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COST ACCOUNTING

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Units (1-14)

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Cost Accounting

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INTRODUCTION

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The business environment has undergone a revolutionary change due to free competition and globalization. The whole world has become a global village where products and services are highly competitive. As a result, cost accounting has gained special importance in all business activities. Cost Accounting has become an important tool of management. Modern industrial enterprises now design cost accounting systems and procedures not only for providing historical data for cost ascertainment but also for assisting the management in controlling and cost-reducing endeavours. As a matter of fact, a cost accountant these days is now more concerned with providing relevant and significant cost data to management for decision-making. Costing methods and techniques have also undergone a revolutionary change in this process. New techniques and procedures are being devised by cost accountants for better cost management.

In this book, *Cost Accounting*, various aspects of cost accounting has been discussed including the cost accounting principles; the material, labour and overhead cost control; different methods and types of costing; reconciliation of cost and final accounts as well as the concept of cost control and cost reduction.

This book, *Cost Accounting*, is written with the distance learning student in mind. It is presented in a user-friendly format using a clear, lucid language. Each unit contains an Introduction and a list of Objectives to prepare the student for what to expect in the text. At the end of each unit are a Summary and a list of Key Words, to aid in recollection of concepts learnt. All units contain Self-Assessment Questions and Exercises, and strategically placed Check Your Progress questions so the student can keep track of what has been discussed.

BLOCK - I

COST ACCOUNTING PRINCIPLES AND STORES ISSUES

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UNIT 1 COST ACCOUNTING PRINCIPLES

Structure

- 1.0 Introduction
- 1.1 Objectives
- 1.2 Meaning and Objectives of Costing and Cost Accounting
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1.0 INTRODUCTION

Cost Accounting is concerned with ascertainment of cost of products/services. Cost accounting has primarily developed to help managers understand the costs of running a business. Profit and loss account and balance sheet are presented to the management by the financial accountant. But modern management needs much more detailed information than those supplied by these financial statements. Cost accounting provides detailed cost information to various levels of management for efficient performance of their functions. The information supplied by cost accounting acts as a management tool for decision making, to optimize the utilization of scarce resources and ultimately add to the profitability of business by controlling expenditure under various heads. In this unit, you will learn about the concept of cost accounting, costing, cost accountancy, and the main elements and installation of a costing system.

Accounting information system is vital to all business enterprises. This system combines the accounting principles and concepts with the benefits of an information system. It is used to analyse and record business transactions, to provide financial information concerning the activities of an enterprise to a diverse group of people such as shareholders, managers, creditors, tax authorities, etc. On the basis of the purpose for which this information is used, accounting is divided into three parts—financial accounting, cost accounting and management accounting.

This overview unit provides a framework of cost accounting, explaining its basic concepts.

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1.1 OBJECTIVES

After going through this unit, you will be able to:

- Describe the meaning of cost and cost accounting
- Discuss the objectives of cost accounting
- Explain the installation of a costing system

1.2 MEANING AND OBJECTIVES OF COSTING AND COST ACCOUNTING

The Chartered Institute of Management Accountants (CIMA), London has defined costing as, '*the techniques and processes of ascertaining costs.*' Wheldon has defined costing as, '*the proper allocation of expenditure and involves the collection of costs for every order, job, process, service or unit.*' Thus, costing simply means cost finding by any process or technique. It consists of principles and rules which are used for determining:

- (a) the cost of manufacturing a product, e.g., motor car, furniture, chemical, steel and paper and
- (b) the cost of providing a service, e.g., electricity, transport and education.

The terms '*costing*' and '*cost accounting*' are often used interchangeably. Cost accounting is a formal system of accounting for costs in the books of account, by means of which, costs of products and services are ascertained and controlled. According to L C Cropper, '*cost accounting means a specialized application of the general principles of accounting, in order to ascertain the cost of producing and marketing any unit of manufacture or of carrying out any particular job or contract.*' An authoritative definition of cost accounting has been given by CIMA, London as follows: '*Cost accounting is the process of accounting for costs from the point at which expenditure is incurred or committed to the establishment of its ultimate relationship with cost centres and cost units. In its widest usage, it embraces the preparation of statistical data, the application of cost control methods and ascertainment of profitability of activities carried out or planned.*'

Costing and Cost Accounting—Difference: Though the terms '*costing*' and '*cost accounting*' are interchangeably used, there is a difference between the two. Costing is simply the method of determining costs by using any method like arithmetic process, memorandum statements, etc. Cost accounting, on the other hand, denotes the formal accounting mechanism, by means of which costs are ascertained by recording them in the books of account. In simple words, costing means finding out the cost of products or services by any technique or method, while cost accounting means costing using the double entry system.

Cost Accountancy: Cost accountancy is a very wide term. It means and includes the principles, conventions, techniques and systems which are employed in a business to plan and control the utilization of its resources. It is defined by CIMA, London 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 therefrom for the purposes of managerial decision making.*'

Cost accountancy is thus the *science, art and practice* of a cost accountant. It is a *science* in the sense that it is a body of systematic knowledge, which a cost accountant should possess for the proper discharge of his duties and responsibilities. It is an *art* as it requires the ability and skill on the part of a cost accountant, in applying the principles of cost accountancy to various managerial problems, like price fixation, cost control, etc. *Practice* refers to constant efforts on the part of cost accountant, in the field of cost accountancy. Theoretical knowledge alone would not enable a cost accountant to deal with the various intricacies involved. He should, thus, have sufficient practical training, and exposure to real life costing dilemmas.

Cost accountancy has a very wide scope. It includes *costing, cost accounting, cost control and cost audit*.

Applications of Cost Accounting

Cost accounting is generally considered as being applicable only to manufacturing concerns. This is not so. Its applications are in fact much wider. All types of activities, manufacturing and non-manufacturing, in which monetary value is involved, should consider the use of cost accounting. Wholesale and retail businesses, banking and insurance companies, railways, airways, shipping and road transport companies, hotels, hospitals, schools, colleges, universities, farming and cinema houses, all may employ cost accounting techniques to operate efficiently. It is only a matter of recognition by the management of the applicability of these costing concepts and techniques in their own fields of endeavour.

Objectives and Functions of Cost Accounting

The main objectives of cost accounting are as follows:

1. **Ascertainment of cost:** This is the primary objective of cost accounting. In cost accounting, cost of each unit of production, job, process or department, etc., is ascertained. Not only actual costs incurred are ascertained but costs are also predetermined for various purposes. For cost ascertainment, various methods and techniques are employed under different situations.
2. **Cost control and cost reduction:** Cost accounting aims at improving profitability by controlling and reducing costs. For this purpose, various specialized techniques, like standard costing, budgetary control, inventory

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control, value analysis, etc., are used. This objective of cost control and cost reduction is becoming increasingly important in the present scenario because of growing competition in the business world.

3. **Guide to business policy:** Cost accounting aims at serving the needs of the management in conducting the business with utmost efficiency. Cost data provide guidelines for various managerial decisions, like making or buying, selling below cost, utilization of idle plant capacity, introduction of a new product, etc.

4. **Determination of selling price:** Cost accounting provides cost information on the basis of which selling prices of products or services may be fixed. In periods of depression, cost accounting guides the firms in deciding the extent to which the selling prices may be reduced to meet the situation.

In order to realize these objectives, the data provided by cost accounting may have to be re-classified, re-organized and supplemented by other relevant business data from outside the formal cost accounting system.

1.2.1 Meaning of Cost

The term 'cost' does not have a definite meaning and its scope is extremely broad and general. It is, therefore, not easy to define or explain this term without leaving any doubt concerning its meaning. Cost accountants, economists and others develop the concept of cost according to their needs because one complete description of 'cost' to suit all situations is not possible.

According to Cambridge International Dictionary of English, cost means '*the amount of money needed to buy, do or make something.*' However, some authoritative definitions of cost are given below:

1. Cost is '*the amount of expenditure (actual or notional), incurred or attributable to a given thing.*' (CIMA, London)
2. '*A cost is the value of economic resources used as a result of producing or doing the things costed.*' (W M Harper)
3. '*Cost is a measurement, in monetary terms, of the amount of resources used for the purpose of production of goods or rendering of services.*' ICWA of India

In fact, in order to assign a definite meaning to the term 'cost', it should be used with a modifier or an adjective, according to the specific purpose for its use. For example, direct cost, fixed cost, variable cost, controllable cost, material cost, selling cost, prime cost, marginal cost, differential cost, standard cost, estimated cost, actual cost, joint cost, conversion cost, etc., have specific meanings.

Cost vs Expense and Loss

Often the terms 'cost' and 'expense' are used interchangeably. But cost should be distinguished from expense and loss.

Expense: Expense is defined as ‘*an expired cost resulting from a productive usage of an asset.*’ It is that cost which has been applied against revenue of a particular accounting period, in accordance with the principle of matching costs to revenue. In other words, an expense is that portion of the revenue-earning potential of an asset which has been consumed in the generation of revenue. Unexpired or unconsumed part of the cost is recorded as an asset in the balance sheet. Such an unexpired cost is converted into an expense when it expires while helping to earn revenue. For example, when a plant is purchased, depreciation on plant (expired cost) is charged to the profit and loss account as an expense and cost of plant remaining after providing depreciation (unexpired cost) is shown as an asset in the balance sheet. Every year, depreciation on plant, representing expense, is debited to profit and loss account and depreciated value representing unexpired cost is shown in the balance sheet. Pre-paid insurance is also an example of unexpired cost which is shown in the balance sheet as an asset.

Loss: Loss is defined as ‘*reduction in a firm’s equity, other than from withdrawals of capital for which no compensating value has been received.*’ A loss is an expired cost resulting from the decline in the service potential of an asset that generated no benefit to the firm. Obsolescence or destruction of stock by fire are examples of loss.

Cost Centre

For the purpose of ascertaining cost, the whole organization is divided into small parts or sections. Each small section is treated as a cost centre of which cost is ascertained. A cost centre is defined by CIMA, London as ‘*a location, person, or item of equipment (or group of these), for which costs may be ascertained and used for the purpose of control.*’ Thus, a cost centre refers to a section of the business to which costs can be charged. It may be a location (a department, a sales area), an item of equipment (a machine, a delivery van), a person (a salesman, a machine operator) or a group of these (two automatic machines operated by one workman). The main purpose of ascertaining the cost of a cost centre is control of cost.

Cost centres are primarily of two types:

- (a) **Personal cost centre**—which consists of a person or a group of persons.
- (b) **Impersonal cost centre**—which consists of a location or an item of equipment or group of these.

From a *functional* point of view, cost centres may be of the following two types:

- (a) **Production cost centre:** These are those cost centres where actual production work takes place. Examples are, weaving department in a textile mill, melting shop in a steel mill and cane crushing shop in a sugar mill.
- (b) **Service cost centre:** These are those cost centres which are ancillary to and render services to production cost centres. Examples of service cost centres are power house, tool room, stores department, repair shop and canteen.

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A cost accountant sets up cost centres to enable himself to ascertain the costs he needs to know. A cost centre is charged with all the costs that relate to it, *e.g.*, if a cost centre is a machine, it will be charged with the costs of power, light, depreciation and its share of rent, etc. The purpose of ascertaining the cost of a cost centre is cost control. The person in charge of a cost centre is held responsible for the control of cost of that centre.

Cost Unit

It has been seen above that cost centres help in ascertaining costs by location, equipment or person. A cost unit goes a step further by breaking up the cost into smaller sub-divisions, thereby helping in ascertaining the cost of saleable products or services.

A cost unit is defined by CIMA, London as a '*unit of product or service in relation to which costs are ascertained.*' For example, in a sugar mill, the cost per tonne of sugar may be ascertained, in a textile mill the cost per metre of cloth may be ascertained. Thus 'a tonne' of sugar and 'a metre' of cloth are cost units. In short, cost unit is unit of measurement of cost.

All sorts of cost units are adopted, the criterion for adoption being the applicability of a particular cost unit to the circumstances under consideration. Broadly, cost units may be of two types as explained below:

- (i) **Units of production**, *e.g.*, a ream of paper, a tonne of steel or a metre of cable.
- (ii) **Units of service**, *e.g.*, passenger miles, cinema seats or consulting hours.

The cost units and cost centres should be those which are natural to the business and which are readily understood and accepted by all concerned.

Cost Object

Cost object may be defined as '*anything for which a separate measurement of cost may be desired.*' A cost accountant may want to know the cost of a particular 'thing' and such a 'thing' is called a cost object. A cost object may be a product, service, activity, department or process, etc. Examples of cost objects are given as follows:

<i>Cost Object</i>	<i>Examples</i>
Product	Car, shaving razor, computer, etc.
Service	Telephone hotline, taxi service
Process	Melting process in a steel mill, weaving process in a textile mill
Activity	Developing a website on the Internet, Purchasing raw material
Department	Personnel department, Stores department, etc.

1.3 INSTALLATION OF A COSTING SYSTEM

There cannot be a readymade costing system for every undertaking. In order to meet the special needs of a business, a costing system has to be specially devised to give it a blend of efficiency and economy. The installation of a costing system requires a thorough study and understanding of all the aspects involved, otherwise the system may be a misfit and enterprise will not be able to derive full advantage from it.

To start with, it is important to make cost benefit analysis, *i.e.*, weigh the cost of the system against the likely benefits to be derived from it. The benefits from the system must exceed the amount spent on it. The management must feel the need for it and should be able to make full use of the information available from the system in the conduct of business. In other words, the system should be justified on the basis of its value to the management.

Steps in Installation

The installation of a costing system requires the following steps:

1. Preliminary investigations should be made relating to the technical aspects of the business. For instance, the nature of the product and methods of production will determine the type of costing system to be applied.
2. The organization structure of the business should be studied to ascertain the scope of authority of each executive. The existing organization should be disturbed to the minimum, as may be advisable after full consideration.
3. The methods of purchase, storage and issue of materials should be examined and modified as per requirements.
4. The existing methods of remunerating labour should be examined for the purpose of introducing any incentive plans.
5. Forms and accounting records should be so designed so as to involve minimum clerical labour and expenditure.
6. The size and layout of the factory should be studied.
7. The system should be effective in cost control and cost reduction.
8. Costing system should be simple and easy to operate. Unnecessary details should be avoided.
9. The installation and operation of the system should be economical.
10. The system should be introduced gradually.

Practical Difficulties

Apart from technical costing problems, a cost accountant is confronted with certain practical difficulties in installing a costing system. These are:

1. **Lack of support of top management:** In order to make the costing system a success, it must have the whole-hearted support of every member of the

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management. Many a time, the costing system is introduced at the behest of the Managing Director or the Financial Director without the support of functional managers. They view the system as an interference in their work and do not make use of the system.

Before the system is installed, the cost accountant should ensure that the management is fully committed to the costing system. A sense of cost consciousness should be created in their minds by explaining to them that the system is for their benefit. A cost manual should be prepared and distributed to them giving the details and functions of the system.

2. **Resistance from the accounting staff:** The existing accounting staff may not welcome the new system. This may be because they look with suspicion at a system which is not known to them. The cooperation of the employees should be sought by convincing them that the system is needed to supplement the financial accounting system and that it is for the betterment of all.
3. **Non-cooperation of working and supervisory staff:** Correct activity data which is supplied by supervisory staff and workers is necessary for a costing system. They may not cooperate and resist the additional paper work arising as a result of the introduction of the system. Such resistance generally arises out of ignorance. Proper education should be given to the staff regarding benefits of the system and the important roles they have to play to make it successful.
4. **Shortage of trained staff:** In the initial stages, there may be shortage of trained costing staff. The staff should be properly trained so that the costing department can run efficiently.

Check Your Progress

1. What are the elements included in the scope of cost accountancy?
2. How does cost accounting helps firms in periods of depression?
3. Define cost object.

1.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Cost accountancy has a very wide scope. It includes costing, cost accounting, cost control and cost audit.
2. In periods of depression, cost accounting guides the firms in deciding the extent to which the selling prices may be reduced to meet the situation.
3. Cost object may be defined as 'anything for which a separate measurement of cost may be desired.'

1.5 SUMMARY

- Costing as, ‘the techniques and processes of ascertaining costs.’ Wheldon has defined costing as, ‘the proper allocation of expenditure and involves the collection of costs for every order, job, process, service or unit.’
- Cost accounting is a formal system of accounting for costs in the books of account, by means of which, costs of products and services are ascertained and controlled.
- Cost accountancy is a wide term. It means and includes the principles, conventions, techniques and systems which are employed in a business to plan and control the utilization of its resources.
- The main objectives of cost accounting include: ascertainment of cost, cost control and reduction, guide to business policy, and determination of selling price.
- The term ‘cost’ does not have a definite meaning and its scope is extremely broad and general.
- Expense is that cost which has been applied against revenue of a particular accounting period, in accordance with the principle of matching costs to revenue.
- For the purpose of ascertaining cost, the whole organization is divided into small parts or sections. Each small section is treated as a cost centre of which cost is ascertained.
- The installation of a costing system requires a thorough study and understanding of all the aspects involved, otherwise the system may be a misfit and enterprise will not be able to derive full advantage from it.
- Some of the practical difficulties in installing a costing system include: lack of support of top management, resistance from the accounting staff, non-cooperation of working and supervisory staff and shortage of trained staff.

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1.6 KEY WORDS

- **Cost Accounting:** It is a specialized branch of accounting, which is concerned with ‘the techniques and processes of ascertaining costs’ of products and services.
- **Cost:** It is defined as a measurement, in monetary terms, of the amount of resources used for the purpose of production of goods or rendering of services.

1.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

NOTES

Short Answer Questions

1. What are the three parts into which accounting is divided?
2. What are the main objectives of cost accounting?
3. Compare cost to expense and loss.
4. Write a short note on cost unit and cost centre.

Long Answer Questions

1. Explain the difference between costing, cost accounting and cost accountancy.
2. Describe the steps involved and practical difficulties in the installation of a costing system.

1.8 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
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UNIT 2 COST CONCEPTS

Structure

- 2.0 Introduction
- 2.1 Objectives
- 2.2 Elements of Cost
 - 2.2.1 Cost Sheet (Cost Statement)
- 2.3 Methods and Systems of Costing
 - 2.3.1 Techniques of Costing
 - 2.3.2 Classifications of Cost
- 2.4 Answers to Check Your Progress Questions
- 2.5 Summary
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- 2.8 Further Readings

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2.0 INTRODUCTION

Cost concepts covers all the aspects related to costs in cost accounting. You have studied in Unit 1 that cost is different from expense and loss. Where expense is an expired cost resulting from productive usage of an asset, loss is an expired cost resulting from the decline in the service potential of an asset that generated no benefit to the firm. You also studied how the meaning of the word cost changes as per the specific purpose of its use. What are the specific purpose of its use, what are the elements of cost, what are its classifications, its methods and techniques and how a cost sheet is prepared are the topics that will be discussed in this unit.

2.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the elements of cost
- Describe the preparation of a cost sheet
- Explain the methods and systems of costing
- Recall the techniques of costing

2.2 ELEMENTS OF COST

A cost is composed of three elements, *i.e.*, material, labour and expense. Each of these elements may be direct or indirect. This is shown as follows:

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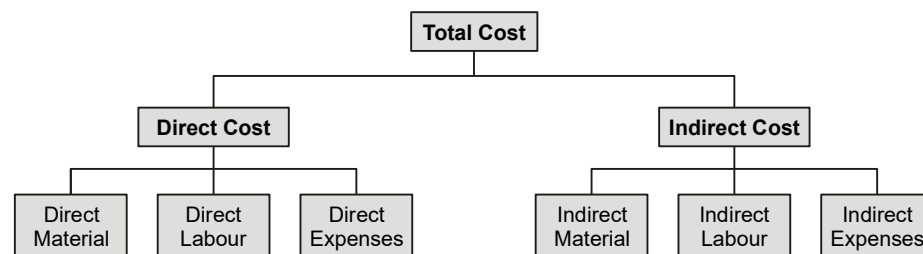


Fig. 2.1 Primary Elements of Cost

Material Cost

According to CIMA, London, material cost is ‘*the cost of commodities supplied to an undertaking.*’ Material cost includes cost of procurement, freight inwards, taxes, insurance, etc., directly attributable to the acquisition. Trade discounts, rebates, duty drawbacks, refund on account of modvat, sales tax, etc., are deducted in determining the cost of material. Materials may be direct or indirect.

