640	47,94,160

(v) Manpower budget showing the number of workers and the amount of wages payable

<i>Direct labour</i>						
<i>Sub-Assemblies</i>	<i>Budgeted Production</i>	<i>Grade A</i>		<i>Grade B</i>		<i>Total</i>
		<i>Hours per Unit</i>	<i>Total Hours</i>	<i>Hours per Unit</i>	<i>Total Hours</i>	
ACB	6,220	8	49,760	16	99,520	
MCB	8,280	6	49,680	12	99,360	
DP	3,920	4	15,680	8	31,360	



Budgets and Budgetary Control

(A) Total hours	1,15,120	2,30,240	
(B) Hours per man per month	200	200	
(C) Number of workers per month : (A/B)	576	1,152	
(D) Wage rate per month (Rs.)	1,000	800	
(E) Wages payable (Rs.) : (C × D)	5,76,000	9,21,600	14,97,600

10.6 Miscellaneous Illustrations

Illustration 1

ABC Ltd. is currently operating at 75% of its capacity. In the past two years, the level of operations were 55% and 65% respectively. Presently, the production is 75,000 units. The company is planning for 85% capacity level during 2006-2007. The cost details are as follows :

	55%	65%	75%
	(Rs.)	(Rs.)	(Rs.)
Direct Materials	11,00,000	13,00,000	15,00,000
Direct Labour	5,50,000	6,50,000	7,50,000
Factory Overheads	3,10,000	3,30,000	3,50,000
Selling Overheads	3,20,000	3,60,000	4,00,000
Administrative Overheads	<u>1,60,000</u>	<u>1,60,000</u>	<u>1,60,000</u>
	<u>24,40,000</u>	<u>28,00,000</u>	<u>31,60,000</u>

Profit is estimated @ 20% on sales.

The following increases in costs are expected during the year :

	<i>In percentage</i>
Direct Materials	8
Direct Labour	5
Variable Factory Overheads	5
Variable Selling Overheads	8
Fixed Factory Overheads	10
Fixed Selling Overheads	15
Administrative Overheads	10



Cost Accounting

Prepare flexible budget for the period 2006-2007 at 85% level of capacity. Also ascertain profit and contribution.

Solution: **ABC Ltd.**

Budget for 85% capacity level for the period 2006-07

<i>Budgeted production (units)</i>	<i>Per Unit</i>	<i>Amount</i>
		<u>85,000</u>
Direct material (note 1)	Rs. 21.60	Rs. 18,36,000
Direct labour (note 2)	10.50	8,92,500
Variable factory overhead (note 3)	2.10	1,78,500
Variable selling overhead (note 4)	<u>4.32</u>	<u>3,67,200</u>
Variable cost	<u>38.52</u>	<u>32,74,200</u>
Fixed factory overhead (note 3)		2,20,000
Fixed selling overhead (note 4)		1,15,000
Administrative overhead		<u>1,76,000</u>
Fixed cost		<u>5,11,000</u>
Total cost		37,85,200
Add : Profit 20% on sales or 25% on total cost		<u>9,46,300</u>
Sales		<u>47,31,500</u>
Contribution (Sales – Variable cost)		14,57,300

Working Notes :

1. Direct Materials :

75% Capacity	Rs. 15,00,000	65% Capacity	Rs. 13,00,000
<u>65% Capacity</u>	<u>Rs. 13,00,000</u>	<u>55% Capacity</u>	<u>Rs. 11,00,000</u>
10% change in capacity	<u>2,00,000</u>	10% change in capacity	<u>2,00,000</u>

For 10% increase in capacity, i.e., for increase by 10,000 units, the total direct material cost regularly changes by Rs.2,00,000



Budgets and Budgetary Control

Direct material cost (variable) = Rs.2,00,000 ÷ 10,000 = Rs. 20

After 8% increase in price, direct material cost per unit = Rs. 20 × 1.08 = Rs.21.60

Direct material cost for 85,000 budgeted units = 85,000 × Rs.21.60 = Rs.18,36,000

2. Direct Labour :

75% Capacity	Rs. 7,50,000	65% Capacity	Rs. 6,50,000
<u>65% Capacity</u>	Rs. <u>6,50,000</u>	<u>55% Capacity</u>	Rs. <u>5,50,000</u>
10% change in capacity	<u>1,00,000</u>	10% change in capacity	<u>1,00,000</u>

For 10% increase in capacity, direct labour cost regularly changes by Rs.1,00,000.

Direct labour cost per unit = Rs.1,00,000 ÷ 10,000 = Rs.10

After 5% increase in price, direct labour cost per unit = Rs.10 × 1.05 = Rs.10.50

Direct labour for 85,000 units = 85,000 units × Rs.10.50 = Rs.8,92,500.

3. Factory overheads are semi-variable overheads :

75% Capacity	Rs. 3,50,000	65% Capacity	Rs. 3,30,000
<u>65% Capacity</u>	Rs. <u>3,30,000</u>	<u>55% Capacity</u>	Rs. <u>3,10,000</u>
10% change in capacity	<u>20,000</u>	10% change in capacity	<u>20,000</u>

Variable factory overhead = Rs.20,000 ÷ 10,000 = Rs.2

Variable factory overhead for 75,000 units = 75,000 × Rs.2 = Rs.1,50,000

Fixed factory overhead = Rs.3,50,000 – Rs.1,50,000 = Rs.2,00,000.

Variable factory overhead after 5% increase = Rs.2 × 1.05 = Rs.2.10

Fixed factory overhead after 10% increase = Rs.2,00,000 × 1.10 = Rs.2,20,000.

4. Selling overhead is semi-variable overhead :

75% Capacity	Rs. 4,00,000	65% Capacity	Rs. 3,60,000
<u>65% Capacity</u>	Rs. <u>3,60,000</u>	<u>55% Capacity</u>	Rs. <u>3,20,000</u>
10% change in capacity	<u>40,000</u>	10% change in capacity	<u>40,000</u>

Variable selling overhead = Rs.40,000 ÷ 10,000 units = Rs.4

Variable selling overhead for 75,000 units = 75,000 × Rs.4 = Rs.3,00,000.