Direct materials: Direct material cost is that which can be conveniently identified with and allocated to cost units. Direct materials generally become a part of the finished product. For example, cotton used in a textile mill is a direct material. However, in many cases, though a material forms a part of the finished product, yet, it is not treated as direct material; *e.g.*, nails used in furniture, thread used in stitching garments, etc. This is because value of such materials is so small that it is quite difficult and futile to measure it. Such materials are treated as indirect materials.

Indirect materials: These are those materials which cannot be conveniently identified with individual cost units. These are minor in importance, such as (i) small and relatively inexpensive items which may become a part of the finished product, *e.g.*, pins, screws, nuts and bolts, thread, etc., (ii) those items which do not physically become a part of the finished products, *e.g.*, coal, lubricating oil and grease, sand paper used in polishing, soap, etc.

Labour Cost

This is ‘*the cost of remuneration (wages, salaries, commissions, bonuses, etc.) of the employees of an undertaking*’ (CIMA). It includes all fringe benefits like P.F. contribution, gratuity, ESI, overtime, incentive bonus, wages for holidays, idle time, etc.

Direct labour: Direct labour cost consists of wages paid to workers directly engaged in converting raw materials into finished products. These wages can be conveniently identified with a particular product, job or process. Wages paid to a machine operator is a case of direct wages.

Indirect labour: It is of general character and cannot be conveniently identified with a particular cost unit. In other words, indirect labour is not directly engaged in the production operations but only to assist or help in production operations.

Expenses

All costs other than material and labour are termed as expenses. It is defined as 'the cost of services provided to an undertaking and the notional cost of the use of owned assets' (CIMA).

Direct expenses: According to CIMA, London, 'direct expenses are those expenses which can be identified with and allocated to cost centres or units.' These are those expenses which are specifically incurred in connection with a particular job or cost unit. Direct expenses are also known as *chargeable expenses*.

Indirect expenses: All indirect costs, other than indirect materials and indirect labour costs, are termed as indirect expenses. These cannot be directly identified with a particular job, process or work order and are common to cost units or cost centres.

Prime Cost

This is the aggregate of direct material cost, direct labour cost and direct expenses. Thus,

$$\text{Direct material} + \text{Direct labour} + \text{Direct expenses} = \text{Prime Cost}$$

Overheads

These are the aggregate of indirect material cost, indirect labour cost and indirect expenses. Thus,

$$\text{Indirect material} + \text{Indirect labour} + \text{Indirect expenses} = \text{Overheads}$$

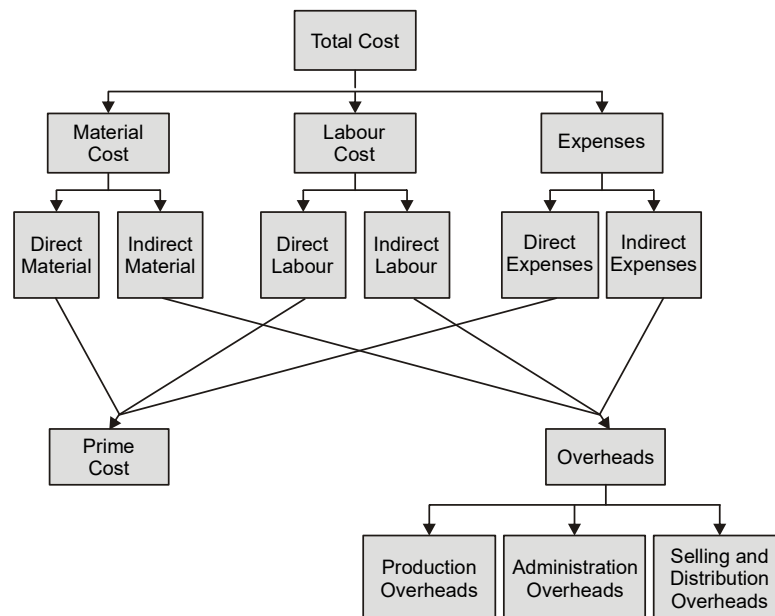


Fig. 2.2 Elements of Cost

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Overheads are divided into three groups as follows:

1. **Production overheads:** Also known as factory overheads, works overheads or manufacturing overheads, these are those overheads which are concerned with the production function. They include indirect materials, indirect wages and indirect expenses in producing goods or services.

(a) *Indirect material*—Examples: Coal, oil, grease, etc.; stationery in factory office, cotton waste, brush and sweeping broom.

(b) *Indirect labour*—Examples: Works manager's salary, salary of factory office staff, salary of inspector and supervisor, wages of factory sweeper and wages of factory watchman.

(c) *Indirect expenses*—Examples: Factory rent, depreciation of plant, repair and maintenance of plant, insurance of factory building, factory lighting and power and internal transport expenses.

2. **Office and administration overheads:** These are the indirect expenditures incurred in general administrative function, *i.e.*, in formulating policies, planning and controlling the functions, directing and motivating the personnel of an organization in the attainment of its objectives.

These overheads are of general character and have no direct connection with production or sales activities. This category of overheads is also classified into indirect material, indirect labour and indirect expenses.

(a) *Indirect material*—Examples: Stationery used in general administrative office, postage, sweeping broom and brush.

(b) *Indirect labour*—Examples: Salary of office staff, salary of managing director, remuneration of directors of the company.

(c) *Indirect expenses*—Examples: Rent of office building, legal expenses, office lighting and power, telephone expenses, depreciation of office furniture and equipments, office air-conditioning and sundry office expenses.

3. **Selling and distribution overheads:** Selling overheads are the costs of promoting sales and retaining customers. They are defined as '*the cost of seeking to create and stimulate demand and of securing orders.*' Examples are advertisements, samples and free gifts and salaries of salesmen.

Distribution cost includes all expenditure incurred from the time the product is completed until it reaches its destination. It is defined as '*the cost of sequence of operations which begins with making the packed product available for dispatch and ends with making the reconditioned returned empty packages if any, available for reuse.*' Examples are carriage outwards, insurance of goods in transit, upkeep of delivery vans and warehousing.

Selling and distribution overheads are also grouped into indirect material, indirect labour and indirect expenses.

- (a) *Indirect material*—Examples: Packing material; stationery used in sales office, cost of samples, price list; catalogues, oil, grease etc., for delivery vans, etc.
- (b) *Indirect labour*—Examples: Salary of sales manager, salary of sales office staff, salary of warehouse staff and salary of drivers of delivery vans.
- (c) *Indirect expenses*—Examples: Advertising, travelling expenses, showroom expenses, carriage outwards, rent of warehouse, bad debts and insurance of goods in transit.

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Illustration 2.1: A manufacturer has shown an amount of ₹19,310 in his books as ‘Establishment’ which really include the following expenses:

	₹
Interest on debentures	1,200
Agents’ commission	6,750
Warehouse wages	1,800
Warehouse repairs	1,500
Lighting of office	70
Office salaries	1,130
Director’s remuneration	1,400
Travelling expenses of salesmen	1,760
Rent, rates and insurance of warehouse	310
Rent, rates and insurance of office	230
Lighting of warehouse	270
Printing and stationery	1,500
Trade magazine	70
Donations	150
Bank charges	100
Cash discount allowed	770
Bad debts	300

From the information prepare a statement showing total:

- (a) Selling expenses
 (c) Administration expenses
 (b) Distribution expenses
 (d) Expenses which you would exclude from costs

(Adapted)

Solution:

(a) <i>Selling Expenses:</i>	₹
Agents’ commission	6,750
Travelling expenses of salesmen	1,760
Bad debts	300
Total	8,810

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(b) <i>Distribution Expenses:</i>	₹
Warehousing wages	1,800
Warehouse repairs	1,500
Rent, rates and insurance of warehouse	310
Lighting of warehouse	270
Total	3,880
(c) <i>Administration Expenses:</i>	₹
Office salaries	1,130
Office lighting	70
Director's remuneration	1,400
Rent, rates and insurance of office	230
Printing and stationery	1,500
Trade magazine	70
Total	4,400
(d) <i>Items not included in costs:</i>	₹
Donations	150
Cash discount allowed	770
Bank charges	100
Interest on debentures	1,200
Total	2,220

Components of Total Cost—Elements of cost may be grouped as follows:

- (i) **Prime Cost** = Direct material + Direct labour + Direct expenses
- (ii) **Works Cost or Factory Cost** = Prime cost + Factory overheads
- (iii) **Cost of Production** = Works cost + Administration overheads
- (iv) **Total Cost or Cost of Sales** = Cost of production + Selling and distribution overheads

2.2.1 Cost Sheet (Cost Statement)

It is a statement which is prepared periodically to provide detailed cost of a cost centre or cost unit. A cost sheet not only shows the total cost but also the various components of the total cost. Period covered by a cost sheet may be a year, a month or a week, etc.

Illustration 2.2: From the following information for the month of January, prepare a cost sheet to show the following components: (a) Prime Cost, (b) Factory Cost, (c) Cost of Production, (d) Total Cost.

	₹
Direct material	57,000
Direct wages	28,500

Factory rent and rates	2,500
Office rent and rates	500
Plant repairs and maintenance	1,000
Plant depreciation	1,250
Factory heating and lighting	400
Factory manager's salary	2,000
Office salaries	1,600
Director's remuneration	1,500
Telephone and postage	200
Printing and stationery	100
Legal charges	150
Advertisement	1,500
Salesmen's salaries	2,500
Showroom rent	500
Sales	1,16,000

Cost Concepts

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Solution:

Cost Sheet for the Month of Jan.

	₹	₹
Direct materials		57,000
Direct wages		28,500
Prime Cost		85,500
<i>Factory Overheads:</i>		
Factory rent and rates	2,500	
Plant repair and maintenance	1,000	
Plant depreciation	1,250	
Factory heating and lighting	400	
Factory manager's salary	2,000	7,150
Factory Cost		92,650
<i>Office and Administration Overheads:</i>		
Office salaries	1,600	
Director's remuneration	1,500	
Telephone and postage	200	
Office rent and rates	500	
Printing and stationery	100	
Legal charges	150	4,050
Cost of Production		96,700

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Selling and Distribution Overheads:

Advertisement	1,500	
Salesmen's salaries	2,500	
Showroom rent	500	4,500
Total cost (or cost of sales)		1,01,200
PROFIT		14,800
Sales		1,16,000

Check Your Progress

1. Give examples of indirect materials in material cost.
2. What is the aggregate of direct material cost, direct labour cost and direct expenses?

2.3 METHODS AND SYSTEMS OF COSTING

In this section, you will learn about the methods and systems, techniques and classification of costing.

Methods and Systems of Costing

The methods or types of costing refer to the techniques and processes employed in the ascertainment of costs. Several methods have been designed to suit the needs of different industries. The method of costing to be applied in a particular concern depends upon the type and nature of manufacturing activity. Basically, there are two methods of costing:

1. Job costing or job order costing
2. Process costing

All other methods are variations of either job costing or process costing. The various methods given here are in outline only and detailed discussion of each of these is given in later units.

1. **Job order costing:** This method '*applies where work is undertaken to customers' special requirements.*' Cost unit in job order costing is taken to be a job or work order for which costs are separately collected and computed. A job, big or small, comprises a specific quantity of a product or service to be provided as per customer's specifications. Industries where this method is used include printing repair shops, interior decoration and painting.
2. **Contract costing or terminal costing:** This is a variation of job costing and, therefore, principles of job costing apply to this method. The difference between job and contract is that job is small and contract is big. It is well said that *a contract is a big job and a job is a small contract.* The cost

unit here is a 'contract' which is of a long duration and may continue over more than one financial year. Contract costing is most suited to construction of buildings, dams, bridges and roads, shipbuilding, etc.

3. **Batch costing:** Like contract costing, this is also a variation of job costing. In this method, the cost of a batch or group of identical products is ascertained and therefore each batch of products is a cost unit for which costs are ascertained. This method is used in companies engaged in the production of readymade garments, toys, shoes, tyres and tubes, component parts, bakery, etc.
4. **Process costing:** As distinct from job costing, this method is used in mass production industries manufacturing standardized products in continuous processes of manufacturing. Costs are accumulated for each process or department. Here raw material has to pass through a number of processes in a particular sequence to the completion stage. In order to arrive at cost per unit, the total cost of a process is divided by the number of units produced. The finished product of one process is passed on to the next process as raw material. Textile mills, chemical works, sugar mills, refineries, soap manufacturing, etc., may be cited as examples of industries which employ this method.
5. **Operation costing:** This is nothing but a refinement and a more detailed application of process costing. A process may consist of a number of operations and operation costing involves cost ascertainment for each operation instead of a process. This method provides minute analysis of costs and ensures greater accuracy and better control.
6. **Single, output or unit costing:** This method of cost ascertainment is used when production is uniform and consists of a single or two or three varieties of the same product. Where the product is produced in different grades, costs are ascertained grade-wise. As the units of output are identical, the cost per unit is found by dividing the total cost by the number of units produced. This method is applied in mines, quarries, brick kilns, steel production, flour mills, etc.
7. **Operating or service costing:** This method should not be confused with operation costing. It is used in undertakings which provide services instead of manufacturing products. For example, transport undertakings (road transport, railways, airlines, shipping companies), electricity companies, hotels, hospitals and cinemas, use this method. The cost units are passenger-kilometre or tonne-kilometre, kilowatt hours, a room per day in a hotel, a seat per show in a cinema hall, etc. This method is a variation of process costing.
8. **Multiple or composite costing:** It is an application of more than one method of cost ascertainment with respect to the same product. This method is used in industries where a number of components are separately

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manufactured and then assembled into a final product. For example, in a television set manufacturing company, manufacture of different component parts may require different production methods and thus different methods of costing may have to be used. Assembly of these components into final product requires yet another method of costing. Other examples of industries which make use of this method are air-conditioners, refrigerators, scooters, cars and locomotives.

2.3.1 Techniques of Costing

It is the type of industry that determines which of the eight methods of costing discussed above will be used in a particular enterprise. However, in addition to these methods, there are certain techniques of costing which are not alternatives to the methods discussed above. These techniques may be used for special purpose of control and policy in any business irrespective of the method of costing being used there. These techniques have been briefly explained below:

1. **Standard costing:** This is a very valuable technique of controlling cost. In this technique, standard cost is predetermined as target of performance, and actual performance is measured against the standard. The difference between standard and actual costs are analysed to know the reasons for the difference so that corrective actions may be taken.
2. **Budgetary control:** Closely allied to standard costing is the technique of budgetary control. A budget is an expression of a firm's business plan in financial form and budgetary control is a technique applied to the control of total expenditure on materials, wages and overheads by comparing actual performance with planned performance. Thus, in addition to its use in planning, the budget is also used for control and co-ordination of business operations.
3. **Marginal costing:** In this technique, separation of costs into fixed and variable (marginal) is of special interest and importance. This is so because marginal costing regards only variable costs as the cost of the products. Fixed cost is treated as period cost and no attempt is made to allocate or apportion this cost to individual cost centres or cost units. It is transferred to costing profit and loss account of the period. This technique is used to study the effect on profit of changes in volume or type of output.
4. **Total absorption costing:** It is a traditional method of costing whereby total costs (fixed and variable) are charged to products. This is in complete contrast to marginal costing where only variable costs are charged to products. Although until recently, this was the only technique employed by cost accountants, but now a days it is considered to have only a limited application.
5. **Uniform costing:** This is not a separate technique or method of costing like standard costing or process costing. It simply denotes a situation in

which a number of firms adopt a uniform set of costing principles. It has been defined by CIMA, London as '*the use by several undertakings of the same costing principles and/or practices.*' This helps to compare the performance of one firm with that of other firms and thus, to derive the benefit of anyone's better experience and performance.

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Costing Methods and Techniques are Tools

Methods and techniques of costing described above should be regarded as tools of a cost accountant and it should not be construed that a particular method or technique is superior to any other. Just as a skilled workman uses different tools for different tasks, similarly, a cost accountant should use these methods and techniques appropriately either individually or in combination. For example, standard costing may be combined with process costing to give 'standard process costing', or standard costing may be combined with marginal costing as well as process costing to give 'standard marginal process costing'. Although this may appear confusing, yet if principles involved in each method or technique are clearly understood, there should not be any difficulty in making the best use of these methods and techniques.

Cost Ascertainment and Cost Estimation

Cost Ascertainment: Cost ascertainment is concerned with computation of actual costs incurred. It refers to the methods and processes employed in ascertaining costs. It has been seen earlier that in different types of industries, different methods are employed for ascertaining cost. These methods are job costing, contract costing, batch costing, process costing, operating costing, single costing and multiple costing. The basic principles underlying these methods are the same but these methods have been designed to suit the needs of individual business conditions. The ascertainment of actual cost has very little utility because of the following reasons:

1. Actual costs cannot be used for the purpose of price quotations and filling tenders.
2. Actual cost has practically no utility for cost control purposes.
3. Actual costs are ineffective as means of measuring performance efficiency.

In spite of these limitations, ascertainment of actual costs proves very useful in many cases. For instance, ascertainment of actual costs reveals unprofitable activities, losses and inefficiencies occurring in the form of idle time, excessive scrap, etc.

Cost Estimation: As against ascertainment of actual costs, costs may also be predetermined. Cost estimation is the process of predetermining costs of goods or services. The costs are determined in advance of production and precede the operations. Estimated costs are definitely the future costs and are based on the

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average of past actual costs adjusted for anticipated changes in future. Cost estimates may have the following uses:

1. Cost estimates are used in making price quotations and bidding for contracts.
2. Cost estimates are used in the preparations of budgets.
3. They help in evaluating performance.
4. They are used in preparing projected financial statements.
5. Cost estimates may serve as targets in controlling the costs.

Extreme care should be taken in cost estimation because a high price quotation may result in loss of business.

2.3.2 Classifications of Cost

Classification is the process of grouping costs according to their common characteristics. It is a systematic placement of like items together according to their common features.

There are various ways of classifying costs as given below. Each classification serves a different purpose:

1. Classification into Direct and Indirect Costs

Costs are classified into direct costs and indirect costs on the basis of their identifiability with cost units or jobs or processes or cost centres.

Direct costs: These are those costs which are incurred for and conveniently identified with a particular cost object. Cost of raw materials used and wages of a machine operator are common examples of direct costs. To be specific, cost of steel used in manufacturing a machine can be conveniently known. It is, therefore, a direct cost. Similarly, wages paid to a tailor in a readymade garments company for stitching a pair of trousers is a direct cost because it can be easily identified in the cost of that garment.

Indirect costs: These are general costs and are incurred for the benefit of a number of cost object. These costs cannot be conveniently identified with a particular cost object. Depreciation of machinery, insurance, lighting, power, rent, managerial salaries, materials used in repairs, etc., are common examples of indirect costs. For example, depreciation of machine for stitching a pair of trousers cannot be known and thus it is an indirect cost.

Costs are not traced or identified directly with a cost object for one of the following three reasons:

1. It is impossible to do so; *e.g.*, rent of building.
2. It is not convenient or feasible to do so; *e.g.*, nails used in furniture or sewing thread.
3. Management chooses not to do so; *i.e.*, many companies classify certain items of cost as indirect because it is customary in the industry to do so;

e.g., carriage inward may be treated as an indirect expense (alternatively, it may be treated as a part of the cost of materials purchased).

The terms 'direct' and 'indirect' should be used in relation to the object of costing. An item of cost may be a direct cost in one case and the same may be indirect in another case. It is the nature of business and the cost unit chosen that will determine whether a particular cost is direct or indirect. For example, depreciation of asphalt mixing plant used by a road building contractor at site is a direct cost, whereas depreciation of plant used in a factory is an indirect cost. It is because in the factory, plant would probably benefit more than one cost unit and it may not be convenient to allocate depreciation to various cost units with any degree of accuracy.

This classification is important from the point of view of accurate ascertainment of cost. Direct costs of a product can be conveniently determined while the indirect costs have to be arbitrarily apportioned to various cost units. For example, in readymade garments, the cost of cloth and wages of tailor are accurately ascertained without any difficulty and are thus direct costs. But the rent of factory building, managerial salaries, etc., which are indirect costs, have to be apportioned to various cost units on some arbitrary basis and cannot be accurately ascertained.

2. Classification into Fixed and Variable Costs

Costs behave differently when level of production rises or falls. Certain costs change in sync with production level while other costs remain unchanged. As such on the basis of behaviour or variability, costs are classified into fixed, variable and semi-variable.

- (i) **Fixed costs:** These costs remain constant in 'total' amount over a specific range of activity for a specified period of time, *i.e.*, these do not increase or decrease when the volume of production changes. For example, building rent and managerial salaries remain constant and do not change with change in output level and thus are fixed costs. But fixed cost 'per unit' decreases when volume of production increases and vice versa, fixed cost per unit increases when volume of production decreases.

The line representing fixed cost per unit will not touch X-axis because the fixed cost per unit cannot be zero.

Relevant range – Fixed cost remains fixed only in relation to a given range of output and for a given time span. If the output is to be increased beyond the range, the fixed cost will also increase. Relevant range refers to the band of activity or volume in which specific relationship between the level of activity and the fixed cost in question is valid.

The characteristics of fixed cost are:

- (a) fixed total cost within a relevant range of output;

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- (b) increase or decrease in per unit fixed cost when quantity of production changes;
 - (c) apportioned to departments on some arbitrary basis;
 - (d) such cost can be controlled mostly by top level management.
- (ii) **Variable costs:** These costs tend to vary in direct proportion to the volume of output. In other words, when volume of output increases, total variable cost also increases and vice versa, when volume of output decreases, total variable cost also decreases, but the variable cost per unit remains fixed.
- Thus, in general, variable costs show the following characteristics:
- (a) variability of the total cost in direct proportion to the volume of output;
 - (b) fixed cost per unit in the face of changing volume;
 - (c) easy and reasonably accurate distribution of cost to departments;
 - (d) such costs can be controlled by functional managers.
- (iii) **Semi-variable or semi-fixed costs (mixed costs):** These costs include both a fixed and a variable component, *i.e.* these are partly fixed and partly variable. A semi-variable cost has a fixed cost element which needs to be incurred irrespective of the level of activity achieved. On the other hand, the variable element in semi-variable costs changes either at a constant rate or in lumps. For example, introduction of an additional shift in the factory will require additional supervisors and certain costs will increase by steps. In the case of a telephone connection, there is a minimum rent and beyond a specified number of calls, the charges vary according to the number of calls made. In fact, there is no definite pattern of behaviour of semi-variable costs.

3. Classification into Committed and Discretionary Costs

It is explained above that costs may be classified into fixed and variable. Fixed costs are further classified into committed costs and discretionary (or programmed) costs. This classification is based on the degree to which a firm is locked into an asset or service that is generating the fixed cost.

Committed costs: These are those costs that are incurred in maintaining physical facilities and managerial set up. Such costs are committed in the sense that once the decision to incur them has been made, they are unavoidable and invariant in the short run. For example, salary of the managing director may represent a *committed cost* if, by policy, the managing director is not to be relieved unless the firm is liquidated. Similarly, depreciation of plant and equipment is *committed* because these facilities cannot be easily changed in the short run.

Discretionary costs: These are those costs which can be avoided by management decisions. Such costs are not permanent. Advertising, research and development cost and salaries of low level managers are examples of discretionary

costs because these costs may be avoided or reduced in the short run, if so desired by the management.

This classification into committed and discretionary costs is important from the point of view of cost control and decision making.

4. Classification into Product Costs and Period Costs

Product costs: These costs include all such costs that are involved in acquiring or making a product. For a trader, product cost includes purchase cost plus freight inwards. For a manufacturer, these consist of direct materials, direct labour and factory overheads. Product costs are 'absorbed by' or 'attached to' the units produced. These are called *inventoriable costs* because these are included in the cost of product as work-in-progress, finished goods or cost of sales.

Period costs: These are those costs which are not necessary for production and are incurred even if there is no production. These are written off as expenses in the period in which these are incurred. Such costs are incurred for a time period and are charged to the profit and loss account of the period. Showroom rent, salary of company executives and travel expenses are examples of period costs. These costs are not inventoried, *i.e.*, these are not included in the value of stocks. Administration and selling expenses are generally treated as period costs.

Classification into product and period cost is important from the point of view of profit determination. This is so because product cost is carried forward to the next accounting period as part of the unsold finished stock, whereas period cost is written off in the accounting period in which it is incurred.

5. Classification into Controllable and Non-controllable Costs

From the point of view of controllability, costs are classified into controllable costs and non-controllable costs.

Controllable costs: These are the costs which may be directly regulated at a given level of management authority. In other words, controllable costs are those costs which are subject to the discretion of the manager and hence can be kept within predefined limits. Variable costs are generally controllable by department heads. For example, cost of raw material may be controlled by purchasing in larger quantities.

Non-controllable costs: These are those costs which cannot be influenced by the action of a specified member of an enterprise. For example, it is very difficult to control costs like factory rent, managerial salaries, etc.

Two important points should be noted regarding this classification. First, controllable costs cannot be distinguished from non-controllable costs without specifying the level and scope of management authority. In other words, a cost which is uncontrollable at one level of management may be controllable at another level of management. For example, a departmental manager may have no control

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over the number of supervisors employed in his department, but this decision may have to be taken by the production manager. Thus, supervision cost will be non-controllable at the departmental manager's level, but it will be controllable at the level of production manager. Secondly, all costs are controllable in the long run at some appropriate management level.

It is a misconception that variable costs are controllable and fixed costs are non-controllable. However, variable costs are more prone to control than fixed costs.

6. Classification into Historical Costs and Predetermined Costs

On the basis of time of computation, costs are classified into historical costs and predetermined costs.

Historical costs: These are the costs which are ascertained after these have been incurred. Historical costs are thus, nothing but *actual costs*. These costs are not available until after the completion of the manufacturing operations.

Predetermined costs: These are future costs which are ascertained in advance of production, on the basis of a specification of all the factors affecting cost. These costs are extensively used for the purpose of planning and control.

7. Classification into Normal and Abnormal Costs

Normal cost may be defined as a cost which is normally incurred on expected lines at a given level of output. This cost is a part of cost of production. *Abnormal cost* is that which is not normally incurred at a given level of output. Such cost is over and above the normal cost and is not treated as a part of the cost of production. It is charged to costing profit and loss account.

Special Costs for Management Decision Making

There are certain costs which are specially computed for use by the management for the purpose of decision making. These costs may not be recorded in the books of account. Some examples include: marginal, imputed, opportunity, relevant, irrelevant, sunk costs, etc.

Check Your Progress

3. Which method of costing is applied in mines, quarries, brick kilns, steel production, flour mills, etc.?
4. Name the technique of costing which is the complete opposite of marginal costing.
5. What are committed costs?

2.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Examples of indirect materials used in material cost include pins, screws, thread, coal, lubricating oil and grease, etc.
2. The aggregate of direct material cost, direct labour cost and direct expenses is prime cost.
3. Single, output or unit costing is applied in mines, quarries, brick kilns, steel production, flour mills, etc.
4. Total absorption costing is the technique of costing which is the complete opposite of marginal costing.
5. Committed costs are those costs that are incurred in maintaining physical facilities and managerial set up.

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2.5 SUMMARY

- A cost is composed of three elements, i.e., material, labour and expense. Each of these elements may be direct or indirect.
- According to CIMA, London, material cost is 'the cost of commodities supplied to an undertaking.' Material cost includes cost of procurement, freight inwards, taxes, insurance, etc., directly attributable to the acquisition.
- Labour cost means the payment made to the employees, permanent or temporary, for their services. CAS-I of ICAI. It includes salaries, wages, commission and all fringe benefits like P.F. contribution, gratuity, ESI, overtime, incentive bonus, wages for holidays, idle time, etc.
- Overheads are the aggregate of indirect material cost, indirect labour cost and indirect expenses.
- Cost sheet is a statement which is prepared periodically to provide detailed cost of a cost centre or cost unit.
- The method of costing to be applied in a particular concern depends upon the type and nature of manufacturing activity. Basically, there are two methods of costing:
 1. Job costing or job order costing
 2. Process costing

All other methods are variations of either job costing or process costing.

- Techniques of costing include: standard costing, budgetary control, marginal costing, total absorption costing and uniform costing.

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- Classification of costs include the following: direct costs and indirect costs, fixed and variable costs, committed and discretionary costs, product and period costs, controllable and non-controllable costs, historical and predetermined costs and normal and abnormal costs.

2.6 KEY WORDS

- **Elements of Cost:** It includes the material, labour and expense
- **Cost Unit:** It is a form of measurement of volume of production or service
- **Cost Centre:** It refers to a section of the business to which costs can be charged
- **Cost Ascertainment:** It refers to the methods and processes employed in ascertaining costs

2.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a short on material costs.
2. Briefly explain overheads.
3. What does a cost sheet show apart from the total cost?
4. Why is said that cost ascertainment has very less utility?
5. State the uses of cost estimation.

Long Answer Questions

1. Distinguish between variable, semi-variable and fixed costs.
2. State the important ways of classification of cost and discuss each of them in detail.
3. Discuss, in detail, the major methods or systems of costing.
4. What are the different techniques of costing?

2.8 FURTHER READINGS

Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.

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Cost Concepts

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UNIT 3 COST ACCOUNTING FOR MATERIAL COST CONTROL

Structure

- 3.0 Introduction
- 3.1 Objectives
- 3.2 Need for Material Cost Control
- 3.3 Techniques of Inventory Control
 - 3.3.1 Stock Levels
 - 3.3.2 Economic Order Quantity or EOQ (Reorder Quantity)
 - 3.3.3 Purchase Control
 - 3.3.4 Stores Control
- 3.4 Answers to Check Your Progress Questions
- 3.5 Summary
- 3.6 Key Words
- 3.7 Self Assessment Questions and Exercises
- 3.8 Further Readings

3.0 INTRODUCTION

The term 'material' refers to all commodities that are consumed in the process of manufacture. It is defined as '*anything that can be stored, stacked or stockpiled.*' Materials are classified into 'direct' materials and 'indirect' materials.

Direct materials are those whose consumption may be identified with specific production units and which usually become a part of the finished product. Direct materials include not only the raw materials entering at the start of the production but all of the following:

- (a) Component parts used in a product, *e.g.*, tyres and tubes in a car or picture tube in a television set.
- (b) Any material used in production but wholly consumed in the production process, *e.g.*, fertilizer used in growing plants.
- (c) Any primary packing material, *i.e.*, any container sold with the final product, *e.g.*, cans for tinned food and drink, bottles for beer, etc.

Indirect materials are those which cannot be conveniently identified with individual cost units. Examples are coal, grease and oil, soap and sandpaper.

The term '*inventory*' is used to cover the stocks of raw materials, components, work-in-progress and finished goods. It has been defined by the Accounting Principles Board as '*the aggregate of those items of tangible personal property which (i) are held for sale in the ordinary course of business; (ii) are in the process of production for such sales; or (iii) are to be currently consumed in the production of goods or services to be available for sale.*'

In this unit, you will learn the need for material cost control, and the techniques of material cost control.

*Cost Accounting for
Material Cost Control*

3.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the need for material cost control
- Explain the concept of purchase control
- Discuss the idea of stores control
- Examine the technique of stock levels
- Describe EOQ analysis

3.2 NEED FOR MATERIAL COST CONTROL

No cost accounting system can become effective without proper and efficient control of materials. This is so because quite often material is the single largest element of cost and as such, an efficient system of material control leads to a significant economy in the total cost. Material is as much cash as cash itself and any theft, waste and excessive use of materials leads to immediate and direct financial losses. Where slack methods exist, it is easy for such losses to pass unnoticed.

Meaning and Definition: Material or inventory control may be defined as ‘*systematic control and regulation of purchase, storage and usage of materials in such a way so as to maintain an even flow of production, at the same time avoiding excessive investment in inventories. Efficient material control cuts out losses and wastes of materials that otherwise pass unnoticed.*’

Thus an efficient system of material control should be comprehensive enough to cover purchase system, storage system, issue to production and determination of stock levels for each item of material.

Objectives of Material or Inventory Control

The broad objectives of material control are listed below:

1. **No under-stocking:** Under-stocking inevitably leads to materials running out of stock at some time or the other. Shortage of material may arise at a time when they are urgently needed and production may then be held up. The delay or stoppage in production due to non-availability of materials is very costly and results in loss of profits.
2. **No over-stocking:** Investment in materials must be kept as low as possible considering the production requirements and the financial resources of the business. Over-stocking of materials locks up capital and causes high storage costs, thereby resulting in adverse effect on profits. This may also result in loss due to obsolescence.

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3. **Economy in purchasing:** The purchasing of materials is a highly specialized function. By purchasing materials at the most favourable prices, the purchaser is able to make a valuable contribution to the reduction in cost.
4. **Proper quality:** While purchasing materials, due consideration should be given to the quality. It is no use purchasing materials of inferior quality or very superior quality. For each type of product, there is a particular type of quality of material which is needed and that quality alone should be purchased.
5. **Minimum wastage:** In order to minimize the loss of materials, proper storage conditions must be provided to different types of materials. Losses of materials occur due to deterioration, obsolescence, pilferage and theft and evaporation. All round efforts should be made to keep these losses to the minimum.
6. **Information about materials:** Not only should materials be available when required, there should also be a system to give complete and up-to-date accounting information about the availability of materials. Sometimes inadequate information about availability of materials may cause new purchases to be made of materials already in stock.

Essential Requirements or Principles of Inventory Control

Ideally, material control must ensure that the following requirements are fully met:

1. There should be proper coordination and cooperation between various departments dealing in materials, viz., Purchasing Department, Stores Department, Receiving and Inspecting Department, Accounting Department, etc.
2. There should be a central purchasing department under the control of a competent and expert purchase manager.
3. There should be proper classification and codification of materials.
4. Material requirements should be properly planned.
5. The perpetual inventory system should be operated so that up-to-date information is available about the quantity of material in stock.
6. Adequate records should be introduced to control materials during production and the quantities manufactured for stock.
7. The storage of all materials should be well planned, subject to adequate safeguards and supervision.
8. The various stock levels like minimum, maximum, etc., should be fixed for each item of material.
9. Purchases of materials should be controlled through budgets.
10. An efficient system of internal audit and internal check should be operated so that all transactions involving materials are checked by reliable and independent persons.

11. There should be regular reporting to management regarding purchases, issues and stock of materials. Special reports should be prepared for obsolete items, spoilage, returns to suppliers, etc.

Techniques of Inventory Control

Various techniques commonly used for inventory control are listed below:

1. ABC technique
2. Stock levels—Minimum, maximum and reorder levels
3. Economic order quantity (EOQ)
4. Proper purchase procedure
5. Proper storage of materials
6. Inventory turnover ratio to review slow and non-moving materials
7. Perpetual inventory system
8. Fixation of material cost standards (Used in Standard Costing)
9. Preparation of material budgets (Used in Budgetary Control)

We will only discuss stock levels, economic order quantity, purchase control (proper purchase procedure) and stores control (proper storage of material) in the next section.

Check Your Progress

1. What are the factors which must be covered by an efficient and comprehensive system of material control?
2. What does over-stocking lead to?

3.3 TECHNIQUES OF INVENTORY CONTROL

In this section, you will learn about the major techniques of inventory control.

3.3.1 Stock Levels

In order to guard against under-stocking and over-stocking, most of the large companies adopt a scientific approach of fixing stock levels. These levels are: (i) maximum level; (ii) minimum level; (iii) reorder level; and (iv) reorder quantity. By adhering to these levels, each item of material will automatically be held within appropriate limits of control. These levels are not permanent and must be changed to suit changing circumstances. Thus, changes will take place if consumption of material is increased or decreased or if—in the light of a review of capital available,—it is decided that the overall inventory must be increased or decreased.

Modern inventory management makes use of operations research and statistical techniques in fixing stock levels. However, given below is the description of various levels along with formulae that are commonly used in their computations.

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Factors: Some of the factors which influence stock levels are:

1. Anticipated rate of consumption
2. Amount of capital available
3. Availability of storage space
4. Storage/warehousing costs
5. Procurement costs
6. Reliability of suppliers
7. Minimum order quantities imposed by suppliers
8. Risk of loss due to: (a) obsolescence; (b) deterioration; (c) evaporation; and (d) fall in market prices

Maximum Level

This is that level above which stocks should not normally be allowed to rise. The maximum level may, however, be exceeded in certain cases, *e.g.*, when unusually favourable purchasing condition arise. It is computed by the following *formula*:

$$\text{Maximum level} = \text{Reorder level} + \text{Reorder quantity} - \left(\frac{\text{Minimum consumption}}{\text{reorder period}} \times \text{Minimum reorder period} \right)$$

The following factors are taken into account in setting this level:

1. Rate of consumption of material
2. Risk of obsolescence and deterioration
3. Storage space available
4. Costs of storage and insurance
5. Availability of funds needed
6. Seasonal considerations, *e.g.*, bulk purchases during off-season at low prices
7. Reorder quantity
8. Restrictions imposed by government or local authority in respect of certain materials in which there are inherent risks of fire, explosion, etc.

The idea of setting maximum stock level is to ensure that capital is not unnecessarily blocked in stores and also to avoid loss due to obsolescence and deterioration.

Minimum Level

It is that level below which stock should not normally be allowed to fall. This is essentially a safety stock and is not normally touched. In case of stock falling below this level, there is a risk of stoppage in production and thus top priority should be given to the acquisition of fresh supplies. It is computed by the following *formula*:

$$\text{Minimum level} = \text{Reorder level} - \left(\frac{\text{Normal consumption}}{\text{reorder period}} \times \text{Normal} \right)$$

In fixing this level, the following factors are considered:

1. Rate of consumption.
2. The time required to acquire fresh supplies under top priority conditions so that stoppage in production can be avoided.

Reorder Level or Ordering Level

This is that level of material at which purchase requisition is initiated for fresh supplies. This level is fixed somewhere above minimum level. This is fixed in such a way that by reordering when materials fall to this level, then in the normal course of events, new supplies will be received just before the minimum level is reached. Its *formula* is:

$$\text{Reorder level} = \frac{\text{Maximum consumption}}{\text{reorder period}} \times \text{Maximum}$$

The following factors are considered in fixing this level:

1. Rate of consumption of the material
2. Minimum level
3. Delivery time—*i.e.*, the time normally taken from the time of initiating a purchase requisition to the receipt of materials. This is also known as lead time
4. Variations in delivery time

Danger Level

Sometimes purchased materials are not received in time and stock level goes below the minimum level. In order to meet such a situation a danger level is fixed. Danger level is a level at which normal issues are stopped and materials are issued for important jobs only. This level is generally fixed somewhat below the minimum level. When stock reaches danger level, urgent action is needed for the replenishment of stock so that stoppage in production can be avoided. Purchasing materials on an urgent basis results in higher purchasing cost. Its formula is:

$$\text{Danger level} = \frac{\text{Normal consumption}}{\text{Max. reorder period under emergency conditions}} \times \text{Max. reorder period}$$

Average Stock Level

This is computed as follows:

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

$$\text{Alternatively, Average stock level} = \text{Minimum level} + \frac{1}{2} (\text{Reorder quantity})$$

Lead time is the time interval between the time when an item reaches reorder level and a fresh order is placed, to the time of actual receipt of materials. When

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purchased materials are received, the maximum level is reached. As materials are consumed, the stock level starts coming down. Fresh supplies are received when stock reaches minimum level.