Cost Accounting

Fixed selling overhead = Rs.4,00,000 – Rs.3,00,000 = Rs.1,00,000

Variable selling overhead after 8% increase = Rs.4 × 1.08 = Rs.4.32

Fixed selling overhead after 15% increase = Rs.1,00,000 × 1.15 = Rs.1,15,000

5. Administrative overhead is fixed :

After 10% increase = Rs.1,60,000 × 1.10 = Rs.1,76,000

Illustration 2

A factory is currently working at 50 per cent capacity and produces 10,000 units. Estimate the profits of the Company when it works to 60 per cent and 80 per cent capacity assuming that the company can sell whatever it produces.

At 60 per cent working, raw material cost increases by 2 per cent and selling price falls by 2 per cent.

At 80 per cent, raw material cost increases by 5 per cent and selling price falls by 5 per cent.

At 50 per cent working, the product costs Rs.180 per unit and is sold at Rs.200 per unit.

The unit cost of Rs.180 is made up as follows :

	Rs.
Material	100
Labour	30
Factory Overhead	3 (40% fixed)
Administration Overhead	20 (50% fixed)

What comments can you offer?

Solution: Statement showing profit at different capacity levels

Units	Capacity Levels		
	50%	60%	80%
	10,000	12,000	16,000
Selling price per unit (as per information given)	Rs. <u>200</u>	Rs. <u>196</u>	Rs. <u>190</u>



Budgets and Budgetary Control

Material (as per information given)	100	102	105
Labour	30	30	30
Factory overhead	18	18	18
Administration overhead	10	10	10
Total marginal cost per unit	158	160	163
Contribution per unit	42	36	27
Total contribution	4,20,000	4,32,000	4,32,000
Less : Fixed cost	2,20,000	2,20,000	2,20,000
Profit	2,00,000	2,12,000	2,12,000
P/V ratio	21%	18.37%	14.21%
Incremental profit (by comparing profit at the preceding level)	–	12,000	–

Comments: P/V ratio is the highest at 50% capacity level. It is beneficial for company to switch over to 60% because at this level profit will be maximum. At this level, impact by increase in sales revenue due to increase in sales volume and incidence of fixed cost is more than the increase in variable cost. At 80% capacity level increase in variable cost is more than the increase in sales revenue due to sales volume and incidence of fixed cost.

Illustration 3

The expenses budgeted for production of 10,000 units in a factory are furnished below :

	<i>Rs. Per unit</i>
Material	70
Labour	25
Variable overheads	20
Fixed overheads (Rs.1,00,000)	10
Variable expenses (direct)	5
Selling expenses (10% fixed)	13
Distribution expenses (20% fixed)	7
Administration expenses (Rs.50,000)	<u>5</u>
Total	<u>155</u>



Cost Accounting

Prepare a budget for the production of (a) 8,000 units, and (b) 6,000 units.

Assume that administration expenses are rigid for all levels of production.

Solution: Flexible Budget for the period.....

	6,000 units		8,000 units			10,000 units	
	Per unit Rs.	Total Rs.	Per unit Rs.	Total Rs.	Rs.	Per unit Rs.	Total Rs.
Materials	70.00	4,20,000	70.00	5,60,000		70.00	7,00,000
Labour	25.00	1,50,000	25.00	2,00,000		25.00	2,50,000
Direct exp.(variable)	5.00	30,000	5.00	40,000		5.00	50,000
Variable overhead	20.00	1,20,000	20.00	1,60,000		20.00	2,00,000
Fixed overhead	16.67	1,00,000	12.50	1,00,000		10.00	1,00,000
Selling exp. : Fixed	2.17	13,000	1.63	13,000		1.30	13,000
Variable	11.70	70,200	11.70	93,600		11.70	1,17,000
Distribution exp.:							
Fixed	2.33	14,000	1.75	14,000		1.40	14,000
Variable	5.60	33,600	5.60	44,800		5.60	56,000
Adm. Exp.: Fixed	8.33	50,000	6.25	50,000		5.00	50,000
Total Cost	166.80	10,00,800	159.42	12,75,400		155.00	15,50,000

Working Notes :

1. Material, labour, direct expenses and variable overheads are variable costs and do not change per unit. Total amount changes in proportion to the number of units produced.
2. Fixed overhead total amount remains at Rs.1,00,000 at all levels of output. Per unit fixed overhead is Rs.1,00,000 divided by the number of units produced.
3. Adm. Expenses are also fixed. It is calculated in the same manner as fixed overhead.
4. Selling expenses are 10% fixed when output is 10,000 units i.e., Rs.13,000 (Rs.1.30 × 10,000 units). Variable selling expenses per unit are 90% of Rs.13 i.e. Rs.11.70. Total fixed cost of Rs.13,000 remains the same at each level and per unit is calculated by dividing Rs.13,000 by the number of units at each level. Variable selling expenses per



Budgets and Budgetary Control

unit is Rs.11.70 which remains the same at each level. Total variable selling expenses are calculated by multiplying Rs.11.70 by the number of units at each activity level.

5. Distribution expenses are calculated in the same way as selling expenses.

Illustration 4

A department of AXY Company attains sales of Rs.6,00,000 at 80% of its normal capacity. Its expenses are given below :

		<i>Rs.</i>	<i>Selling Costs :</i>	
Office salaries	90,000		Salaries	8% of sales
General expenses	2% of sales		Travelling expenses	2% of sales
Depreciation	7,500		Sales office	1% of sales
Rent and rates	8,750		General expenses	1% of sales
<i>Distribution costs:</i>				
Wages				15,000
Rent				1% of sales
Other expenses				4% of sales

Draw up Flexible Administration, Selling and Distribution Costs Budget, operating at 90 per cent, 100 per cent and 110 per cent of normal capacity.

Solution: Flexible Budget/ For the period

	80%	90%	100%	110%
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Sales	6,00,000	6,75,000	7,50,000	8,25,000
<i>Administration Costs:</i>				
Office Salaries (fixed)	90,000	90,000	90,000	90,000
General expenses (2% of Sales)	12,000	13,500	15,000	16,500
Depreciation (fixed)	7,500	7,500	7,500	7,500
Rent and rates (fixed)	8,750	8,750	8,750	8,750
(A) Total Adm. Costs	1,18,250	1,19,750	1,21,250	1,22,750



Cost Accounting

<i>Selling Costs :</i>				
Salaries (8% of sales)	48,000	54,000	60,000	66,000
Travelling expenses (2% of sales)	12,000	13,500	15,000	16,500
Sales office (1% of sales)	6,000	6,750	7,500	8,250
General expenses (1% of sales)	6,000	6,750	7,500	8,250
(B) Total Selling Costs	72,000	81,000	90,000	99,000
<i>Distribution Costs :</i>				
Wages (fixed)	15,000	15,000	15,000	15,000
Rent (1% of sales)	6,000	6,750	7,500	8,250
Other expenses (4% of sales)	24,000	27,000	30,000	33,000
(C) Total Distribution Costs	45,000	48,750	52,500	56,250
Total Costs (A + B + C)	2,35,250	2,49,500	2,63,750	2,78,000

Note : All fixed costs have been assumed to remain unchanged even at 110% capacity. However, in practice, fixed costs may change when capacity utilisation exceeds 100%.

Illustration 5

Floatglass Manufacturing Company requires you to present the budget for the next year from the following information :

Sales :

Toughened Glass Rs.6,00,000

Bent Glass Rs.2,00,000

Direct material cost 60% of sales

Direct wages 20 workers @ Rs.150 per month

Factory overheads :

Indirect labour –

Works manager Rs.500 per month

Foreman Rs.400 per month

Stores and spares 2.5% on sales



Budgets and Budgetary Control

Depreciation on machinery	Rs.12,600
Light and power	Rs.3,000
Repairs and maintenance	Rs.8,000
Others sundries	10% on direct wages
Administration, selling and distribution expenses	Rs.36,000 per year

Solution: Master Budget for the year ending

<i>Sales :</i>		<i>Rs.</i>
Toughened Glass		6,00,000
Bent Glass		<u>2,00,000</u>
Total Sales		8,00,000
<i>Less : Cost of production :</i>		
Direct materials (60% of Rs.8,00,000)	4,80,000	
Direct wages (20 workers × Rs.150 × 12 months)	<u>36,000</u>	
Prime Cost	5,16,000	
<i>Fixed Factory Overhead :</i>		
Works manager's salary (500 × 12)	6,000	
Foreman's salary (400 × 12)	4,800	
Depreciation	12,600	
Light and power	<u>3,000</u>	<u>26,400</u>
<i>Variable Factory Overhead :</i>		
Stores and spares	20,000	
Repairs and maintenance	8,000	
Sundry expenses	<u>3,600</u>	<u>31,600</u>
Works Cost		<u>5,74,000</u>
Gross Profit (Sales – Works cost)		2,26,000
<i>Less: Adm., selling and distribution expenses</i>		<u>36,000</u>
Net Profit		<u>1,90,000</u>



Cost Accounting

Illustration 6

The cost accountant of manufacturing company provides you the following details for year 2007 :

	Rs.		Rs.
Direct materials	1,75,000	Other variable costs	80,000
Direct Wages	1,00,000	Other fixed costs	80,000
Fixed factory overheads	1,00,000	Profit	1,15,000
Variable factory overheads	1,00,000	Sales	7,50,000

During the year, the company manufactured two products A and B and the output and costs were :

	A	B
Output (units)	2,00,000	1,00,000
Selling price per unit	Rs.2.00	Rs.3.50
Direct materials per unit	Re.0.50	Re.0.75
Direct wages per unit	Re.0.25	Re.0.50

Variable factory overhead are absorbed as a percentage of direct wages. Other variable costs have been computed as : Product A Re.0.25 per unit; and B Re.0.30 per unit.

During 2008, it is expected that the demand for product A will fall by 25 % and for B by 50%. It is decided to manufacture a further product C, the cost for which are estimated as follows :

	Product C
Output (units)	2,00,000
Selling price per unit	Rs.1.75
Direct materials per unit	Re.0.40
Direct wages per unit	Re 0.25

It is anticipated that the other variable costs per unit will be the same as for product A.

Prepare a budget to present to the management, showing the current position and the position for 2008. Comment on the comparative results.



Budgets and Budgetary Control

Solution: Budget Showing Current Position and Position for 2008

	<i>Position for 2007</i>			<i>Position for 2008</i>			
	A	B	Total (A+B)	A	B	C	Total (A+B+C)
Sales (units)	2,00,000	1,00,000	–	1,50,000	50,000	2,00,000	–
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
(A) Sales (Rs.)	4,00,000	3,50,000	7,50,000	3,00,000	1,75,000	3,50,000	8,25,000
Direct Material	1,00,000	75,000	1,75,000	75,000	37,500	80,000	1,92,500
Direct wages	50,000	50,000	1,00,000	37,500	25,000	50,000	1,12,500
Factory overhead (variable)	50,000	50,000	1,00,000	37,500	25,000	50,000	1,12,500
Other variable costs	50,000	30,000	80,000	37,500	15,000	50,000	1,02,500
(B) Marginal Cost	2,50,000	2,05,000	4,55,000	1,87,500	1,02,500	2,30,000	5,20,000
(C) Contribution (A-B)	1,50,000	1,45,000	2,95,000	1,12,500	72,500	1,20,000	3,05,000
Fixed costs –Factory			1,00,000				1,00,000
– Others			<u>80,000</u>				<u>80,000</u>
(D) Total fixed cost			<u>1,80,000</u>				<u>1,80,000</u>
Profit (C – D)			<u>1,15,000</u>				<u>1,25,000</u>

Comments: Introduction of Product C is likely to increase profit by Rs.10,000 (i.e. from Rs.1,15,000 to Rs.1,25,000) in 2008 as compared to 2006. Therefore, introduction of product C is recommended.