Illustration 3.1

Two materials *A* and *B* are used as follows:

Minimum usage 50 units per week each

Maximum usage 150 units per week each

Normal usage 100 units per week each

Reorder quantity *A*—600 units, *B*—1000 units

Delivery period *A*—4 to 6 weeks, *B*—2 to 4 weeks.

Calculate various stock levels.

Solution:

Reorder level = Maximum consumption × Maximum reorder period

$$A = 150 \text{ units} \times 6 \text{ weeks} = \mathbf{900 \text{ units}}$$

$$B = 150 \text{ units} \times 4 \text{ weeks} = \mathbf{600 \text{ units}}$$

$$\text{Minimum level} = \text{Reorder level} - \left(\text{Normal consumption} \times \text{Normal delivery period} \right)$$

$$A = 900 - (100 \text{ units} \times 5 \text{ weeks}) = \mathbf{400 \text{ units}}$$

$$B = 600 - (100 \text{ units} \times 3 \text{ weeks}) = \mathbf{300 \text{ units}}$$

Average reorder period has been taken as normal reorder period.

$$\text{Maximum level} = \text{Reorder level} + \text{Reorder quantity} - \left(\text{Minimum consumption} \times \text{Minimum delivery time} \right)$$

$$A = 900 \text{ units} + 600 \text{ units} - (50 \text{ units} \times 4 \text{ weeks}) = \mathbf{1,300 \text{ units}}$$

$$B = 600 \text{ units} + 1,000 \text{ units} - (50 \text{ units} \times 2 \text{ weeks}) = \mathbf{1,500 \text{ units}}$$

Average stock level

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

$$A = \frac{1}{2} (400 \text{ units} + 1,300 \text{ units}) = \mathbf{850 \text{ units}}$$

$$B = \frac{1}{2} (300 \text{ units} + 1,500 \text{ units}) = \mathbf{900 \text{ units}}$$

3.3.2 Economic Order Quantity or EOQ (Reorder Quantity)

Reorder quantity is the quantity for which order is placed when stock reaches reorder level. By fixing this quantity, the purchaser doesn't have to recalculate the quantity to be purchased each time he orders for materials.

Reorder quantity is known as Economic Order Quantity because it is the quantity which is most economical to order. In other words, economic order quantity is that size of the order which gives maximum economy in purchasing any material and ultimately contributes towards maintaining the material at the optimum level and at minimum cost.

While setting economic order quantity, two types of costs should be taken into account:

1. **Ordering cost:** This is the cost of placing an order with the supplier. Because of so many factors involved, it is quite difficult to quantify this cost. It mainly includes the cost of stationery, salaries of those engaged in receiving and inspection, salaries of those engaged in placing orders, etc.
2. **Cost of carrying stock:** This is the cost of holding the stock in storage. It includes the following:
 - (a) Cost of operating the stores, (salaries, rent, stationery, etc.)
 - (b) The incidence of insurance cost
 - (c) Interest on capital locked up in store
 - (d) Deterioration and wastage of materials

Note: At EOQ, ordering cost and cost of carrying stock are equal, *i.e.*, when the total of the two types of costs is the lowest.

The above two types of costs are of opposing nature. If, for instance, an attempt is made to reduce the costs of carrying stock by keeping stocks as low as possible, the cost of ordering will go up because the number of replenishment orders will automatically rise. On the other hand, if in order to save ordering costs, order is placed for a larger quantity at one time, the stock will remain longer in stores and the cost of carrying stock will go up. The problem is, therefore, to balance these two types of costs and the economic order quantity is fixed at a point where the aggregate cost is the minimum. This is shown in Figure 3.1, in which the line of cost of ordering has been shown sloping downward indicating lower cost when large quantity is purchased and the line representing cost of carrying stock going upward indicating higher costs for holding larger stocks. The economic order quantity, which is the ideal order size, is at a point where total cost curve is at its lowest point.

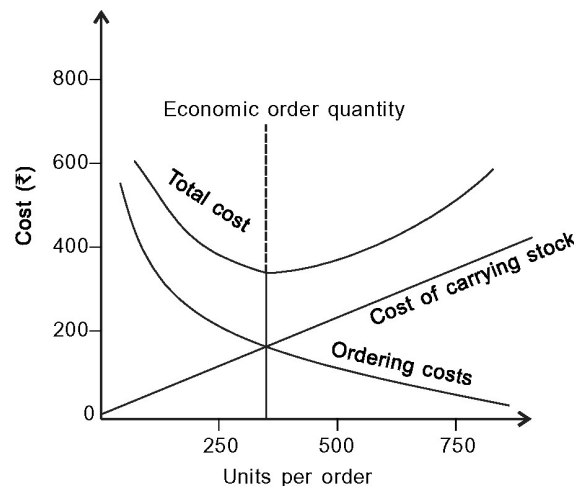


Fig. 3.1 Economic Order Quantity

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Mathematical Formulae of EOQ

The above graphic methods of determining economic order quantity may not provide the most accurate answer. Economic order quantity can also be calculated with the help of a formula as given below:

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

where EOQ = Economic Order Quantity

A = Annual consumption in units

B = Buying or ordering cost per order

C = Cost per unit

S = Storage or carrying cost as a percentage of average inventory

Alternatively,
$$EOQ = \sqrt{\frac{2 \cdot A \cdot B}{S}}$$

where S = Storage cost per unit per annum

Illustration 3.2

Estimated requirement for the year	600 units
Cost per unit	₹20
Ordering cost (per order)	₹12
Carrying cost (% of average inventory)	20%

Solution:

$$EOQ = \sqrt{\frac{2 \times 600 \times 12}{20 \times 20\%}} = 60 \text{ units}$$

In this illustration, if carrying cost is given as ₹4 per unit per annum, EOQ will be calculated as follows:

$$EOQ = \sqrt{\frac{2 \cdot A \cdot B}{S}} = \sqrt{\frac{2 \times 600 \times 12}{4}} = 60 \text{ units}$$

Tabular Method

Economic order quantity can also be determined with the help of a table prepared for this purpose. This method is particularly used when prices vary according to the quantity to be purchased. A table is prepared to show the various costs for different ordering quantities thus, enabling one to find out the most economic size of the quantity to order, *i.e.*, where the total cost is the least of all. This is illustrated as follows:

Illustration 3.3: Determine EOQ from the following information using tabular method:

- Annual consumption — 12,000 units
 Cost of ordering — ₹15 per order
 Cost of material — ₹1.25 per unit
 Carrying cost — 20 per cent of average inventory

Solution: The following table may be prepared to determine the economic order quantity:

No. of orders per year	Units per order ₹	Value per order ₹	Ordering cost ₹	Carrying cost ₹	Total cost
1	12,000	15,000	15	1,500	1,515
2	6,000	7,500	30	750	780
3	4,000	5,000	45	500	545
4	3,000	3,750	60	375	435
5	2,400	3,000	75	300	375
6	2,000	2,500	90	250	340
7	1,714	2,142	105	214	319
8	1,500	1,875	120	188	308
9	1,333	1,667	135	167	302
10	1,200	1,500	150	150	300
11	1,091	1,364	165	136	301
12	1,000	1,250	180	125	305
13	923	1,154	195	115	310
14	857	1,071	210	107	317
15	800	1,000	225	100	325

The above table shows that 1,200 units is the ideal size of the order because total cost at this level is the least of all. This means the number of orders per year should be ten. Other order quantities (more than or less than 1,200 units) are not so economical because total cost is higher than this level. The result of this table can be verified with the help of mathematical formula as shown below:

$$EOQ = \sqrt{\frac{2 \cdot A \cdot B}{C \cdot S}} = \sqrt{\frac{2 \times 12,000 \times 15}{1.25 \times 20\%}} = 1,200 \text{ units}$$

3.3.3 Purchase Control

Purchasing is the function of buying raw materials, general supplies, tools, office stationery and other items. The essentials of efficient purchasing are right quantity, right quality, right time, right price, right source and delivery at the right place.

Just-in-time (JIT) Purchasing

Just-in-time purchasing is the purchase of materials immediately before these are required for use in production. According to CIMA, London JIT purchasing is

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‘matching receipts of materials closely with usage so that raw material inventory is reduced to near zero level.’ The purpose of JIT purchasing is to reduce stock levels to the minimum through creating closer relationship with suppliers and arranging frequent deliveries of materials in smaller quantities. It results in enormous savings in storage costs, material handling costs, spoilage, obsolescence etc. An important effect of JIT purchasing is that with frequent purchasing the issue price is likely to be closer to market prices. In order to save on ordering costs, long term agreements may be entered into with suppliers.

Centralized and Decentralized Purchasing

Broadly speaking, purchase function may be organized in two ways, *i.e.*, centralized purchasing and decentralized purchasing.

Centralization: Centralization of purchasing means that all purchases are made by a single purchase department. Head of this department is designated as Purchase Manager or Chief Buyer.

Decentralization: In decentralized purchasing, each branch or department makes its own purchases. If the branches or plants are located at different places, the decentralized purchasing can better meet the situation by making purchases in the local market by plant or branch managers.

Advantages of Centralized Purchasing

1. Specialized and expert purchasing staff can be concentrated in one department.
2. A firm policy can be initiated which may result in favourable terms of purchase, *e.g.*, higher trade discount or easy terms of payment
3. Standardization of quality of raw material is facilitated.
4. Better control over purchasing is possible because reckless buying by various individuals is avoided. Keeping all records of purchase transactions at one place also helps in control.

Disadvantages of Centralized Purchasing

1. The creation and maintenance of a special purchasing department leads to higher administration costs which small concerns may not be in a position to afford.
2. Centralized purchasing is not suitable for plants or branches located at different places which are far apart.

Purchase Procedure

Although the details of a purchase procedure may differ from firm to firm, the important steps in purchasing and receiving of materials are as follows, assuming that purchases are centralized:

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1. Purchase Requisition

Purchases of materials are initiated through purchase requisitions. A purchase requisition is a formal request by the head of a department or an authorized officer to the purchase manager to purchase the specified materials. Such requisitions are received from certain authorized persons as follows:

- (i) *Storekeeper* When materials reach ordering level, the storekeeper should initiate purchase procedure.
- (ii) *Production planner* for special materials required for the manufacture of a new product.
- (iii) *Plant engineer* for repairs and maintenance materials.
- (iv) *Department heads* (e.g., office manager) for any materials required for his department, like filing cabinets, stationery and office sundries.

Purposes: A purchase requisition serves the following purposes:

1. It initiates the purchase and sets the purchasing process in motion.
2. It provides a written record of details like quantities, specification, etc., of materials to be purchased.
3. It provides dates for reference, e.g., date when materials are required. Dates are particularly important in case responsibility for stoppage in production due to shortage of materials is to be determined.

Generally two copies of purchase requisition are prepared. The *original copy* is sent to the purchasing department and *carbon copy* is retained and filed by the requisitioner for his own reference. (*A note of caution:* Purchase Requisition should not be confused with Stores or Materials Requisition).

2. Selection of Suppliers

When the purchasing department receives a duly authorized purchase requisition, a source of supply has to be selected. The purchase department generally maintains a list of suppliers for each type of material and selects a particular supplier after inviting tenders. The important rule is to buy the best quality materials at the lowest possible price after giving due consideration to delivery dates and other terms of purchases. Purchases should be made from dependable sources of supply and ethical standards should be maintained in dealing with suppliers.

In many industries, long term contracts are entered into with suppliers. For example, a car manufacturer may contract ahead for the supply of tyres and tubes for a year's requirement at a time. Such an arrangement has the advantage of not having to keep large stocks if the continuity of supply can be relied upon. Moreover, the supplier gets a regular customer and may offer favourable terms. Periodic withdrawals against the contract are made by raising a purchase order.

3. Purchase Order and Follow-up

When the supplier has been selected, the most common procedure is the preparation of a purchase order. The purchase order is the form used by the

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purchasing department authorizing the suppliers to supply the specified materials at the price and terms stated therein. A purchase order should be carefully prepared as it forms a basis of legal contract between the parties concerned. For this reason, authority to sign purchase orders should also be restricted to selected responsible officials.

Large companies generally prepare *five copies* of the purchase order. The *original* is sent to the supplier. *Second copy* is retained by the purchase department for its own file. *Third copy* is sent to the receiving department as an advance intimation to expect the materials. *Fourth copy* is sent to the cost accounting department for entry in the ordered column of the appropriate stores ledger account. The *last copy* is sent to the department requisitioning the material as an intimation of the order and expected date of receipt of materials.

It is very important to follow up purchase orders so as to ensure timely delivery. Lack of follow-up measures may cause delay in arrival of materials resulting in stoppage in production for want of materials.

4. Receipt of Materials

All incoming materials should be received by the Receiving Department. This department performs the functions of unpacking the goods received and verifying their quantities and conditions. The quantity is checked against the purchase order copy and the supplier's advice note which is normally received along with the goods.

Full particulars of the goods received are entered in a *Goods Received Note*. Goods Received Note serves the following purposes:

1. It informs the storekeeper and the requisitionist of the receipt of materials.
2. It notifies the accounting department that the materials have been received and that a voucher can be prepared.
3. When it includes columns of cost, it can serve as a source of entry in the stores ledger.

Original copy of the Goods Received Note is sent to the purchase department to be marked completed. *Second copy* is sent to the storekeeper or the requisitionist along with the goods. *Third copy* is sent to the accounting department for entry in the stores ledger and the *last copy* is retained by the receiving department for its own file.

5. Inspection and Testing of Materials

Goods received should be inspected for quality to ensure that they comply with the specifications stated on the purchase order. Where technical or laboratory inspection is necessary, the goods are passed to a laboratory which will provide a report on the quality of goods.

An inspection report is prepared to show the results of the inspection. This report is either prepared separately or incorporated in the Goods Received Note. In either case, the report is forwarded to the purchasing department.

6. Return of Rejected Materials

Where materials received are damaged or are not in accordance with the specifications, these are usually returned to the supplier along with a Debit Note, informing him that his account has been debited with the value of materials concerned. When such a claim is accepted by the supplier, he signifies his acceptance by the issue of a Credit Note. The rejected materials may be returned to the supplier immediately or they may be held pending his instructions.

This Debit Note may be prepared by the purchase department on the basis of the inspection report. *Original copy* is sent to the supplier. *One copy* is sent to accounts department for adjustment entry and *one copy* is retained for purchase department file.

7. Passing Invoices for Payment

When the invoices are received by the purchasing department, the process of assembling the business papers connected with each purchase and preparation of voucher begins. Invoices are numbered serially and entered in the Invoice Register. The following documents are assembled in support of the invoice: (a) Purchase Order; (b) Goods Received Note; (c) Inspection Report, if not incorporated in the Goods Received Note and (d) Debit or Credit Note.

After comparing these documents with the invoice, if it is found that the invoice is in order, the purchase manager will sign it and pass it to the accounts department for payment. All calculations are checked before a voucher authorizing payment is prepared. All related documents like Purchase Order, Goods Received Note are marked with the invoice number to preclude the passing of a possible duplicate invoice.

Purchase Price

The invoice received from the supplier provides a base figure of purchase price. The following adjustments have to be made in this figure to arrive at the real material cost.

Quantity discount: This is an allowance made by the supplier to the purchaser to encourage large orders. The discount often varies according to the size of the order, *i.e.*, the larger the quantity ordered, the higher is the discount, within fixed limits. Quantity discount is allowed by a supplier as a measure of the savings in his cost which arise from the production and distribution on a large scale. Part of these savings enjoyed by the supplier is passed on to the purchaser in the form of quantity discount. The amount of the quantity discount is deducted from the purchase price to arrive at the material cost.

Trade discount: This is an allowance made by the supplier to a purchaser who has to re-sell the material, *e.g.*, discount allowed by the manufacturer to the wholesaler. The idea is to cover the expenses (*e.g.*, storage, re-packing) and profit of the dealer who is providing a service to help the original supplier to distribute

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his goods. This discount is also deducted from the purchase price to arrive at the material cost.

Cash discount: This discount is allowed by the supplier to a purchaser to encourage prompt payment of invoice, *e.g.*, 2% discount may be allowed if payment is made within 30 days and 4% discount if payment is made within 7 days. As cash discount is a form of interest on capital, its treatment is a subject of debate among cost accountants. Generally, it is considered a financial and non-costing item and thus is not included in cost accounts.

Sales tax and other levies: Items, like sales tax, excise duty, customs duty and octroi, should be added to the purchase price.

Transport charges: These include sea, land and air freight, dock charges, insurance, etc. on materials purchased. Sometimes the purchase price quoted by the supplier includes all these charges, but where the price does not include these charges, these should be added to the purchase price. Where it is impracticable to do so (*e.g.*, where such costs are too small or invoices are received late) these may be charged as factory overheads.

Cost of containers: The supplier may or may not charge separately for containers. If no such charge is made, no adjustment is required in the purchase price. However, if containers are separately charged, all such costs should be included in the purchase price *i.e.* (i) the cost of containers if these are not returnable; and (ii) the difference between the cost of container and the amount refunded when container is returned, where containers are returnable.

3.3.4 Stores Control

Storekeeping is the function of receiving of materials, storing them and issuing these to workshops or departments. As a substantial amount of a company's working capital is invested in stores, storekeeping acquires special importance. The stores department is under the control of a person known as 'storekeeper' or stores superintendent. He should be a man of undoubted integrity, suitably trained and experienced and well versed in the principles of good storekeeping.

Objectives of Good Storekeeping

Good storekeeping should achieve the following objectives:

1. Protection of materials from losses due to fire, evaporation, obsolescence, etc.
2. Avoiding over-stocking and under-stocking
3. Economical use of storage space
4. Up-to-date stores records
5. Immediate location of materials required
6. Facilitating perpetual inventory

7. Speedy receipts and issues of stores
8. Minimize storage cost

Functions and Duties of Storekeeper

Various *functions* and *duties* of a storekeeper are as follows:

1. Maintaining materials in a tidy manner
2. Proper maintenance of records of materials received, issued to production and in stock
3. Accepting materials into the stores after having ascertained that the delivery complies with specifications detailed on Goods Received Note
4. Issuing materials against duly authorized Stores Requisitions
5. Requisitioning further supplies from the purchasing department when reorder level is reached on any material
6. Preventing the entry of unauthorized persons in the storeroom
7. Periodic comparison of bin card balances with physical quantities in the bins
8. Advising management on obsolete and slow-moving stocks

Stores Organization

There are mainly two types of stores organization, *i.e.*, central stores and departmental sub-stores. From control point of view, it is ideal to have one central store for receiving and issuing all materials. However, this is not always practicable because in large factories, where there are many production departments, the location of the central store may not be convenient to all such departments.

Thus, where it is not advantageous to keep central stores, departmental sub-stores should be maintained. It is recommended that control over all sub-stores should be centralized and storekeeper of each sub-store should be responsible to the chief storekeeper. This will ensure a uniform policy of purchasing, storing and issuing materials.

Imprest System

Sometimes large organizations use the imprest system of stores management. This is similar in operation to imprest system of petty cash. Under this system, a number of sub-stores exist, each drawing their supplies from the central store. Each sub-store is given, as a commencing stock, sufficient supplies for a little more than the re-stocking period. At the end of the period, the storekeeper of each sub-store will requisition from the central stores the number of articles required to bring the stock upto the predetermined quantity.

For example, let us assume the imprest amount set for a material is 400 kgs. During the week ending on 24 February, issues of materials have reduced the

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stock to 140 kgs. The sub-storekeeper will issue a requisition from the central store for 260 kgs to ensure that at the beginning of the next week, 400 kgs are in stock.

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This system combines the advantages of central buying and storing with the benefits of having stocks conveniently available at several issuing points. The system also helps in exercising an excellent control over sub-stores as over-issues will not be re-imbursed and the sub-storekeeper will have to explain discrepancies, if any.