Illustration 7

A department of Tek India Company attains sales of Rs.6,00,000 at 80% of its normal capacity. Its expenses are given below :

	<i>Rs.</i>
Office salaries	90,000
General expenses	2% of sales
Depreciation	7,500
Rent and rates	8,750



Cost Accounting

Selling Cost :

Salaries	8% of sales
Travelling expenses	2% of sales
Sales office	1% of sales
General expenses	1% of sales

Distribution Cost :

Wages	15,000
Rent	1% of sales
Other expenses	4% of sales

Draw up Flexible administration, Selling and distribution Costs Budget, operating at 90 per cent, 100 per cent and 110 per cent of normal capacity.

Solution:

Flexible Budget

for the period

	80%	90%	100%	110%
	Rs.	Rs.	Rs.	Rs.
Sales	6,00,000	6,75,000	7,50,000	8,25,000
<i>Administration Costs :</i>				
Office salaries (fixed)	90,000	90,000	90,000	90,000
General exp. (2% of Sales)	12,000	13,500	15,000	16,500
Depreciation (fixed)	7,500	7,500	7,500	7,500
Rent and rates (fixed)	8,750	8,750	8,750	8,750
(A) Total Adm. Costs	1,18,250	1,19,750	1,21,250	1,22,750
<i>Selling costs :</i>				
Salaries (8% of sales)	48,000	54,000	60,000	66,000
Travelling expenses	12,000	13,500	15,000	16,500
Sales office (1% of sales)	6,000	6,750	7,500	8,250
General exp. (1% of sales)	6,000	6,750	7,500	8,250
(B) Total Selling Costs	72,000	81,000	90,000	99,000



Budgets and Budgetary Control

<i>Distribution Costs :</i>				
Wages (fixed)	15,000	15,000	15,000	15,000
Rent (1% of sales)	6,000	6,750	7,500	8,250
Other expenses (4% of sales)	24,000	27,000	30,000	33,000
(C) Total Dist. Costs	45,000	48,750	52,500	56,250
Total Cost (A + B + C)	2,35,250	2,49,500	2,63,750	2,78,000

Note : All fixed costs have been assumed to remain unchanged even at 110% capacity. However, in practice, fixed costs may change when capacity utilisation exceeds 100%.

10.7 Self Examination Questions

Multiple Choice Questions

- (i) A budget that gives a summary of all the functional budgets and projected Profit and Loss Account is known as
 - (a) Capital budget
 - (b) Flexible budget
 - (c) Master budget
 - (d) Discretionary budget
- (ii) The fixed-variable cost classification has a special significance in the preparation of
 - (a) Flexible budget
 - (b) Master budget
 - (c) Cash budget
 - (d) Capital budget
- (iii) The basic difference between a fixed budget and a flexible budget is that a fixed budget
 - (a) includes only fixed costs, and a flexible budget only variable costs
 - (b) is a budget for a single level of some measures of activity, while a flexible budget consists of several budgets based on different activity levels



Cost Accounting

- (c) is concerned with future acquisition of fixed assets, while a flexible budget is concerned with expenses that vary with sales
 - (d) cannot be changed after a fiscal period begins, while a flexible budget can be changed after a fiscal period begins
- (iv) When preparing a production budget, the quantity to be produced equals:
- (a) Sales quantity + opening stock + closing stock
 - (b) Sales quantity – opening stock + closing stock
 - (c) Sales quantity – opening stock – closing stock
 - (d) Sales quantity + opening stock – closing stock
- (v) A job requires 2,400 actual labour hours for completion and it is anticipated that there will be 20 percent idle time. If the wage rate is Rs 10 per hour , what is the budgeted labour cost for the job?
- (a) Rs 19200
 - (b) Rs 24,000
 - (c) Rs 28,800
 - (d) Rs 30,000
- (vi) Of the four costs shown below , which would not be included in the cash budget of an insurance firm?
- (a) Depreciation of fixed asset
 - (b) Commission paid to agents
 - (c) Office salaries
 - (d) Capital cost of a new computer
- (vii) A master budget comprises
- (a) The budgeted profit and loss account
 - (b) Budgeted cash flow, budgeted profit and loss, budgeted balance sheet
 - (c) Budgeted cash flow
 - (d) Entire sets of budgets prepared



Budgets and Budgetary Control

- (viii) Which of the information below should be contained in a budget manual?
- (a) An organisation chart
 - (b) Timetable for budget preparation
 - (c) A list of account codes
 - (d) all a, b and c
- (ix) ABC Ltd cash budget forewarns of a short term surplus. Which of the following would be appropriate action to be taken in such a situation?
- (a) Increase debtors and stock to boost sales
 - (b) Purchase new fixed assets
 - (c) Repay long term loans
 - (d) Pay creditors early to obtain a cash discount
- (x) PG Ltd. makes a single product and is preparing its material usage budget for next year. Each unit of product requires 2 kg of material, and 5,000 units of product are to be produced next year.
- Opening stock of material is budgeted to be 800 kg and PG Ltd. budgeted to increase material stock at the end of next year by 20%.
- The material usage budget for next year is
- (a) 8,000 kg
 - (b) 9,840 kg
 - (c) 10,000 kg
 - (d) 10,160 kg.

Answers to Multiple Choice Questions

1. c; 2. a; 3.b; 4.b; 5.d; 6.a; 7.b; 8.d; 9.a&d; 10.c

Short Answer Type Questions

1. Discuss briefly the objectives of budgeting.
2. Define the terms "Budget" and "Budgeting control".



Cost Accounting

3. Distinguish between fixed budget and flexible budget.
4. Write short notes on the following,
 - (a) Capital expenditure budget
 - (b) Cash budget
5. Distinguish between Functional budgets and master budget.

Long Answer Type Questions

1. Discuss the objectives of introducing a Budgetary Control System in an organisation.
2. Discuss briefly the advantages and limitations of "Budgetary Control System".
3. (a) List any six functional budgets prepared by a business.
(b) What do you understand by the term sales budget? How it is prepared.
4. "Establishing specific targets for future operations is part of the planning function of management, while executing actions to meet the goals is the directing function of management". In the context of this statement, discuss the planning directing and controlling functions of management.
5. Discuss the salient features of a budgetary control system.