Classification and Codification of Materials

Names and descriptions of materials are often long and vague. In order to avoid length and ambiguity in description and names of materials, a symbol may be assigned to each item of material which is known as a code. Codification is the procedure of systematic assignment of symbols for each item of store. Such codes may be either numeric, alphabetic or a combination of numerical and alphabetical symbols. Such codes are short names of materials. The codes being shorter, considerable time and effort may be saved by substituting a code for a longer name and or a cumbersome description.

Classification of materials refers to grouping of materials according to their nature in suitable categories. For example, copper, iron, aluminium may be classified as metals; items like soap, cotton waste and lubricating oil, may be classified as consumable stores; all forms of tools including jigs and fixtures may be classified as tools.

Advantages: The advantages to be derived from the use of a satisfactory system of classification and codification of materials are as follows:

1. Ambiguity in description is avoided as a particular code can refer to only one type of item
2. Clerical effort is reduced as length in description is minimized
3. Secrecy of materials used in production is maintained
4. Coding is essential in mechanized accounting

Basic Principles of Coding

While assigning codes, the following principles should be kept in mind:

1. **Exclusive:** Each code number should relate to only one type of material and there should be no duplication.
2. **Clear:** The code must be clear and should identify the material without any ambiguity.
3. **Brief:** Codes should be brief because long codes take longer to write and are prone to error.
4. **Elastic:** The code should be such that new materials can be added easily and logically.

5. **Mnemonic:** As far as possible, codes should be easier to remember, such as, HCW for Hard Copper Wire.

Systems of Coding

1. Numerical and Decimal: In this method, a number is allotted to each item. Sub-groups are indicated by decimals. For example, in a foundry, the following codes may be assigned:

Coal	31
Wood	32
Copper	33
Steel	34
Aluminium	35
Bronze	36

Further, physical characteristics can be indicated in the code by decimals. This is shown below for copper, of which the numerical code as shown above is 33.

Copper Sheets	33.1
Copper Bars	33.2
Copper Granules	33.3
Copper Wire	33.4
Copper Tubes	33.5

Sub-division of, say, copper bars into various grades may be coded as follows:

Copper bar grade 1	33.2.1
Copper bar grade 2	33.2.2
Copper bar grade 3	33.2.3

This numerical method allows a wide range and is, therefore, most suited where the number of items is very large.

2. Alphabetical or Mnemonic: In this method, each item of store may be denoted by a combination of alphabets. As alphabets represent the first sound of description of materials, it becomes easy to remember the codes. The system is, thus, also known as 'Mnemonic'. Examples:

Mild Copper Bar	MCB
Cast Iron Sheet	CIS
Stainless Steel Wire	SSW

3. Alpha-numerical: This is a combination of numerical and alphabetical methods. Examples:

Mild Copper Bar of 6" Length	MCB6
Toughened Steel Tubes of 3/4" diameter	TST34
Brass Strips of 1/4" thickness	BS14

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The codes of materials should appear on all documents relating to the movement and use of materials and should be marked against the appropriate bins. As a note of caution, codes must be handled with extreme care. If a slight mistake is made in quoting the code, the entire work order may have to be scrapped, entailing considerable loss to the factory.

Stores Records

The stores records are of two types:

1. **Perpetual Inventory Records:** These records show the movement of stores, *i.e.*, the receipt of materials, issues of materials to production department and also balance in stock. Bin card and stores ledger are the two basic perpetual inventory records.
2. **Documents:** The documents are used to authorize movement of materials into and out of stores. These documents include Goods Received Note, Bill of Materials, Materials Requisition Note, Materials Return Note and Material Transfer Note.

Bin Card (Stock Card)

A bin is a container in which material is kept. Separate bin cards are maintained by the storekeeper for each item of material in store. The bin cards show the details of receipts and issues of materials and the balance in stock at any time. This record is of immense help to the storekeeper in controlling the stock position.

A bin card is attached to the bin, drawer or any other container in which material is stored. An entry is made at the time of each receipt or issue and the new balance in stock is calculated. All these entries of receipts and issues are supported by documents, such as Goods Received Note, Materials Return Note, Stores Requisition Note, etc. Alternatively, bin cards are kept on a table in trays.

A bin card is a quantitative record of receipts, issues and closing balances of material items in store. It does not contain information about the prices of materials.

Two Bin System: In this system, two bins are maintained for each item of material. One bin constitutes the main or the regular bin from which materials are issued and the other bin contains the minimum stock from which issues are made only when stock in the regular bin is exhausted. At the time of stock verification, it is usually sufficient to verify stock in the regular bin as the stock in the minimum stock bin is already known.

The idea of two bin system is to provide automatic information about reaching minimum stock level so that issue of materials for regular production is stopped. At this stage, materials are issued only for urgent orders till fresh supplies of materials are received.

Illustration 3.4: The following are the receipts and issues of material *X* in a factory during December 2009.

*Cost Accounting for
Material Cost Control*

- Dec.1 Opening stock 200 kgs
 - Dec.5 Received from supplier S₁ 400 kgs (GRN No. 448)
 - Dec.8 Issued to production department 240 kgs (S.R. No. 883)
 - Dec.10 Issued to production department 160 kgs (S.R. No. 897)
 - Dec.12 Received from supplier S₂ 500 kgs (GRN No. 455)
 - Dec.15 Issued to production department 400 kgs (S.R. No. 912)
 - Dec.16 Received from supplier S₃ 250 kgs (GRN No. 461)
 - Dec.19 Received from supplier S₁ 500 kgs (GRN No. 462)
 - Dec.21 Issued to production department 250 kgs (S.R. No. 940)
 - Dec.24 Issued to production department 260 kgs (S.R. No. 950)
 - Dec.27 Issued to production department 340 kgs (S.R. No. 974)
- (GRN denotes Goods Received Notes. SR denotes Stores Requisition).

The minimum stock level of material *X* is 200 kgs. Reorder level is 350 kgs and reorder quantity is 500 kgs. Code No. of material is MN 240.

Prepare a Bin Card No. 148 for material *X* with all necessary details showing the transactions in December 2009.

Solution:

BIN CARD					
Bin No.	148	Min. Level	200 kgs		
Description	<i>X</i>	Reorder Level	350 kgs		
Code No.	MN 240	Reorder Qty	500 kgs		
Stores Ledger Folio:					
<i>Date</i>	<i>Receipts</i>		<i>Issues</i>		<i>Balance</i>
<i>2009</i>	<i>Ref. No. (GRN No.)</i>	<i>Quantity kgs</i>	<i>Ref. No. (SR No.)</i>	<i>Quantity kgs</i>	<i>Quantity kgs</i>
Dec. 1	—	—	—	—	200
Dec. 5	448	400	—	—	600
Dec. 8	—	—	883	240	360
Dec. 10	—	—	897	160	200
Dec. 12	455	500	—	—	700
Dec. 15	—	—	912	400	300
Dec. 16	461	250	—	—	550

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Dec. 19	462	500	—	—	1,050
Dec. 21	—	—	940	250	800
Dec. 24	—	—	950	260	540
Dec. 27	—	—	974	340	200

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Stores Ledger

The stores ledger is maintained in the cost accounting department and is one of the basic records for material accounting in a cost system. This record gives the same information regarding stores as bin card and in addition, it gives the monetary values of materials. Separate ledger folios are maintained in it for each item of material. The ledger sheets may be in loose leaf form or separate bindings may be used for each type of material.

There are mainly three sections in this ledger, *i.e.*, receipts, issues and balance, each of these with appropriate sub-divisions showing date, quantity, unit price and total cost. Two additional sections are usually included, *i.e.*, On Order and Materials Reserved columns. The 'On Order' column prevents placing of duplicate orders and 'Reserve' column indicates the materials reserved for a specific job order.

Bin Card and Stores Ledger—Distinction

The main points of difference between bin card and stores ledger are as follows:

1. Bin card is a record of quantities only, whereas stores ledger records both quantities and money values of materials.
2. Bin card is maintained by the storekeeper, whereas stores ledger is kept by the cost office.
3. Posting in bin card normally takes place before a transaction occurs, while in stores ledger, it is posted after the transaction.

Documents Authorizing Movements of Materials

Goods Received Note

A reference was made to this note in the purchase procedure discussed earlier. It was stated that a copy of Goods Received Note is sent to the storekeeper along with the materials for his records. The storekeeper uses this document for posting on the receipt side of the bin card.

Stores Requisition Note (or Materials Requisition Note)

It is a document which is used to authorize and record the issue of materials from store. The storekeeper should issue materials on the presentation of duly authorized stores requisition note. It should be appreciated that this is a key document in virtually all costing systems and serves the dual purpose of:

- (a) authorizing the storekeeper to issue material
- (b) providing a written record of usage of materials

A separate requisition may be prepared for each item of material or a single requisition may be prepared to cover the issuance of a number of items. The stores requisition note may be prepared in duplicate or triplicate. The original copy is passed to the stores department while duplicate is retained by the department requisitioning materials. When only two copies are prepared, the stores department copy is also routed to the costing department. However, if the requisition is prepared in triplicate, two copies are sent to the stores department out of which it sends one to the costing department for necessary accounting entries. The stores requisition note is used for making entries in bin card, stores ledger, materials abstract, etc.

Bill of Materials (Specification of Materials)

It is a master requisition which lists all the materials required for the completion of a job. So, a bill of materials is a special form of stores requisition note which is generally used by departments having standard materials requirements or a comparatively fixed list of materials. For instance, in assembly type production, there will be no variation in the amount of materials which are used. In such a case, much time would be saved if a bill of materials (on which names or codes of all materials required are pre-printed) is used because then only quantity is to be indicated against the code or name of material required.

Where the job is of a special nature, a special bill of materials must be prepared and a copy of this is generally passed to the stores department in advance to enable it to arrange for materials not in stock.

Materials Return Note

When materials issued are in excess of requirements, the unused materials are returned to stores together with a Materials Return Note. This note is similar to Materials Requisition Note, but is normally printed in a different colour for easy identification. When materials are received in the stores, these should be placed in appropriate bins and entries made in the bin card.

Materials Return Note is usually prepared in triplicate by the stores clerk. *One copy* is sent to the department that is returning materials. *Second copy* is sent to the cost office for appropriate entries and the *third copy* is retained by the stores department for entry in the bin card.

Materials Transfer Note

Materials may have to be sometimes transferred from one job to another. This may be either because excess materials were issued to a job and surplus materials are directly transferred to another job or because materials issued to a less urgent job are transferred to a more urgent job.

When such transfers are not permitted, the surplus materials are returned to the stores and then re-issued to another job. This results in extra transport costs.

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Thus, when materials are bulky, such transport costs may be heavy, which can be avoided if direct transfers are permitted.

Where such transfers are permitted, these should be supported by a special document known as a Material Transfer Note. Failure to record transfer of costs would result in incorrect costs of the jobs concerned.

Check Your Progress

3. State the risk which may happen in case of stock falling below the minimum level.
4. What does ordering cost includes?
5. List the documents which are assembled in support of the invoice.
6. What are the three sections of a stores ledger?

3.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. An efficient system of material control should be comprehensive enough to cover purchase system, storage system, issue to production and determination of stock levels for each item of material.
2. Over-stocking of materials locks up capital and causes high storage costs, thereby resulting in adverse effect on profits.
3. In case the stock falls below the minimum level, there is a risk of stoppage in production and thus top priority should be given to the acquisition of fresh supplies.
4. Ordering cost includes the cost of stationery, salaries of those engaged in receiving and inspection, salaries of those engaged in placing order, etc.
5. The documents which are assembled in support of the invoice are: (a) Purchase order; (b) Goods Received Note; and (c) Inspection Report; if not incorporated in the Goods Received Note and (d) Debit or Credit Note.
6. The three sections of a stores ledger are: receipts, issues and balances.

3.5 SUMMARY

- The term 'material' refers to all commodities that are consumed in the process of manufacture.
- Material or inventory control may be defined as 'systematic control and regulation of purchase, storage and usage of materials in such a way so as to maintain an even flow of production, at the same time avoiding excessive

investment in inventories. Efficient material control cuts out losses and wastes of materials that otherwise pass unnoticed.’

- Various techniques commonly used for inventory control are listed below:
 - o ABC technique
 - o Stock levels—Minimum, maximum and reorder levels
 - o Economic order quantity (EOQ)
 - o Proper purchase procedure
 - o Proper storage of materials
 - o Inventory turnover ratio to review slow and non-moving materials
 - o Perpetual inventory system
 - o Fixation of material cost standards (Used in Standard Costing)
 - o Preparation of material budgets (Used in Budgetary Control)
- In order to guard against under-stocking and over-stocking, most of the large companies adopt a scientific approach of fixing stock levels. These levels are: (i) maximum level; (ii) minimum level; (iii) reorder level; and (iv) reorder quantity.
- Reorder quantity is the quantity for which order is placed when stock reaches reorder level. By fixing this quantity, the purchaser doesn’t have to recalculate the quantity to be purchased each time he orders for materials. Reorder quantity is known as Economic Order Quantity because it is the quantity which is most economical to order.
- Purchasing is the function of buying raw materials, general supplies, tools, office stationery and other items. The essentials of efficient purchasing are right quantity, right quality, right time, right price, right source and delivery at the right place.
- The details of a purchase procedure generally includes: purchase requisition, selection of suppliers, purchase order and follow-up, receipt of materials, inspection and testing of materials, return of rejected materials and passing invoices for payment.
- Storekeeping or stores control is the function of receiving of materials, storing them and issuing these to workshops or departments.
- Stores records are of two types: perpetual inventory records and documents.

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3.6 KEY WORDS

- **Material:** It refers to tangible items that are consumed in the process of manufacture
- **Stock Levels:** It refers to the scientific approach of fixing stock levels to guard against under-stocking and over-stocking

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- **Economic Order Quantity (EOQ):** It is that size of the purchase order which gives maximum economy in purchasing
- **Storekeeping:** It is the function of receiving of materials, storing them and issuing these to workshops or departments

3.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What are the objectives of material or inventory control?
2. State the essential requirements or principles of inventory control.
3. What are some of the factors which influence stock levels?
4. List the advantages and disadvantages of centralized purchasing.
5. What are the objectives of good storekeeping?
6. Write a short note on perpetual inventory records.

Long Answer Questions

1. Explain the inventory control technique of fixing stock levels.
2. Describe the Economic Order Quantity analysis.
3. Discuss the purchase procedure.
4. What are the different documents authorizing the movements of materials?

3.8 FURTHER READINGS

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UNIT 4 TECHNIQUES OF INVENTORY CONTROL

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Structure

- 4.0 Introduction
- 4.1 Objectives
- 4.2 Inventory Systems
- 4.3 Pricing Material Issues or Stores Issues
- 4.4 Treatment of Waste, Scrap, Defectives and Spoilage
- 4.5 ABC and VED Analysis
- 4.6 Answers to Check Your Progress Questions
- 4.7 Summary
- 4.8 Key Words
- 4.9 Self Assessment Questions and Exercises
- 4.10 Further Readings

4.0 INTRODUCTION

In the previous unit, you learn about some of the techniques of inventory control including stock levels, EOQ analysis, purchase control and stores control. A very crucial aspect related to stores and purchase control and central to inventory control is the manner in which the inventory system is maintained. In this unit, you will learn about the types of inventory system with a focus on perpetual inventory system. Further, you will also learn about another significant factor of inventory control, i.e., pricing of stores issues and its methods. Lastly, you will study some other inventory control techniques like Treatment of waste, scrap, defectives and spoilage and ABC and VED analysis.

4.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the perpetual inventory system
- Explain the methods of pricing of stores issues
- Describe the treatment of waste, scrap, defectives and spoilage
- Explain the ABC and VED analysis

4.2 INVENTORY SYSTEMS

There are mainly two inventory systems, viz., Periodic Inventory System and Perpetual Inventory System.

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Periodic Inventory System

Under this system, stock-taking is undertaken at the end of the accounting year. As the stock taking involves verifying the physical quantities of stores in hand, some firms temporarily suspend plant operations when this is done. This is because it is rarely feasible to take stocks while production continues. Thus, the annual stock-taking should be organized well in advance to minimize production hold-ups.

Perpetual Inventory System

The periodic inventory system has certain serious disadvantages which the perpetual inventory system overcomes. A perpetual inventory system is defined as '*the method of recording stores balances after each receipt and issue to facilitate regular checking and obviate closing down for stock-taking.*' Thus, under this system, current balance of stores is always shown in records, any receipts being added to and any issues being deducted from the balance after each transaction. As stated earlier, the records used for perpetual inventory are bin card and stores ledger.

Perpetual inventory system is operated by taking the following steps:

1. **Reconciliation of bin cards and stores ledger accounts:** As we have seen earlier, the records of each item of store are kept simultaneously at two places *i.e.*, bin card and stores ledger, which are the perpetual inventory records. The balance of an item of store as shown in the bin card should agree with that shown in the stores ledger. Any difference between these two figures may be due to: (a) some arithmetic error in working out the balance; and/or (b) wrong posting or non-posting in bin card or stores ledger. The balances of the two records should be reconciled after passing rectifying entries.
2. **Continuous stock-taking:** In any perpetual inventory system, the book balances as shown by bin cards and stores ledger should agree with actual physical balance in store. This is best done by continuous stock-taking, which is an integral part of the per-perpetual inventory system. The primary objectives of continuous stock-taking are to confirm that the perpetual inventory system is functioning properly and to bring records into line with the physical stocks. Under this system, a few items of stores are counted daily or at frequent intervals and compared with the bin cards and stores ledger by the stores auditor. Whenever there is a difference between the recorded balance and actual stocks, an enquiry is made and the difference is adjusted in the records to make them correspond with the physical count.

It should be noted that perpetual inventory system is not the same as continuous stock-taking. Whereas, perpetual inventory is a system of keeping up-

to-date records, the continuous stock-taking is physical checking of records with actual stock. Continuous stock-taking is only a part of perpetual inventory system.

The difference between book balance and physical balance may arise due to:

- (a) Clerical errors in posting and working out balances in bin card and stores ledger
- (b) Pilferage and breakages
- (c) Over or under-issues or wrong issues
- (d) Variations in weight caused by evaporation or absorption of moisture
- (e) Breaking the bulk, *i.e.*, issuing materials in smaller quantities
- (f) Placing materials in the wrong bin

Advantages of Perpetual Inventory System: Perpetual inventory system has the following advantages:

1. The system helps in avoiding the long and costly work of physical checking of all the stocks at the end of the year.
2. It also avoids dislocation in production which arises in the case of periodic stock taking at the end of the year.
3. As stock figures are readily available at all times, the Profit and Loss Account and Balance Sheet can be easily prepared at interim periods.
4. The system acts as a moral check on part of the staff of the stores department, and compels them to work honestly and to maintain up-to-date records.
5. A system of internal check remains in operation all the time.
6. Discrepancies are readily discovered and rectified. This gives an opportunity for preventing a recurrence in future.
7. The system helps in keeping the stocks within the limits decided upon by the management so that excessive working capital is not sunk in the stocks.
8. A detailed and reliable check on stores is obtained.

4.3 PRICING MATERIAL ISSUES OR STORES ISSUES

When materials are issued from stores to production department, a question arises regarding the price at which materials issued are to be charged. This is because the same type of material may have been purchased in different lots at different times at several different prices. This means that actual cost can take on several different values and some method of pricing the issue of materials must be selected. This basic problem of pricing the issue of materials is illustrated in the following stores ledger account. (*Figures are assumed*).

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Stores Ledger Account

Date	Receipts				Issues				Balance		
	Ref. (GRN)	Qty Units	Rate ₹	Amt ₹	Ref. (SR)	Qty Units	Rate ₹	Amt ₹	Qty Units	Rate ₹	Amt ₹
2010											
1 July	—	—	—	—	—	—	—	—	200	5	1,000
4 July	430	500	6	3,000	—	—	—	—	200	5	1,000
									500	6	3,000
									200	5	1,000
8 July	310	800	6.50	5,200	—	—	—	—	500	6	3,000
									800	6.5	5,200
10 July	—	—	—	—	115	900	?	?	600	?	?