Numerical Questions

1. A company has compiled the following data for preparation of budget for 1998 :

	<i>Products</i>		
	<i>A</i>	<i>B</i>	<i>C</i>
Sales per month			
Units	8,000	4,000	6,000
	Rs./Unit	Rs./Unit	Rs./Unit
Selling price	40	80	100
Direct materials	20	48	40
Direct labour :			
Dept.	Rate/Hour		
	Rs.		
1.	5.00	10	20



Budgets and Budgetary Control

2	4.00	8	4	12
Variable overheads		3	3	7
Fixed overheads Rs. 1,50,000 per month				

After the Budget was discussed the following action plan was approved for improving the profitability of the company :

- (i) Direct labour in department 1 which is in short supply should be increased by 15,000 hours by spending fixed overheads of Rs. 8,000 per month.
- (ii) To boost sales, an advertisement programme should be launched at a cost of Rs. 10,000 per month.
- (iii) The selling prices should be reduced by :
A : 2 ½ % B : 8 ¾ % C : 1%
- (iv) The sales targets have been increased and the sales department has confirmed that the company will be able to achieve the following quantities of sales :
A : 12,000 Units B : 6,000 Units C : 10,000 Units

Required :

- (i) Present the original monthly budget for 1998.
 - (ii) Set an optimal product mix after taking the action plan into consideration and determine its monthly profit.
 - (iii) In case the requirement of direct labour hours of department 2 in excess of 40,000 hours is to be met by overtime working involving double the normal rate, what will be the effect of so working overtime on the optimum profit calculated by you in (ii) above.
2. P. Ltd. manufactures two products using one type of material and one grade of labour. Shown below an extract from the company's working papers for the next period's budget :

	Product A	Product B
Budgeted sales (units)	3,600	4,800
Budgeted material consumption, per product (kg.)	5	5



Cost Accounting

Budgeted material cost Rs. 12 per kg.

Standard hours allowed per product

5

4

Budgeted wage rate Rs. 8 per hour

Overtime premium is 50% and is payable, if a worker works for more than 40 hours a week. There are 90 direct workers.

The target productivity ratio (or efficiency ratio) for the productive hours worked by the direct workers in actually manufacturing the products is 80%; in addition the non-productive down time is budgeted at 20% of the productive hours worked.

There are twelve 5 day weeks in the budget period and it is anticipated that sales and production will occur evenly throughout the whole period.

It is anticipated that stock at the beginning of the period will be :

A 1,020 units; Product B 2,400 units; Raw material 4,300 kgs.

The target closing stock, expressed in terms of anticipated activity during the budget period are 7: Product A 15 days sales; Product B 20 days sales; Raw material 10 days consumption.

Required :

Calculate the material purchases budget and the wages budget for the direct workers, showing the quantities and values, for the next period.

GLOSSARY

Abnormal spoilage.	Spoilage that is not expected to arise under efficient operating conditions; it is not an inherent part of the selected production process.
Absorption costing	Method of inventory costing in which all direct manufacturing costs and all manufacturing overhead costs – both variable and fixed – are considered as inventoriable costs.
Actual costing	A costing method that traces direct costs to a cost object by using the actual direct cost rate (s) times the actual quantity and allocates indirect costs based on the actual indirect cost (rate)s times the actual quantity.
Actual Costs.	Costs incurred (historical costs), as distinguished from predicted or forecasted costs
Allowable cost.	Cost that the parties to a contract agree to include in the costs to be reimbursed.
Average cost	Cost computed by dividing total cost by the number of units
Batch-level costs.	The costs of resources sacrificed on activities that are related to a group of units of products or services rather than to each individual unit of product or service.
Benchmarking	The continuous process of measuring products, services, or activities against the best levels of performance that may be found either inside or outside the organization.
Book Value.	The original cost minus accumulated depreciation of an asset.
Bottleneck.	An operation where the work required to be performed approaches or exceeds the available capacity.
Breakeven point	Quantity of output sold at which total revenues equal total cost, that is where the operating income is nil.



Cost Accounting

Budget	Quantitative expression of a proposed plan of action by management for a specified period and is an aid to coordinating what needs to be done to implement that plan.
Budgeted cost	Predicted or forecasted cost as distinguished from actual or historical cost
Byproduct.	Product from a joint process that has a low sales value compared with the sales value of the main or joint product(s)
Carrying cost	Costs that arise while holding inventory
Cash budget	Schedule of expected cash receipts and disbursement over a specified period.
Constant gross-margin percentage NRV method.	Joint cost allocation method that allocates joint costs in such a way that the overall gross-margin percentage is identical for all the individual products.
Contribution	Difference between selling price and the variable cost
Controllable cost	Any cost that is primarily subject to the influence of given manager of a given responsibility center for a given time span.
Controllability	The degree of influence that a specific manager has over costs, revenues, or other items in question.
Conversion cost.	All manufacturing costs other than direct materials costs.
Cost.	Resource sacrificed or forgone to achieve a specific objective.
Cost accounting.	Management accounting plus a part of financial accounting - to the extent that cost accounting provides information that helps the requirements of external reporting.
Cost accounting system.	Means by which cost accounting information is reported. Also called costing system.
Cost accumulation.	The collection of cost data in some organised way through an accounting system.



Glossary

Cost allocation.	The assigning of indirect costs to the chosen cost object.
Cost allocation base.	A factor that is the common denominator for systematically allocating an indirect cost or group of indirect costs to a cost object.
Cost assignment.	General term that encompasses both (1) tracing accumulated costs to a cost object and (2) allocating accumulated costs to a cost object.
Cost- benefit approach	Primary criterion for choosing among alternative accounting systems, which is how each system achieves organization goals in relation to the cost of each system.
Cost center.	A responsibility center in which a manager is accountable for costs only.
Cost driver.	Any factor that affects costs. That is, a change in the cost driver will cause a change in the total cost of a related costs object.
Cost estimation.	The measurement of past cost relationships.
Cost incurrence.	Occurs when resources are actually sacrificed.
Cost object.	Anything for which a separate measurement of costs is desired.
Costs of quality.	Costs incurred to prevent poor quality from occurring or those costs incurred because poor quality has occurred.
Cost-plus contract.	Contract in which reimbursement is based on actual allowable cost plus a fixed fee.
Cost pool.	A grouping of individual cost items.
Cost predictions.	Forecast of future costs.
Cost tracing.	The assigning of direct costs to the chosen cost object.
Costing system.	See cost accounting system.



Cost Accounting

Costing system refinement	Making changes to an existing costing system that results in a better measure of the way that jobs, products, customers, and so on, differentially use the resources of the organization.
Current cost.	Asset measure based on the cost today of purchasing an asset identical to the one currently held. It is the cost of purchasing the services provided by that asset if an identical asset couldn't currently be purchased.
Design of products, services, or processes.	The detailed planning and engineering of products, services, or processes.
Differential cost.	See incremental cost.
Differential revenue	Difference in total revenue between two alternatives
Direct allocation method.	Method of support cost allocation that ignores any services rendered by one support department to another; it allocates each support department's total costs directly to the operating departments. Also called direct method.
Direct costing.	See variable costing
Direct costs of a cost object.	Costs that are related to the cost object and can be traced to it in an economically feasible way.
Direct manufacturing labour costs.	Compensation of all manufacturing labor that is considered to be part of the cost object (say, units finished or in process) and that can be traced to the cost object in an economically feasible way.
Direct materials costs.	The acquisition costs of all materials that eventually become part of the cost object (say, units finished or in process) and that can be traced to that cost object in an economically feasible way.
Direct materials inventory.	Direct materials in stock and awaiting use in the manufacturing process.



Direct method.	See direct allocation method.
Discretionary costs.	Arise from periodic (usually yearly) decisions regarding the maximum outlay to be incurred. They are not tied to a clear cause-and-effect relationship between inputs and outputs.
Distribution	The mechanism by which products or services are delivered to the customer.
Double -counting	Occurs when a cost item is included in a contract reimbursement report both a direct cost item and as part of an indirect cost pool allocated to the contract using a budgeted rate.
Dual-rate method	Cost allocation method in which costs are grouped in two separate cost pools, each of which has a different allocation rate and may have a different allocation base.
Economic order quantity (EOQ)	Decision model that calculates the optimal quantity of inventory to order. Simplest model incorporates only ordering costs and carrying costs.
Effectiveness.	The degree to which a predetermined objective or largest is met.
Efficiency.	The amount of inputs used to achieve a given level of output.
Efficiency variance	The difference between actual input quantity used and budgeted input quantity allowed for actual output multiplied by budgeted price. Also known as usage variance
Effort.	Exertion toward a goal
Engineered costs.	Costs that result specifically from a clear cause-and-effect relationship between inputs and outputs.
Equivalent units.	Measure of the output in terms of the quantities of each of the factors of production that have been consumed by the units. It is the collection of inputs necessary to produce one fully complete unit of product or output.



Cost Accounting

Events	A possible occurrence in decision model. Also called states or states of nature.
Expected value.	Weighted average of the outcomes of a decision with the probability of each outcome serving as the weight. Also called expected monetary value.
Factory overhead costs.	See manufacturing overhead costs.
Favourable variance	Variance that has an effect of increasing operating income relative to the budgeted amount.
Financial accounting.	Focus on external reporting through financial statements to investors, government authorities, and other outside parties.
Finished goods inventory.	Goods fully completed but not yet sold.
First-in, first-out (FIFO) process costing method.	Method of process costing that computes unit costs by confining equivalent units to work done during the current period only; costs of the current period are separately identified so that the unit costs are related only to the current period's work.
Fixed cost.	Cost that does not change in total despite changes of a cost driver.
Fixed overhead flexible budget variance	The difference between the actual fixed overhead costs and fixed overhead costs in the flexible budget.
Flexible budget	Budget developed using budgeted revenues and budgeted costs based on the actual output in the budget period.
Flexible budget variance	The difference between the actual result and the corresponding flexible budget amount based on the actual output level in the budget period.
Full product costs.	The sum of all the costs in all the business functions - R&D, design, production, marketing, distribution, and customer service.



Glossary

Goods in process inventory.	See work in process inventory.
Gross margin.	Revenues minus cost of goods sold.
High - low method.	Method used to estimate a cost function that entails using only the highest and lowest observed values of the cost driver within the relevant range.
Homogeneous cost pool.	Cost pool in which all costs have a similar cause-and-effect or benefits-relationship between the cost driver and the costs of the activity.
Hybrid costing systems.	Blends of characteristics from both job costing systems and process costing systems
Idle time	Wages paid for unproductive time caused by lack of orders , machine breakdowns etc
Imputed costs.	Costs recognized in particular situations that are not regularly recognized by accrual accounting procedures.
Incremental cost.	Difference in total cost between two alternatives. Also called differential cost and net relevant cost.
Incremental revenue	Additional total revenue from an activity
Indirect cost of a cost object.	Costs that are related to the cost object but cannot be traced to it in an economically feasible way.
Indirect manufacturing costs.	See manufacturing overhead costs.
Infrastructure costs.	Costs that arise from having property, plant, equipment, and a functioning organization; little can be done in the short run to change infrastructure costs.
Intermediate product.	Product transferred from one sub-unit to another subunit of the organization. This product is further processed and sold to an external customer.