How to price the issue of 900 units on 10 July and how to value the stock of 600 units in hand on this date? Various alternative issue prices that could possibly be charged are ₹6 per unit, *i.e.*, the price paid on 4 July or ₹6.50 per unit, *i.e.*, the price paid on 8 July, or ₹5 per unit, *i.e.*, the price of opening stock or an average of these prices or some other price. The question is whether it should be the original purchase price or the current market price on the date of issue or should some other price be used for this purpose. The question is important because the pricing directly affects the amount of profit or loss reported for the accounting period. If the method chosen puts higher value to closing stock, it will result in higher profit, and vice versa, lower valuation of closing stock will result in lower profits.

It should be noted that methods discussed below are methods of pricing the issue of materials and not the methods of physically issuing materials.

These methods are discussed and illustrated below.

First-in, First-out (FIFO) Method

This method is based on the assumption that materials which are purchased first are issued first. It uses the price of the first batch of materials purchased for all issues until all units from this batch have been issued. After the first batch is fully issued, the price of the next batch received becomes the issue price. Upon this batch also getting fully used, the price of the still next batch is used for pricing and so on. In other words, the materials are issued at the oldest cost price listed in the stores ledger account and thus, the materials in stock are valued at the price of the latest purchases.

Three important effects of using FIFO method are:

- Materials are priced at the actual cost
- Charge to production for material cost is at the oldest prices of materials in stock
- Closing stock is valued at the latest price paid

Illustration 4.1: From the following transactions, prepare a Stores Ledger Account using FIFO method:

*Techniques of
Inventory Control*

Year 2010

1 July	Opening stock			500 units @ ₹20 each
4 July	Purchased	GRN	574	400 units @ ₹21 each
6 July	Issued	SR	251	600 units
8 July	Purchased	GRN	578	800 units @ ₹24 each
9 July	Issued	SR	258	500 units
13 July	Issued	SR	262	300 units
24 July	Purchased	GRN	584	500 units @ ₹25 each
28 July	Issued	SR	269	400 units

GRN = Goods Received Notes; SR = Stores Requisition

(These transactions have also been used to illustrate other methods of pricing).

Solution:

FIFO Method
Stores Ledger Account

Date 2010	Receipts				Issues				Balance		
	Ref. GRN	Qty Units	Rate ₹	Amt ₹	Ref. (SR)	Qty Units	Rate ₹	Amt ₹	Qty Units	Rate ₹	Amt ₹
1 July	—	—	—	—	—	—	—	—	500	20	10,000
4 July	574	400	21	8,400	—	—	—	—	500 400	20 21	10,000 8,400
6 July	—	—	—	—	251	600 { 500 100	20 21	10,000 2,100	300	21	6,300
8 July	578	800	24	19,200	—	—	—	—	300 800	21 24	6,300 19,200
9 July	—	—	—	—	258	500 { 300 200	21 24	6,300 4,800	600	24	14,400
13 July	—	—	—	—	262	300	24	7,200	300	24	7,200
24 July	584	500	25	12,500	—	—	—	—	300 500	24 25	7,200 12,500
28 July	—	—	—	—	269	400 { 300 100	24 25	7,200 2,500	400*	25	10,000

* Closing stock is 400 units @ ₹25 = ₹10,000.

It should be noted that the assumption of FIFO is only for accounting purpose, *i.e.*, the physical flow of materials need not necessarily be in the order of the flow of cost, though normally materials would be expected to move out of stock on a FIFO basis because oldest stocks are usually used up first.

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In *periods of rising prices*, the FIFO method produces higher profits and results in higher tax liability because lower cost is charged to production. Conversely, in *periods of falling prices*, the FIFO method produces lower profits and results in lower taxes because they are derived from a higher cost of goods sold.

Last-in, First-out (LIFO) Method

This method operates in just the reverse order of FIFO method. It is based on the assumption that the last materials purchased are the first materials to be issued. Thus, the price of the last batch of the materials purchased is used first for all issues until all units from this batch have been issued, after which the price of the previous batch of materials purchased is used. It should be noted that physical flow of materials may not conform to LIFO assumption.

Three points should be noted regarding this method:

- (a) Material issues are priced at actual cost
- (b) Charge to production for material cost is at latest prices paid
- (c) Closing stock valuation is at the oldest prices paid and is completely out of line with the current prices

Illustration 4.2: Prepare a Stores Ledger Account, showing pricing of materials on LIFO basis, from the data given in Illustration 4.1.

Solution:

LIFO Method Stores Ledger Account

Date 2010	Receipts				Issues				Balance		
	Ref. GRN	Qty Units	Rate ₹	Amt ₹	Ref. (SR)	Qty Units	Rate ₹	Amt ₹	Qty Units	Rate ₹	Amt ₹
1 July	—	—	—	—	—	—	—	—	500	20	10,000
4 July	574	400	21	8,000	—	—	—	—	500	20	10,000
									400	21	8,400
6 July	—	—	—	—	251	600	400	21	8,400		
						200	20	4,000	300	20	6,000
8 July	578	800	24	19,200	—	—	—	—	300	20	6,000
									800	24	19,200
9 July	—	—	—	—	258	500	24	12,000	300	20	6,000
									300	24	7,200
13 July	—	—	—	—	262	300	24	7,200	300	20	6,000
24 July	584	500	25	12,500	—	—	—	—	300	20	6,000
									500	25	12,500
28 July	—	—	—	—	269	400	25	10,000	* 300	20	6,000
									100	25	2,500

* Closing stock is 300 units @ ₹20 = ₹6,000 + 100 units @ ₹25 = ₹2,500.

Total 400 units at ₹8,500.

In *periods of rising prices*, profit and tax liability under LIFO would be lower than under FIFO method because cost will be charged at current prices which are at higher level. Conversely, in *periods of falling prices*, closing stock

is valued at old prices which are at higher level and thus, profit would also be higher resulting in higher tax liability.

Average Cost Methods

These methods are based on the assumption that when materials purchased in different lots are stored together, their identity is lost, and therefore, issues should be charged at an average price. Basically, average prices are of two types—simple average and weighted average.

(a) Simple Average Method

Simple average price is calculated by adding all the different prices of materials in stock, from which the materials to be priced could be drawn, by the number of prices used in that total. This method does not take into account the quantities of materials in stock while calculating the average. Suppose, the following three lots of materials are in stock when material is to be issued:

500 units purchased @ ₹20

200 units purchased @ ₹21

700 units purchased @ ₹22

$$\text{Simple Average Price} = \frac{20 + 21 + 22}{3} = 21$$

While calculating the simple average, the price of lots of materials which are assumed to have been completely issued on FIFO basis are not taken into account.

Illustration 4.3: Prepare Stores Ledger Account by Simple Average Method from the transactions given in Illustration 4.1.

Solution:

Simple Average Price Method Stores Ledger Account

Date	Receipts				Issues				Balance		
	Ref. GRN	Qty Units	Rate ₹	Amt ₹	Ref. SR	Qty Units	Rate ₹	Amt ₹	Qty Units	Rate ₹	Amt ₹
1 July	—	—	—	—	—	—	—	—	500	20	10,000
4 July	574	400	21	8,400	—	—	—	—	900	—	18,400
6 July	—	—	—	—	251	600	20.50	12,300	300	—	6,100
8 July	578	800	24	19,200	—	—	—	—	1100	—	25,300
9 July	—	—	—	—	258	500	22.50	11,250	600	—	14,050
13 July	—	—	—	—	262	300	24.00	7,200	300	—	6,850
24 July	584	500	25	12,500	—	—	—	—	800	—	19,350
28 July	—	—	—	—	269	400	24.50	9,800	400	—	9,550

Working Notes: Various issue prices are computed as follows:

$$\text{On 6 July} = (20 + 21) \div 2 = ₹20.50$$

$$\text{On 9 July} = (21 + 24) \div 2 = ₹22.50$$

$$\text{On 13 July} = (24 \div 1) = ₹24.00$$

$$\text{On 28 July} = (24 + 25) \div 2 = ₹24.50$$

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(b) Weighted Average Method

This method gives due weightage to the quantities held at each price when calculating the average price. The weighted average price is calculated by dividing the *total cost* of material in stock, from which the material to be priced could have been drawn, by the *total quantity* of material in that stock. The simple formula is that weighted average price at any time is the *balance value* figure divided by the *balance units* figure.

Illustration 4.4: From the transactions given in Illustration 4.1, prepare Stores Ledger Account assuming pricing according to Weighted Average Method.

Solution:

Weighted Average Method Stores Ledger Account

Date	Receipts				Issues				Balance		
	Ref. GRN	Qty Units	Rate ₹	Amt ₹	Ref. SR	Qty Units	Rate ₹	Amt ₹	Qty Units	Rate ₹	Amt ₹
2010											
1 July	—	—	—	—	—	—	—	—	500	20.000	10,000
4 July	574	400	21	8400	—	—	—	—	900	20.444	18,400
6 July	—	—	—	—	251	600	20.444	12,267	300	20.444	6133
8 July	578	800	24	19,200	—	—	—	—	1100	23.030	25,333
9 July	—	—	—	—	258	500	23.030	11,515	600	23.030	13,818
13 July	—	—	—	—	262	300	23.030	6909	300	23.030	6909
24 July	584	500	25	12,500	—	—	—	—	800	24.261	19,409
28 July	—	—	—	—	269	400	24.261	9705	400	24.261	9704

Notes: The issue prices are calculated as follows:

On 4 July ₹18,400 ÷ 900 units = ₹20.444

On 8 July ₹25,333 ÷ 1,100 units = ₹23.030

On 24 July ₹19,409 ÷ 800 units = ₹24.261

The fresh issue rate is determined after each purchase and not at the time of each issue. Thus, as soon as fresh supply is received, a new price is calculated and all issues are then valued at that price until the next supply is received when a new issue price will be calculated.

Replacement Price Method

Replacement price is the price at which materials would be replaced, *i.e.*, the market price on the date of issue. This method is used when it is desired to reflect the current prices in cost. It is most suitable for businesses that buy large quantities of materials well in advance of requirements to take advantage of cheap prices the benefit of which is not desired to be passed on to the customer.

Illustration 4.5: From the transactions given in Illustration 4.1, you are required to prepare a Stores Ledger Account when issues are priced according to Replacement Price Method. Further, assume that the replacement prices are as under:

July 6—₹22; July 9—₹23; July 13—₹24; July 28—₹26.

Solution:**Replacement Price Method**
Stores Ledger Account

Date	Receipts				Issues				Balance		
	Ref. GRN	Qty Units	Rate ₹	Amt ₹	Ref. SR	Qty Units	Rate ₹	Amt ₹	Qty Units	Rate ₹	Amt ₹
2010											
1 July	—	—	—	—	—	—	—	—	500	20	10,000
4 July	574	400	21	8,400	—	—	—	—	900	—	18,400
6 July	—	—	—	—	251	600	22	13,200	300	—	5,200
8 July	578	800	24	19,200	—	—	—	—	1,100	—	24,400
9 July	—	—	—	—	258	500	23	11,500	600	—	12,900
13 July	—	—	—	—	262	300	24	7,200	300	—	5,700
24 July	584	500	25	12,500	—	—	—	—	800	—	18,200
28 July	—	—	—	—	269	400	26	10,400	400	—	7,800

Note: Balance amount is calculated by deducting issue amount from the previous balance amount.

NOTES**Standard Price Method**

Standard price is a predetermined price which is fixed for a definite period, such as a year. It takes into account factors like probable trend of prices over that period, market conditions, discounts, etc. Thus, standard price is a notional price and not the actual cost price. Standard prices are fixed for each item of material and where prices of materials fluctuate heavily, standard prices should be fixed for a short period and revised as and when required.

Under this method, all receipts are posted in the Stores Ledger Account at actual cost and issues are priced at standard price. The difference between actual and standard prices, is transferred to Material Price Variance Account.

While this method is used mainly in connection with standard costing, it can be employed in practically any other costing system.

Illustration 4.6: Again using the transactions given in Illustration 4.1, prepare Stores Ledger Account under Standard Price Method. Assume standard price is ₹24 per unit.

Solution:**Standard Price Method**
Stores Ledger Account

Date	Receipts				Issues				Balance	
	Ref. GRN	Qty Units	Rate ₹	Amt ₹	Ref. SR	Qty Units	Rate ₹	Amt ₹	Qty Units	Amt ₹
2010										
1 July	—	—	—	—	—	—	—	—	500	10,000
4 July	574	400	21	8,400	—	—	—	—	900	18,400
6 July	—	—	—	—	251	600	24	14,400	300	4,000
8 July	578	800	24	19,200	—	—	—	—	1,100	23,200
9 July	—	—	—	—	258	500	24	12,000	600	11,200
13 July	—	—	—	—	262	300	24	7,200	300	4,000
24 July	584	500	25	12,500	—	—	—	—	800	16,500
28 July	—	—	—	—	269	400	24	9,600	400	6,900

Note: The value of closing stock of 400 units at the standard price of ₹24 should be ₹9,600. The difference of ₹2,700 (*i.e.*, ₹9,600 – 6,900) represents favourable price variance and to this extent the closing stock is undervalued. This favourable variance may be partly due to the efficiency in purchasing and partly due to other factors.

NOTES

Highest-in, First-out (HIFO) Method

In this method, materials issued are charged at the rate of the highest priced materials in stores. This highest rate is continued to be used until material at that highest price is exhausted, after which the next highest price is used. Thus, in HIFO method, the production absorbs the high cost of materials and closing stock is valued at lower rates.

The HIFO method has the advantage that in fluctuating market, the highest cost of materials is recovered first and inventory valuation is kept at the lowest which is tantamount to creating a secret reserve. This method is not popular but is used in 'cost-plus contracts' with advantage.

Next-in, First-out (NIFO) Method

Here materials are not charged at a price which has been paid, but rather at a price at which an order has been placed, *i.e.*, the price of materials that will be next received. For example, in stock there are two batches of materials, one at ₹15 and the other at ₹16. There is a further batch of materials on order at ₹16.50 which has not yet been received. If materials were to be issued now, these will be charged at ₹16.50. The main argument in favour of this method is that this is a more up-to-date replacement price than the LIFO method.

Specific Price or Identifiable Cost Method

Special materials purchased exclusively for specific jobs or work orders should be charged to those specific jobs at the specific (actual) price. This method can always be used where materials are purchased and set aside for a particular job or work order until required for production. Those materials which have not been purchased for specific jobs, are issued according to FIFO, LIFO or any other method.

Of course, this method has only a limited application. But it enjoys the advantages of pricing the materials at actual cost and thus is desirable from costing point of view. This method has a special application in job order industries, where special materials may be purchased for specific jobs.

Illustration 4.7: From the following information, prepare a Stores Ledger Account using Specific Price Method.

1 July	Purchased for Job No. 108	500	units @ ₹20 each
4 July	Purchased for Job No. 107	400	units @ ₹21 each
8 July	Purchased for Job No. 109	800	units @ ₹24 each
24 July	Purchased for Job No. 112	1,000	units @ ₹25 each

6 July	Issued 400 units to Job No. 107
9 July	Issued 300 units to Job No. 108
13 July	Issued 700 units to Job No. 109
14 July	Issued 200 units to Job No. 108
26 July	Issued 500 units to Job No. 112
28 July	Issued 100 units to Job No. 109

NOTES**Solution:**

Specific Price Method
Stores Ledger Account

Date July	Receipts				Issues				Balance	
	Ref. Job No	Qty Units	Rate ₹	Amt ₹	Ref. Job No.	Qty Units	Rate ₹	Amt ₹	Qty Units	Amt ₹
1	108	500	20	10,000	—	—	—	—	500	10,000
4	107	400	21	8,400	—	—	—	—	900	18,400
6	—	—	—	—	107	400	21	8,400	500	10,000
8	109	800	24	19,200	—	—	—	—	1,300	29,200
9	—	—	—	—	108	300	20	6,000	1,000	23,200
13	—	—	—	—	109	700	24	16,800	300	6,400
14	—	—	—	—	108	200	20	4,000	100	2,400
24	112	1,000	25	25,000	—	—	—	—	1,100	27,400
26	—	—	—	—	112	500	25	12,500	600	14,900
28	—	—	—	—	109	100	24	2,400	500*	12,500

* This closing stock consists of 500 units @ ₹25 = ₹12,500 for Job No. 112.

Base Stock Method

This method assumes that minimum (base) stock is always held in stock and is not issued. This is in the nature of a fixed asset and is carried at original cost. Any quantity in excess of base stock is valued according to one of the other methods, *i.e.*, FIFO, LIFO, Average, etc. Thus, base stock method is not an independent method and has to be used along with some other method.

Though theoretically sound, the base stock method is rarely encountered in practice. It offers the advantages of simplifying valuation of inventory because base stock values are fixed. But the inventory valuation may not reflect the current market prices. Other merits and demerits of this method depend upon whether FIFO, LIFO, or any other method that is used, along with this method.

Illustration 4.8: With the information provided in Illustration 4.1, prepare a Stores Ledger Account. Assume base stock is 100 units.

Use FIFO method along with Base Stock Method.

Solution:

NOTES

Base Stock Method
Stores Ledger Account

Date 2010	Receipts				Issues				Balance		
	Ref. GRN	Qty Units	Rate ₹	Amt ₹	Ref. (SR)	Qty Units	Rate ₹	Amt ₹	Qty Units	Rate ₹	Amt ₹
1 July	—	—	—	—	—	—	—	—	500	20	10,000
4 July	574	400	21	8,400	—	—	—	—	{ 500	20	10,000
									{ 400	21	8,400
6 July	—	—	—	—	251	600 { 400	20	8,000	{ 100	20	2,000
						200	21	4,200	{ 200	21	4,200
8 July	578	800	24	19,200	—	—	—	—	{ 100	20	2,000
									{ 200	21	4,200
									{ 800	24	19,200
9 July	—	—	—	—	258	500 { 200	21	4,200	{ 100	20	2,000
						300	24	7,200	{ 500	24	12,000
13 July	—	—	—	—	262	300	24	7,200	{ 100	20	2,000
									{ 200	24	4,800
24 July	584	500	25	12,500	—	—	—	—	{ 100	20	2,000
									{ 200	24	4,800
									{ 500	25	12,500
28 July	—	—	—	—	269	400 { 200	24	4,800	{ *100	20	2,000
						200	25	5,000	{ 300	25	7,500

* Closing stock consists of base stock of 100 units @ ₹20 = 2,000 + 300 units @ ₹25 = 7,500, total 400 units at ₹9,500.

Periodic Simple Average Method

This method is similar to simple average method except that the issue price here is computed periodically (normally at the month-end) and not at the time of each issue of material. Thus the periodic average covers the prices of purchases made during that period.

In order to compute periodic simple average, the prices paid for different lots are added and the total is divided by the number of prices. Thus:

$$\text{Periodic simple average price} = \frac{\text{Total of purchase prices during the period}}{\text{No. of prices during the period}}$$

All the issues of material during that period will be priced at this periodic simple average. It should be noted that the price of the opening stock does not enter the computation of average price.

Periodic Weighted Average Method

Like periodic simple average method, in this method also average price is calculated at the end of a given period (which is usually one month). The weighted average price is calculated at the end of a given period by dividing the total cost of purchases during the period by the quantity purchased. Thus:

$$\text{Periodic weighted average price} = \frac{\text{Total cost of materials purchased}}{\text{Quantity purchased}}$$

The purchases during the period and closing stock are included in this calculation but it must be noted that the opening stock does not enter into this calculation because it was not purchased during the current period and would have been included in the last period's calculation.