Cost Accounting

Internal failure costs.	Costs incurred when a nonconforming product is detected before it is shipped to customers
Inventoriable costs.	Specific type of capitalised cost. They are costs associated with the purchase of goods for resale (in the case of merchandise inventory) or costs associated with the acquisition and conversion of materials and all other manufacturing inputs into goods for sale (in the case of manufacturing inventories).
Inventory Management	The planning, organizing, and control activities focused on the flow of materials into, through, and from the organization.
Investment center.	A responsibility center in which a manager is accountable for investments, revenues, and costs.
Job	A unit or multiple units of a distinct product or service
Job cost record.	Record used to accumulate the costs of a job. Also called job order sheet or job cost sheet.
Job costing system.	Costing system in which the cost of a product or service is obtained by assigning costs to a distinct, identifiable product or service.
Job cost sheet.	See job cost record.
Job order sheet.	See job cost record.
Joint cost.	Cost of a single process that yields multiple products simultaneously
Joint products.	Products from a joint process that have relatively high sales value and are not separately identifiable as individual products until the split off point.
Just-in-time (JIT) production.	Production system in which each component on a production line is produced immediately as needed by the next step in the production line.



Just-in-time (JIT) purchasing.	The purchase of goods or materials such that delivery immediately precedes demand or use. In the extreme, no inventories would be held.
Labour time record.	Record used to charge departments and job cost records for labor time used.
Linear cost function	Cost function in which graph of the total cost versus the level of a single activity related to that cost is a straight line within the relevant range
Main product.	When a single process yielding two or more products yield only one product with a relatively high sales value, that product is termed a main product.
Management accounting.	Focuses on internal customers; it measures and reports financial and other information that assists managers in fulfilling goals of the organization.
Management by exception.	The practice of concentrating on areas that deserve attention and placing less attention on areas operating as expected.
Manufacturing lead-time.	Time from when an order is ready to start on the production line to when it becomes a finished good.
Manufacturing overhead allocated.	All manufacturing costs that are assigned to a product (or service) using a cost allocation base because they cannot be traced to a product (or service) in an economically feasible way.
Manufacturing overhead costs.	All manufacturing costs finished or in process but that cannot be traced to that cost object in an economically feasible way. Also called indirect manufacturing costs, factory overhead costs, and factory burden costs
Manufacturing-sector companies.	Provide to their customers tangible produces that have been converted to a different basic form from the materials purchased from suppliers.



Cost Accounting

Margin of Safety.	Excess of budgeted revenues over the breakeven revenues.
Marketing.	The process by which individuals or groups (a) learn about and value the attributes of products or services and (b) purchase those products or services.
Master budget	Expression of management's operating and financial plan for a specified period and includes a set of budgeted financial accounts.
Mixed cost.	A cost that has both fixed and variable elements. Also called a semi variable cost.
Motivation.	The desire to attain a selected goal (the goal-congruence aspect) combined with the resulting drive or pursuit toward that goal (the effort aspect).
Non-value-added cost.	A cost that customers perceive as not adding value to a product or service.
Normal costing.	A costing method that traces direct costs to a cost object by using the actual direct cost rate(s) times the actual quantity and allocates indirect costs based on the budgeted indirect cost rate(s) times the actual quantity.
Normal spoilage.	Spoilage that arises under efficient operating conditions; it is an inherent result of the particular process.
Normal utilisation.	The denominator-level concept based on the level of capacity utilization that satisfies average customer demand over a period (say, two or three year) that included seasonal, cyclical, or other trend factors
Objective function.	Expresses the objective to be maximized (for example, operating income) or minimized (for example, operating costs) in a decision model. Also called choice criterion.
Operating budget	Budgeted income statements and its supporting schedules.



Glossary

On-time performance.	Situation in which the product or service is actually delivered at the time it is scheduled to be delivered.
Operating department.	A department that adds to product or service value that is observable by a customer. Also called a production department in manufacturing organizations.
Operating income.	Operating revenues for the accounting period minus all operating costs, including cost of goods sold.
Operation.	A standardized method or technique that is performed repetitively regardless of the distinguishing features of the finished good.
Operation costing.	Hybrid costing system applied to batches of similar products. Each batch of products uses the same resources to the same extent as all other batches.
Opportunity cost.	The contribution to income that is forgone (rejected) by not using a limited resource in its best alternative use.
Ordering costs.	Costs of preparing and issuing a purchase order.
Organisational structure.	The arrangement of lines of responsibility within the entity.
Outcomes	Predicted consequences of the various possible combinations of actions and events in a decision model. Also called payoffs.
Outlay costs.	Current or near-future cash disbursements made to meet costs incurred because of a specific decision. Also called out-of-pocket costs.
Output level overhead variance.	Difference between budgeted fixed overhead and the fixed overhead allocated to actual output units achieved. Also called a production volume variance or a production level variance in a manufacturing setting.
Output unit-level costs.	The costs of resources sacrificed on activities performed on each unit of product or service.



Cost Accounting

Outsourcing.	Process of purchasing goods and services from outside vendors rather than producing the same goods or providing the same services within the firm.
Over absorbed indirect (overhead) costs.	See over allocated indirect (overhead) costs.
Over allocated indirect (overhead) costs.	Allocated amount of indirect costs in an accounting period is greater than the actual (incurred) amount in that period. Also called over applied indirect (overhead) costs and over absorbed indirect (overhead) costs.
Period costs.	Cost that are reported as expenses of the period in question.
Periodic inventory method.	Inventory method that does not maintain a continuous record of inventory changes.
Perpetual inventory method.	Inventory method that maintains a continuous ("real-time") record of additions to and reductions from inventory.
Physical measure method.	Joint cost allocation method that allocates joint costs on the basis of their relative proportions at the splitoff point, using a common physical measure such as weight or volume.
Post manufacturing costs.	All costs incurred in the value-chain business functions of marketing, distribution, and customer service. Also called downstream costs.
Pre manufacturing costs.	All costs incurred in the value chain business functions of research and development and the design of products or processes. Also called upstream costs.
Prevention costs.	Costs incurred in preventing the production of products that do not conform to specifications.
Price variance	The difference between the actual price and the budgeted price multiplied by the actual quantity of input
Prime costs.	All direct manufacturing costs.



Glossary

Process costing system	Costing system in which the cost of a product or service is obtained by assigning costs to masses of similar units and then computing unit costs on an average basis.
Product cost.	Sum of costs assigned to a product for a specific purpose.
Product life cycle.	Spans the time from initial research and development to the time at which support to customers is withdrawn.
Product line.	A grouping of similar products.
Product over costing.	A product consumes a relatively low level of resources but is reported to have a relatively high cost.
Product under costing.	A product consumes a relatively high level of resources but is reported to have a relatively low cost.
Production	The coordination and assembly of resources to produce a product or deliver a service.
Productivity.	Measures the relationship between actual inputs used and actual outputs achieved; the lower the inputs for a given set of outputs or the higher the outputs for a given set of inputs, the higher the level productivity.
Profit center.	A responsibility center in which a manager is accountable for revenues and costs.
Pro forma statements.	Budgeted financial statements of an organization
Project	Complex job that often takes months or years to complete and requires the work of many different departments, divisions, or subcontractors.
Pro rating.	The spreading of under allocated or over allocated overhead among ending work in process, finished goods, and cost of goods sold.



Cost Accounting

Purchase costs.	Cost of goods acquired from suppliers, including freight and transportation costs.
PV graph	Shows how changes in the quantity of units sold effects the operating income.
Purchase - order lead time.	Amount of time between the placement of an order and its delivery.
Quality.	The conformance of a product or service with a preannounce or pre specified standard.
Reciprocal allocation method.	Method of support-cost allocation that explicitly includes the mutual services rendered among all support departments
Relevant range.	Range of the cost driver in which a specific relationship between cost and the driver is valid.
Reorder point.	The quantity level of the inventory on hand that triggers a new order.
Research and development.	The generation of, and experimentation with, idea related to new products, services, or process.
Residual income.	Income minus an imputed interest charge for the investment base.
Responsibility accounting.	System that measures the plans (by budgets) and actions (by actual results) of each responsibility center. (202)
Responsibility center.	A part, segment, or submit of an organization whose manager is accountable for a specified set of activities.
Revenue center.	A responsibility center in which a manager is accountable for revenues only.
Revenue driver.	Any factor, such as units sold, that affects revenues.
Reworked units.	Unacceptable units of production that are subsequently reworked and sold as acceptable finished goods.



Glossary

Safety stock.	The buffer inventory held as a cushion against unexpected increases in demand or lead time and unexpected unavailability of stock from suppliers.
Sales mix.	Relative combination of quantities of products or services that constitutes total sales.
Sales price variance	Difference between the actual price and the budgeted price multiplied by the actual quantity sold
Sales volume variance	The difference between the actual quantity and budgeted quantity multiplied by the budgeted price.
Sales value at split off method.	Joint cost allocation method that allocates joint costs on the basis of each product's relative sales value at the split off point.
Scrap.	Product that has a minimal (frequently zero) sales value.
Service department.	See support department.
Service-sector companies.	Provide services or intangible products to their customers - for example, legal advice or an audit.
Separable costs	All costs incurred beyond the split off point that are assignable to each of the specific products identified at the split off point
Shrinkage.	The difference between goods purchased for sale and goods actually sold (after making inventory adjustments). This difference can arise from breakages before a sale, theft, perishability and so on.
Spoilage point	Juncture in the process when the products become separately identifiable
Spoilage.	Unacceptable units of production that are discarded or sold for net disposal proceeds.
Standard	A carefully determined cost of a unit or output
Standard cost	A carefully determined cost of a unit of output



Standard costing	Costing system that traces direct costs to output produced by multiplying the standard prices or rates by the standard quantities of input allowed for actual outputs produced and allocates overhead cost on the basis of the standard overhead cost rates times the standard quantities of the allocation bases allowed for the actual output produced.
Static budget	Budget based on the output planned at the beginning of the period.
Step allocation method.	See step-down allocation method.
Step-down allocation method.	Method of support cost allocation that allows for partial recognition of services rendered by support departments to other support departments. Also called step or sequential allocation method.
Stock out.	A stock out arises when a customer demands a unit of product and that unit is not readily available.
Straight -line depreciation (SL).	Depreciation method in which an equal amount of depreciation is taken each year.
Sunk costs.	Past costs that are unavoidable because they cannot be changed no matter what action is taken.
Time driver.	Any factor that causes a change in the speed with which an activity is undertaken when the factor itself changes.
Uncertainty.	The possibility that an actual amount will deviate from an expected amount.
Under absorbed indirect (overhead) costs.	See under allocated indirect (overhead) costs.
Under allocated indirect (overhead) costs.	Allocated amount of indirect costs in an accounting period is less than the actual (incurred) amount in that period. Also called under applied indirect (overhead) costs or under absorbed



	indirect (overhead) costs.
Under applied indirect (overhead) costs.	See under allocated indirect (overhead) costs.
Unfavourable variance	Variance that has an effect of decreasing operating income relative to the budgeted amount.
Unit cost.	Computed by dividing some total cost (the numerator) by some number of units (the denominator). Also called average cost.
Value-added activities.	Activities that customers perceive as adding utility (usefulness) to the products or services they purchase.
Value-added cost.	A cost that customers perceive as adding value to produce or service.
Value chain.	The sequence of business functions in which utility (usefulness) is added to the products or services of an organization.
Variable cost.	Cost that changes in total in proportion to changes of a cost driver.
Variable costing.	Method of inventory costing in which all direct manufacturing costs and variable manufacturing overhead costs are included as inventoriable costs; fixed manufacturing overhead costs are excluded from the inventoriable costs and are costs of the period in which they are incurred.
Variable cost percentage.	Total variable costs (with respect to an output-related factor) divided by revenues.
Variance	The difference between the amount based upon actual result and the corresponding budgeted amount.
Weighted-average process costing method.	Method of process costing that focuses on the total costs and total equivalent units completed to date; no distinction is made between work completed during the preceding period and work completed during the current period.



Cost Accounting

- Work in process inventory.** Goods partially worked on but not yet fully completed. Also called work in progress inventory or goods in process inventory
- Work in progress inventory.** See work in process inventory.
- Working capital cycle.** Movement from cash to inventories to receivables and back to cash.