NOTES

Moving Simple Average Method

In this method, the periodic simple average is further averaged. For this purpose, a number of periods (or months) is decided first and then the total of the periodic average prices of the given periods is divided by the number of periods taken. When a 5-monthly moving average is to be calculated, one has to add the periodic simple average prices of 5 months (including and preceding the month for which issue price is required) and divide it by 5 to give the moving simple average price. For example, if moving average price is to be calculated for five months of January to May, then we will add the periodic simple average prices of January to May and divide it by 5, to give the moving simple average price. The price so calculated will be applicable for issues during the month of May. For the month of June, we omit the periodic simple average of January and add the price of June and divide by 5 to get the issue price. Thus, the average price is made to move from month to month by omission of the average price of the earliest month and including the average price of the month for which issue price is applicable.

Illustration 4.9: Compute simple moving average rates in a paint industry which purchased double boiled oil at different monthly rates as given below. Six-monthly moving rate is to be computed from June.

<i>Month</i>	<i>Price per litre (₹)</i>	
January	2.50	
February	2.60	
March	2.90	
April	2.80	
May	2.75	
June	2.75	
July	2.65	
August	2.80	(ICWA Inter)

NOTES

Solution:

Computation of Moving Simple Average Rate

Month (a)	Price per litre (b)	Six monthly total (c)	Simple moving average [c ÷ 6]
January	2.50		
February	2.60		
March	2.90		
April	2.80		
May	2.75		
June	2.75	16.30	2.72
July	2.65	16.45	2.74
August	2.80	16.65	2.77

Moving Weighted Average Method

In this method, the moving average price is calculated in exactly the same way as the moving simple average price except that periodic weighted average prices are taken for averaging.

Inflated Price Method

This method is used where materials are subject to some inevitable losses that may arise from evaporation, breaking the bulk, etc. The issue price is slightly inflated to ensure that the loss is covered and the full cost of the material concerned is recovered. For instance, let us assume 100 gallons of a liquid are purchased at ₹9 per gallon and a loss of 5% is expected. This means only 95 gallons would be available for issues to production. In order to recover the original cost of ₹900 (*i.e.*, $100 \times ₹9$), the issue price must be $₹900 \div 95 \text{ gallons} = ₹9.47$.

This is not a distinct method of pricing but only a procedure for accounting adjustment. It is, therefore, used in conjunction with one of the other methods like FIFO, LIFO.

Illustration 4.10: 3,000 feet of leather is purchased at 48 paise per foot. Normal wastage on account of cutting the bundle of leather into pieces of one foot is estimated at 10 per cent. The wastage has a saleable value of 30 paise per foot.

Calculate the cost of material of work order requiring 450 pieces of cut leather.

Solution:

Cost of leather = $3,000 \times 0.48$	= ₹1,440
Less: Saleable value of normal loss (300 ft @ ₹0.30)	90
Net cost	<u>₹1,350</u>

Normal quantity available (3,000 ft less 10%) = 2,700 ft

Issue rate per ft = ₹1,350 ÷ 2,700 ft = ₹0.50

Cost of 450 pieces = 450 × 0.50 = ₹225

Pricing of Materials Returned

Sometimes, materials may be returned by production department to stores for some reason or the other. Such return of materials may be treated by one of the following two methods:

1. The returned materials may be entered in the *Receipts column* of Stores Ledger Account at the price at which these were originally issued at if they were a new purchase. These materials are re-issued for production at a price according to the method of pricing in vogue.
2. The returned materials are recorded in the *Receipts column* of the Stores Ledger Account at the price at which these were originally issued and issued at the immediately next stores requisition at the same price.

Choice of Method of Pricing

The various factors affecting choice of a method are:

1. The extent of price fluctuations
2. Frequency of receipts and issues of materials
3. Type of costing system in use, *i.e.*, job or process costing
4. The proportion of material cost in total cost
5. Degree of accuracy required
6. Whether issues can be identified with purchased lots
7. Whether standard costing system is in use
8. The need for maintaining uniformity in costs within the industry
9. The nature of material, *i.e.*, whether it is subject to some losses like evaporation, breaking the bulk, etc.
10. Managerial policy regarding valuation of closing stock

Check Your Progress

1. List the reasons which the balance of an item of store as shown in the bin card differs from that shown in the stores ledger.
2. What happens after the first batch is fully issued in the FIFO method?
3. When is the replacement price method used?
4. Which type of industry uses the identifiable cost method?

NOTES

4.4 TREATMENT OF WASTE, SCRAP, DEFECTIVES AND SPOILAGE

NOTES

Losses of materials may arise during handling, storage or during process of manufacture. Such losses or wastages are classified into two categories—normal loss and abnormal loss.

Normal Loss: This is that loss which has necessarily to be incurred and thus is unavoidable. Examples are:

- (i) Loss by evaporation in case of liquid materials.
- (ii) Loss due to loading and unloading of material, say, in case of coal and other materials of such nature.
- (iii) Loss due to breaking the bulk. When materials are purchased in large quantity and issued to production in small lots, some difference is likely to arise.

Normal losses of material cannot be completely eliminated but may be controlled to a limited extent.

Abnormal Loss: This is that loss which arises due to inefficiency in operations, bad luck, mischief, etc. Examples are:

- (i) Theft or pilferage
- (ii) Breakage
- (iii) Fire, accident, flood, etc.
- (iv) Use of inaccurate weighing instruments
- (v) Improper storage resulting in deterioration of materials

Control of Material Losses

The following steps are suggested to control the loss of materials:

1. Proper storage conditions should be provided, particularly in case of perishable materials.
2. The store room should be well guarded and protected to avoid the risks of fire or theft, etc.
3. In order to reduce losses due to obsolescence, materials should be issued on first-in, first-out basis.
4. Accuracy of weighing instruments should be periodically checked.
5. A systematic procedure should be developed regarding movement of materials from one place to another and no unauthorized movement of materials should be permitted.
6. Specialized material handling equipment should be employed so as to minimize losses in materials handling.

Accounting Treatment

It is a principle of costing that all normal losses which are necessarily to be incurred are treated as a part of the cost and abnormal losses which are really avoidable should not be included in the cost. Therefore, in order to absorb normal material losses in cost, the rates of usable materials in stock are inflated so that such losses are covered. Alternatively, normal material loss is transferred to factory overhead.

Abnormal material losses, such as those due to breakage, theft, fire, flood and abnormal evaporation, are charged to Costing Profit and Loss Account.

Material losses may arise in the form of waste, scrap, spoilage or defectives. These are explained below:

Waste

Meaning: Waste has been defined as ‘*that portion of a basic raw material lost in processing, having no recovery value.*’ In fact, waste is a material loss during production or storage due to various factors, such as evaporation, chemical reaction, shrinkage, contamination, unrecoverable residue, which has little or no value. Waste may be visible or invisible. *Visible waste* is that which is physically present, e.g., ash and saw dust. An *invisible waste*, on the other hand, is the disappearance of basic raw material in the form of evaporation, smoke, etc. Waste in certain industries creates problems of disposal. Usually this is disposed of in the easiest and cheapest manner, e.g., liquid wastes may be poured into nearby rivers.

Control of waste: Waste has the effect of reducing the quantity of output. Thus, waste should be reduced to the minimum. Allowance for normal waste should be made on the basis of past experience, technical factors and any special features of the material, product and process, etc. Responsibilities should be assigned for any waste over and above the normal waste.

A Waste Report should be prepared periodically to compare the actual waste with the predetermined level.

Accounting of waste: Waste usually has no realizable value. If waste is a part of the normal process loss, the cost will be absorbed by the good production. On the other hand, if it is a part of the abnormal process loss, it is transferred to Costing Profit and Loss Account.

However, if waste has any sale value at all, then the small amount received should be treated as ‘other income’.

Scrap

Meaning: This is defined as ‘*the incidental residue from certain types of manufacture usually of small amount and low value, recoverable without further processing.*’ According to Cost Accounting Standard-6 (CAS-6), issued by ICWA of India, ‘*scrap is the “discarded material having some value in a few cases and which is usually either disposed of without further treatment*

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(other than reclamation and handling) or re-introduced into the process in place of raw materials.”’ Scrap has the following features:

- (a) Scrap is incidentally produced from the manufacturing process.
- (b) Scrap is usually of small value.
- (c) No further processing is required to realize its saleable value.
- (d) Scrap may be used in place of raw material, in some cases.
- (e) Unlike waste, scrap is always physically available.

Examples of scrap are trimmings in timber industries; cuttings, pieces, etc., in leather and readymade garments factory and cut pieces of metal sheets.

Control of scrap: Like waste, scrap also increases the cost of production. Although scrap might realize a nominal amount, the sale value will mostly be much lower than the cost of raw materials. Therefore, scrap should be kept as low as possible and a proper control should be exercised on this loss of materials.

Control of scrap is possible by setting standards for scrap, determining the responsibility for scrap and by keeping proper records of scrap. A Scrap Report should be prepared at regular periods whereby a comparison should be made between actual scrap and standard allowance for scrap and remedial measures should be taken for any adverse variances that may be detected.

Accounting of scrap: The problem of scrap is more complex than that of waste. It may be treated in any of the following ways:

- (a) **As other income:** Sales of scrap may simply be treated as ‘other income’ and credited to Profit and Loss Account. This method is particularly suitable when the scrap has a relatively small realisable value, after taking into account the cost of its disposal and marketing.
- (b) **Credit to overheads:** The net value of scrap, *i.e.*, after adjusting selling and distribution costs, may be credited to production overheads of the department producing the scrap. An alternative to this method is that net realisable value is credited to the material cost.
- (c) **Credit to job or process:** The realisable value of scrap may be credited to the job or process which yields the scrap. This method is suitable when scrap is identifiable with a particular job or process and is of significant value.

Spoilage

Meaning: Spoiled work results when materials are damaged in manufacturing operations in such a way that they cannot be rectified and brought back to normal specifications. Spoilage differs from scrap in that scrap unavoidably arises as a result of manufacturing operations, whereas spoilage occurs due to some defect in materials or manufacturing operations which could have been avoided. Spoiled work may have a realisable value and in certain cases, it is sold as ‘seconds’.

Control of spoilage: Normal spoilage should be determined in advance and it should be periodically compared with actual spoilage in the Spoilage Report. Causes of any abnormal spoilage should be investigated and remedial measures immediately taken.

Accounting of spoilage: For accounting purposes, spoiled work should be divided into normal and abnormal. The cost of normal spoilage should be borne by good production. This can be done by charging the loss due to spoilage to production and spreading it over the good units produced.

Abnormal spoilage, caused due to inefficiency and treated as controllable should be transferred to Costing Profit and Loss Account.

Defectives

Meaning: Defective work may be defined as ‘that production which is below standard specifications or quality and can be rectified by incurring additional expenditure (of material, labour, etc.) known as rectification costs.’ The main difference between spoilage and defective is that whereas the former cannot be rectified and sold as good units, the latter can be rectified by incurring additional costs and brought back to the level of standard product. Sometimes, when defectives cannot be rectified as standard product, they may be sold as ‘seconds’.

Control of defectives: This should cover not only control over the quantity of defective production but also control over rectification costs. On the basis of past experience, standards for defective work and rectification costs should be fixed. Reasons for any defectives over and above the normal or standard defective work should be fully investigated and corrective steps should be taken. If, for example, defective output is due to bad workmanship, suitable incentives may be provided to workers for minimizing the defective work. A report on defective work should be periodically prepared.

Accounting of defective work: The main problem in accounting of defective work is the problem of treatment of rectification or rework costs. Where defective work is easily identifiable with specific jobs, the rectification costs should be debited to the jobs concerned. Where, however, such work cannot be conveniently identified with jobs, the rectification costs may be debited to overheads. In the case of abnormal type of defective work, the rectification costs may be transferred to Costing Profit and Loss Account.

4.5 ABC AND VED ANALYSIS

In this section, you will learn about the ABC and VED analysis of material cost control.

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ABC Analysis

ABC technique is a value based system of material control. In this technique, materials are analysed according to their value so that costly and more valuable materials are given greater attention and care. All items of materials are classified according to their value—high, medium and low values, which are known as *A*, *B* and *C* items, respectively. *ABC* technique is sometimes called *Always Better Control* method.

'A' Items—These are high value items which may consist of only a small percentage of the total items handled. On account of their high cost, these materials should be under the tightest control and the responsibility of the most experienced personnel.

B' Items—These are medium value materials which should be under the normal control procedures.

'C' Items—These are low value materials which may represent a very large number of items. These materials should be under simple and economical methods of control.

The point of classifying stock into *A*, *B* and *C* categories is to ensure that material management focuses on *A* items where sophisticated controls should be installed. *B* items may be given less attention and *C* items least attention.

Thus *ABC* technique is a selective control which aims at concentrating efforts on those materials where attention is needed most. This is so because it is unwise to give equal attention to all items in stock. The items are listed and ranked in the order of their descending importance showing quantity and value of each item. This is illustrated below with arbitrary percentage figures.

Category	% of total value	% of total quantity	Type of control
<i>A</i>	70	10	Strict control
<i>B</i>	25	30	Moderate control
<i>C</i>	5	60	Loose control
Total	100	100	

In the above table it is shown that 10 per cent of the total items account for as much as 70 per cent of the total value. These are *A* category items which need very strict control because of their high cost significance. The second type of items represent 30 per cent of the total quantity but account for 25 per cent of the total value. These are *B* items which need routine type of control. Finally, the items representing 60 per cent of the total quantity account only for 5 per cent of total value. These *C* items are kept under simple physical control. The rules regarding purchasing, storing and issuing of various categories of items should be formed according to the value and importance of materials.

Advantages: The advantages of *ABC* technique are as follows:

1. Closer and stricter control can be exercised on those items which represent large amounts of capital invested.
2. Investment in inventory is regulated and funds can be utilized in the best possible way.
3. Economy in stock carrying costs.
4. It helps in maintaining enough safety stock for 'C' category items.
5. Selective control helps in maintaining high stock turnover rate.

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VED Analysis

You have seen in the aforementioned section, that ABC analysis uses a quantifiable approach to categorizing inventory, the Vital Essential Analysis uses a more qualitative approach. The fundamental question behind using this technique is to find out the essential item without which the production will come to a halt.

It is possible that under the ABC analysis, the essential item for your production is least costly and therefore categorized under C category. But this would be a grievous categorization since, the absence of such item would adversely affect production. VED analysis unlike ABC analysis, does not take into account the intrinsic value of the item, instead it computes the 'nuisance value'. This denotes the cost that the unit will incur on not having the item in store.

VED analysis then divides the items of production into three categories: vital, essential and desirable. Vital item is necessary for production, the absence of essential item will not halt production but will have an impact on speed, quality and costs and the presence of desirable item will not affect the functioning but might cause disruptions or losses.

Check Your Progress

5. Give some examples of abnormal loss.
6. What is the accounting treatment of waste, if it is a part of the abnormal process loss?
7. State the purpose of classifying stocks into A, B and C categories.

4.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The two reasons why there arises a difference between the balance of an item of store as shown in the bin card and that in stores ledger are: (a) some arithmetic error in working out the balance; and/or (b) wrong posting or non-posting in bin card or stores ledger.

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2. In the FIFO method, after the first batch is fully issued, the price of the next batch received becomes the issue price.
3. The replacement price method is used when it is desired to reflect the current prices in cost.
4. The identifiable cost method has a special application in job order industries, where special materials may be purchased for specific jobs.
5. Some examples of abnormal loss include: theft or pilferage, breakage, fire, accident, flood, etc., use of inaccurate weighing instruments and improper storage resulting in deterioration of materials.
6. If the waste is a part of the abnormal process loss, it is transferred to Costing Profit and Loss Account.
7. The point of classifying stock into *A*, *B* and *C* categories is to ensure that material management focuses on *A* items where sophisticated controls should be installed. *B* items may be given less attention and *C* items least attention.

4.7 SUMMARY

- There are two methods of inventory systems: periodic inventory system and perpetual inventory system.
- Under perpetual inventory system of inventory control, bin cards and stores ledger *records show stores balances after each receipt and issue so that* current balance of stores is shown at any point of time, any receipts being added to and any issues being deducted from the balance after each transaction.
- When materials are issued from stores to production department, a question arises regarding the price at which materials issued are to be charged. This is because the same type of material may have been purchased in different lots of different times at several different prices.
- Methods of pricing material or stores issues are: First-in, First Out Method; Last-in First-out Method; Average Cost Methods; Replacement Price Method; Standard Price Method; etc.
- Loss of materials may arise during handling, storing or during process of manufacture. Such losses or wastages are classified into two categories: normal loss and abnormal loss.
- It is a principle of costing that all normal losses which are necessarily to be incurred are treated as a part of the cost and abnormal losses which are really avoidable should not be included in the cost. Therefore, in order to absorb normal material losses in cost, the rates of usable materials in stock are inflated so that such losses are covered. Alternatively, normal material loss is transferred to factory overhead.

- Abnormal material losses, such as those due to breakage, theft, fire, flood and abnormal evaporation, are charged to Costing Profit and Loss Account.
- *ABC* technique is a value based system of material control in which materials are analysed according to their value so that costly and more valuable materials are given greater attention and care.
- VED analysis unlike ABC analysis, does not take into account the intrinsic value of the item, instead it computes the 'nuisance value'. This denotes the cost that the unit will incur on not having the item in store.
- VED analysis then divides the items of production into three categories: vital, essential and desirable. Vital item is necessary for production, the absence of essential item will not halt production but will have an impact on speed, quality and costs and the presence of desirable item will not affect the functioning but might cause disruptions or losses.

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4.8 KEY WORDS

- **First-in, First-out (FIFO):** It is a method based on the assumption that materials which are purchased first are issued first.
- **Last-in, First-out (LIFO):** It is a method which operates in just the reverse order of FIFO method, i.e., the last materials purchased are issued first.
- **Average Cost Methods:** It is based on the assumption that when materials purchased in different lots are stored together, their identity is lost, and therefore, issues should be charged at an average price.
- **Waste:** It is that form of material loss whereby 'basic raw material is lost in processing, having no recovery value.'
- **Scrap:** It is defined as 'the incidental residue from certain types of manufacture usually of small amount and low value, recoverable without further processing.'

4.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What is the periodic inventory system?
2. State the advantages of the perpetual inventory system.
3. Write a short note on ABC and VED analysis.

Long Answer Questions

1. Describe the steps involved in the perpetual inventory system.

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2. What are the various methods of pricing material issues? When do you advocate pricing the issues at cost price based on the 'Last-in, first-out' method?
3. Explain the FIFO and LIFO methods of valuing material issues. Discuss the effect of rising prices and falling prices on these two methods of pricing of material issues.
4. Explain the accounting treatment and control of the following in cost accounts:
(a) Waste, (b) Scrap, (c) Defective, (d) Spoilage.

4.10 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
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BLOCK - II

METHODS AND COST CONTROL

Labour Cost Control

UNIT 5 LABOUR COST CONTROL

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Structure

- 5.0 Introduction
- 5.1 Objectives
- 5.2 Labour Turnover
- 5.3 Time Keeping and Time Booking
- 5.4 Treatment of Idle Time and Overtime Cost
- 5.5 Wage Rates for Costing and Systems of Wage Payment
 - 5.5.1 Time Rate and Piece Rate system
 - 5.5.2 Incentive Plans
- 5.6 Answers to Check Your Progress Questions
- 5.7 Summary
- 5.8 Key Words
- 5.9 Self Assessment Questions and Exercises
- 5.10 Further Readings

5.0 INTRODUCTION

Labour or manpower represents human resources used in production. After material cost, labour cost is the second major element of cost. Despite large scale use of machinery and advanced technologies in manufacturing, the role of labour in production cannot be underestimated. So significant is the role of labour that productivity of all other resources depends on the productivity of human resources. In other words, higher efficiency of labour helps in lowering the cost per unit of production. There is, therefore, a special need for proper organization for accounting and control of labour cost.

According to Cost Accounting Standard-7 (CAS-7) issued by ICWA of India, employee cost is *'the aggregate of all kinds of consideration paid, payable and provision made for future payments, for the services rendered by employees of an enterprise (including temporary, part time and contract employees). Consideration includes wages, salaries, contractual payments and benefits, as applicable, or any payment made on behalf of the employee. This is also known as labour cost.'*

Labour cost is of two kinds: (i) Direct labour cost, (ii) Indirect labour cost

Organization for Accounting and Control of Labour Cost

There are mainly five departments in an organization which deal with labour. These are as follows:

Personnel department: This is a service department and is mainly concerned with the proper selection and training of workers and placing them on jobs for which they are best suited.

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Engineering department: This department prepares and plans specifications of jobs makes job analysis, conducts time and motion studies, makes provision for safe working conditions and supervises production activities.

Time-keeping department: This department is concerned with recording of workers's time. The recording of time put in by workers is required not only for attendance and wage calculation purpose but also for the purpose of cost analysis and apportionment of labour cost over various jobs.

Payroll department: This department maintains a record of job classification and wage rate of each employee and performs the function of computation of wages payable to them by preparing payroll or wage sheet. It is also responsible for disbursement of wages.

Cost accounting department: This department accumulates and classifies all cost data of which labour is one important element. It analyses the payroll and prepares routine and special labour cost reports for submission to management so that proper control may be exercised on labour cost.

In this unit, you will learn about the different methods of labour cost control.

5.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the meaning and causes of labour turnover and the methods of its measurement
 - Explain the various methods of time keeping and time booking
 - Describe idle time and overtime and their effect on cost
 - Explain time rate and piece rate systems of labour remuneration
 - Classify various incentive plans of labour remuneration
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5.2 LABOUR TURNOVER

Labour turnover falls under the purview of personnel department. In all business organizations, it is a common feature that some workers leave the employment and new workers join in place of those leaving. This change in work force is known as labour turnover. Labour turnover is thus defined as '*the rate of change in the composition of the labour force in an organization.*' Labour turnover varies greatly between different trades and industries. For example, where part-time and seasonal labour is employed, the rate will be higher.

Measurement of Labour Turnover

To facilitate comparisons between different periods and different undertakings, labour turnover may be expressed in a rate.

There are three alternative methods by which this rate is computed. Once a particular method is used, it should be consistently followed for comparative analysis. The methods are:

1. Separation method: This method takes into account only those workers who have left during a particular period. Its formula is:

$$\text{Labour Turnover Rate} = \frac{\text{No. of workers who have left during a period}}{\text{Average no. of workers during the period}} \times 100^*$$

$$\text{Average Number} = \frac{\text{No. of workers in the beginning} + \text{No. of workers at the end of the period}}{2}$$

*Multiplication by 100 in the given formulae indicates that the rates are in percentage.

2. Replacement method: This method takes into account only those new workers who have joined in place of those who have left. Its formula is:

$$\text{Labour Turnover Rate} = \frac{\text{No. of workers replaced during the period}}{\text{Average no. of workers during the period}} \times 100$$

If new workers are engaged for expansion programme or any other such purpose, they are not considered for this computation.

3. Flux method: This shows the total change in the composition of labour force due to separations and replacement of workers. Its formula is:

$$\text{Labour Turnover Rate} = \frac{\text{No. of workers who left} + \text{No. of workers replaced}}{\text{Average no. of workers}} \times 100$$

Labour Turnover due to New Recruitment: It has been stated above that workers joining the organization on account of opening of new departments or due to any type of expansion programme should be excluded while calculating the labour turnover rate. But these new workers recruited are certainly responsible for a change in the composition of labour force. Therefore, some cost accountants measure turnover rate for these new workers (excluding replacements) by the following method:

$$\text{Labour Turnover Rate} = \frac{\text{No. of new workers joining in the period (excluding replacement)}}{\text{Average no. of workers}} \times 100$$

Total number of workers joining, including replacements, is called accession. The labour turnover rate in such a case may be calculated in respect of workers joining (accession) the organization during the period which includes all workers joining due to replacements and also due to expansion. It is calculated as follows:

$$\text{Labour Turnover Rate} = \frac{\text{No. of accessions during a period}}{\text{Average no. of workers}} \times 100$$

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When labour turnover rate is computed by taking into account the number of accessions, the flux method rate will be calculated as follows:

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$$\text{Labour Turnover Rate (Flux Method)} = \frac{\text{No. of Separations} + \text{No. of replacements} + \text{No. of new workers recruited}}{\text{Average no. of workers}} \times 100$$

$$\text{or} = \frac{\text{No. of Separations} + \text{No. of accessions}}{\text{Average no. of workers}} \times 100$$

Equivalent Annual Labour Turnover Rate: Labour turnover rate, as explained above, may be computed for a month, a quarter or for any period other than a year. It may be converted into an equivalent annual labour turnover rate by using the following formula:

$$\text{Equivalent annual labour turnover rate} = \frac{\text{Turnover rate for the period}}{\text{No. of days in the period}} \times 365 \text{ days}$$

Illustration 5.1: From the following data given by the Personnel Department, calculate the labour turnover rate by applying:

- (a) Separation method
- (b) Replacement method
- (c) Flux method

No. of workers on the payroll:

At the beginning of the month 900

At the end of the month 1,100

During the month, 10 workers left, 40 persons were discharged and 150 workers were recruited. Of these, 25 workers are recruited in the vacancies of those leaving, while the rest were engaged for an expansion scheme. (*ICWA Inter*)

Solution:

$$\text{Average no. of workers} = \frac{900 + 1,100}{2} = 1,000$$

$$\text{No. of workers left} = 10 + 40 = 50$$

$$1. \text{ Separation Rate} = \frac{50}{1,000} = 5\%$$

$$2. \text{ Replacement Rate} = \frac{25^*}{1,000} \times 100 = 2.5\%$$

$$3. \text{ Flux Rate} = \frac{50 + 25}{1,000} \times 100 = 7.5\%$$

*Note: Additional workers engaged on expansion plan have not been considered.

Alternative methods produce the following rates:

Labour Cost Control

$$\text{Labour turnover rate for new workers} = \frac{125}{1,000} \times 100 = \mathbf{12.50\%}$$

(excluding replacements)

$$\text{Labour turnover rate (for accessions)} = \frac{25 + 125}{1,000} \times 100 = \mathbf{15\%}$$

$$\text{Labour turnover rate (Flux Method)} = \frac{50 + 25 + 125}{1,000} \times 100 = \mathbf{20\%}$$

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Causes of Labour Turnover

Labour turnover reports should be prepared regularly to be placed before the management, giving a breakdown of the causes as to why the workers left. The causes may be classified in two broad categories: (i) Avoidable causes; and (ii) Unavoidable causes.

Avoidable causes: These include:

1. Low wages and allowances
2. Unhappy relations with co-workers and supervisors
3. Unsatisfactory working conditions
4. Trade union rivalry
5. Lack of medical facilities, transport facilities, etc.
6. Inadequate job security and retirement benefits

Unavoidable causes: These include:

1. Death or retirement
2. Illness or accident
3. Domestic problems
4. Discharge on disciplinary grounds
5. Seasonal nature of business
6. Change in plant location
7. Personal dislike for job or environment
8. Marriage—particularly in the case of women workers
9. Change of job for betterment

Effect of Labour Turnover

A certain amount of labour turnover will always take place. To a limited extent this may be welcome, particularly at the lower management level as it creates vacancies for internal promotions which acts as motivation for young and ambitious workers. Moreover, new workers bring new ideas and methods of doing work from other organizations.

Labour turnover is expensive and generally it should be minimized because it leads to increased cost of production for reasons stated below.

Cost of Labour Turnover

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The cost of labour turnover may be broadly classified into two broad categories: (i) Preventive costs; and (ii) Replacement costs.

Preventive costs: These costs are those which are incurred to keep the work force satisfied and to prevent or discourage them from leaving the organization. These include:

1. Cost of personnel management—only that portion of this cost which can be attributed to the efforts of the personnel department in maintaining good relations between management and workers
2. Cost of welfare activities and services, *e.g.*, canteen meals, co-operative stores, educational and transport facilities and housing schemes
3. Cost of medical services
4. Pensions schemes—to provide security and retirement benefits
5. Extra bonus and other perquisites (in excess of those given by other similar concerns) to discourage their defecting to other undertakings

Replacement costs: These costs include all such losses and wastages arising because of the inexperienced new labour force replacing the existing one as well as the cost of recruitment and training of the new workers. These include:

1. Cost of recruitment and selection of new employees
2. Cost of training of new workers
3. Loss of output due to some time gap in recruiting new workers
4. Loss due to inefficiency of new workers
5. Cost of accidents due to lack of experience of new workers
6. Cost of extra scrap and defective work of new workers
7. Cost of tools and machine breakdown due to faulty handling by new workers

Reduction and Control of Labour Turnover

Labour turnover may be reduced by taking action on the basis of avoidable causes given earlier. The following steps may be taken in this regard:

1. Devising a suitable and satisfactory wage policy
2. Providing working conditions conducive to health and efficiency
3. Impartial and sympathetic attitude of personnel management
4. Introducing financial and non-financial incentive plans
5. Providing promotional opportunities
6. Encouraging labour participation in management

7. Introducing an effective grievance procedure
8. Strengthening the welfare measures

Treatment of Cost of Labour Turnover: The preventive cost of labour turnover should be apportioned to various departments on the basis of number of workers in each department.

Regarding the replacement costs, if the replacement is due to the fault of a particular department, it should be directly charged to that department. If labour turnover is due to the defective management policy, the replacement cost should be apportioned to various departments on the basis of number of workers in each department.

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Check Your Progress

1. What are the three methods of calculating rate in labour turnover?
2. What are the avoidable causes of labour turnover?

5.3 TIME KEEPING AND TIME BOOKING

The time-keeping department is an important part of a firm's system of accounting and control of labour cost. The main function of this department is to accurately record each worker's time of arrival and departure in the factory and also the time spent on different jobs or processes. Thus it embraces two functions:

- (a) *Time keeping, i.e.*, recording arrival and departure time of workers for attendance purpose and for calculation of wages; and
- (b) *Time booking, i.e.*, recording time spent by workers on different jobs or processes for determining labour cost of jobs/processes.

The purpose of time recording is to provide basic data for:

- (i) Preparation of payroll
- (ii) Attendance records, to meet statutory requirements
- (iii) Computing labour cost of a job or process
- (iv) Computing overhead cost of jobs, if based on wages or labour hours
- (v) Statistical analysis of labour records for determining productivity and control of labour cost

Methods of Time Keeping

There are mainly three methods for recording attendance of workers.

1. Attendance register: In this method, attendance of each worker is recorded in the register maintained for this purpose. This register provides sufficient number of columns for attendance of each worker. Entries in the arrival and departure columns may be made by the foreman or the worker himself. If workers are literate,

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they should be required to sign against their entries to avoid any dispute later on. Separate attendance register may be maintained in each department if the number of workers is large, otherwise one register will serve the purpose.

This method is quite simple and cheap. But it can be used only when the number of workers is small. In such cases, generally there is no need for a separate time keeper as the work is done by the foreman.

2. Token or disc method: Each worker is allotted an identification number is suitably painted or engraved on a round metal token (or disc) with a hole in it. All such tokens are hung in a serial order on a board at the factory gate. As the worker arrives, he removes his token from the board and puts it in a box kept nearby or hangs it on another board which is specially kept for this purpose. After the fixed time, the box or the second board is removed. Those coming late have to hand over their tokens personally at the time office so that exact time of their arrival can be noted.

The time office records attendance on the basis of tokens in the box. The absentees are indicated by the missing tokens. Similar procedure is followed at the departure time in the evening.

This method is not fool-proof as a worker may try to get his absentee friends marked present by dropping their tokens in the box.

3. Time-recording clocks: Unlike the first two methods, this is a mechanical method of recording attendance and proves quite useful when the number of workers is fairly large.

Each worker is allotted a Clock Card which bears his identification number, name, department, etc. These cards are kept in a rack in a serial order. There are usually two racks—an 'In' rack and an 'Out' rack. On arrival, the worker will pick up his card from the 'Out' rack, put it in the slot of the clock, press a button and the exact time is printed on the card. After this the card is put in the 'In' rack. An inspection of the 'Out' racks will reveal absentees.

A similar procedure is followed if workers leave the factory at mid-day for lunch or in the evening at close time. Clocks are adjusted so that late arrivals, early or late leavings, overtime, etc., are automatically printed in red. The time keeper must take care to ensure that no worker places friend's card in the clock in addition to his own, so as to avoid proxy.

At the end of each week, the cards are sent to the pay office and a fresh set of cards for the ensuing week is placed in the racks.

Advantages: The main advantages of installing time-recording clocks are:

1. The method is quite economical for large concerns as the initial heavy capital expenditure in installing clocks is recovered by savings in operating expenses, *i.e.*, economy in wages of time recording staff

2. Chances of disputes are reduced as clocks provide more authentic records than hand-written documents
3. Work in connection with the preparation of wage sheets becomes easier because clock cards may be utilized for calculation of wages

The main *shortcoming* of this method is that heavy initial capital investment is required which small concerns may find difficult to afford

4. Biometric Time Clock: Biometric time-recording clock is an electronic device to record attendance of employees. It is a new generation technique which is replacing the typical time clock used to track employee attendance. Instead of employees punching a time card or logging their attendance by hand, they simply place their finger on the Fingerprint Reading Sensor or place their hand into the Hand Reader and the rest of the work is done by the machine. This device completely eliminates the time and effort required to monitor the time clock activity at punch in/out times, consequently leading to substantial cost saving and improved productivity.

The main features and advantages of biometric system are that it can:

1. Eliminate time card
2. Automatic payroll processing
3. Eliminate buddy-punching
4. Eliminate early punch hours
5. Eliminate unauthorized overtime
6. Eliminate time spent on payroll calculations
7. Accurately report employee time/attendance to payroll and HR

Time Booking

In addition to recording worker's time of arrival and departure, it is necessary to record the details of work done by the workers and the time spent on each job or process. Recording of worker's time spent on different jobs is known as time booking. The objectives of time booking are:

- (i) to ensure that the time for which a worker is paid is properly utilized;
- (ii) to ascertain the labour cost of work done;
- (iii) to provide a basis for apportionment of overheads;
- (iv) to ascertain the idle time so as to control it.

Methods of Time-booking

The following are the common methods of time booking:

1. **Job Ticket:** Job tickets or job cards are very commonly used for recording the time spent on each job. A card is prepared for each job and is allotted to the worker who takes up that particular job. The worker enters in this card the time of starting as well as finishing the job. After finishing the job,

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the worker submits his work along with his job ticket. He is then issued another job ticket for the next job. Thus, only one job ticket is issued to a worker at a time. Such job tickets also serve the purpose of authorizing the worker to carry out the job stated therein.

However, if there is a loss of time between finishing of one job and beginning of the next job, it should be entered on the idle time card so that the record of his day's activities may be complete and the time lost is not unduly charged against production. Such idle time card should also show the reasons for idle time, like machine breakdown, waiting for instructions or lack of tools or materials.

2. **Combined Time and Job Card:** This card combines the two in one—the clock card and job card, *i.e.*, it records both the attendance time as well as time spent on different jobs. Idle time is automatically revealed as the difference between attendance time and work time.

3. **Daily Time Sheet:** Each worker is daily issued a time sheet in which the time spent on each job during the day is recorded. This sheet must be completed on the same day and handed over to the foreman for signature.

The main drawback of this method is that it needs a lot of paperwork as considerable amount of time will be taken in preparing time sheets and in consolidating these records for purposes of ascertaining labour cost. However, it is suitable where the workers have to frequently change their jobs in a day, *e.g.*, maintenance workers.

4. **Weekly Time Sheet:** Weekly time sheets record almost the same information as the daily time sheet. The main difference is that instead of recording the work done for a day only, record of work carried out is entered on a weekly basis. Thus, weekly time sheets need less paperwork as compared to daily time sheets. This method proves useful where the jobs are big and their number is small, *e.g.*, building and construction work and interior decoration.

The entries in the weekly time sheets may not be accurate as some workers may make entries for two/three days together at one sitting and in the process may forget time spent on certain jobs.

5. **Piece Work Card:** This card is allotted to a worker who is paid on piece basis. This card may be made either for each individual job or for recording the work done on several jobs. If group system of piece work is in vogue, the card may be allotted to each group of workers.

Though piece rate workers are paid on the basis of number of units produced and not on the basis of time taken, recording their time spent on different jobs is essential, particularly where overheads are absorbed on the basis of labour hours. Moreover, it ensures that piece workers do not cause any interruption in production by their late arrival or early departure.

Check Your Progress

3. State the main function of the time-keeping department.
4. What is the main drawback of the daily time sheet?

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5.4 TREATMENT OF IDLE TIME AND OVERTIME COST

This falls under the purview of payroll department.

Idle Time

Idle time represents time lost by workers who are paid on time basis. When workers are paid on time basis, some difference between the time for which they are paid and that which they actually spend on production is bound to arise. This difference is known as idle time. Idle time is defined as ‘the difference between the time for which employees are paid and the employees’ time booked against the cost object.’ It represents the time for which they are paid but no production is obtained. For example, time lost between factory gate and the department, time when production is interrupted by machine maintenance, allowable time-offs such as rest intervals, tea breaks, etc.

Causes

Idle time may occur owing to productive, administrative or economic causes.

1. **Productive causes:** The productive causes are those which result in loss of production. These include:
 - (a) Idle time due to machine breakdown
 - (b) Power failures
 - (c) Waiting for tools and/or raw materials
 - (d) Waiting for work
 - (e) Waiting for instructions

Idle time due to productive causes is usually controllable by proper planning, strict supervision and proper maintenance of plant and machinery.

2. **Administrative causes:** Idle time is sometimes caused by administrative decisions. Thus, when there is surplus capacity of plant and machinery, which the management decides not to utilize, there may be some idle time due to administrative decisions. This usually happens during depressions when some of the machines have got to work below normal capacity and the regular workers are paid full amount of wages. This is because the management does not want to discharge trained workers temporarily. Such idle time arises out of abnormal situations and is generally not controllable.

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3. **Economic causes:** Idle time may also be caused by fall in the demand of products, say due to severe competition, seasonal nature of certain industries like woollen goods, ice-cream, etc., where production cannot be evenly distributed throughout the year. In such cases, it is not possible to get rid of workers during slack season. Such surplus labour force is usually utilized for doing some other jobs and if such complementary jobs cannot be found, there will be some idle time which is beyond control.

Treatment of Idle Time

From the point of view of treatment in cost accounts, idle time is classified as normal and abnormal.

Normal idle time: This is that wastage of labour time which cannot be avoided and has to be borne by the employer. For example:

- (a) The time which elapses between the completion of one job and the commencement of the next.
- (b) The time taken in going from the factory gate to the department in which the worker is engaged.
- (c) Personal needs, tea breaks, rest intervals, etc.
- (d) Time spent in setting machines, etc.

The cost of normal idle time may be treated in one of the following two ways:

- (i) *As overhead cost* it may be charged to factory overheads. For this purpose, idle time is allotted a separate standing order number. This helps in its effective control.
- (ii) *As direct wages* The wage rate may be inflated to make allowance for normal loss of labour time. Thus, if a worker's production time is only 7 hours during an 8 hours day and his hourly rate of pay is ₹20, the inflated wage rate will be:

$$\frac{8 \text{ hrs}}{7 \text{ hrs}} \times ₹20 = ₹22.86 \text{ per hour.}$$

The second method is not considered very desirable as the cost of idle time should be treated separately instead of being absorbed as a part of direct labour cost. In this way, it can prove more helpful for the purpose of controlling and reducing it to the minimum.

Abnormal idle time: This is that idle time which arises due to reasons in no way connected with the usual routine of manufacture and for which employer must pay. For example:

- (a) Time lost due to breakdown of machinery
- (b) Strikes and lockouts
- (c) Time lost in waiting for tools and/or raw materials
- (d) Accidents, etc.

Abnormal idle time is attributed to defective planning, inefficiency or bad luck. Payment for such idle time is not included in cost and is transferred to Costing Profit and Loss Account.

Labour Cost Control

Control of Idle Time

From control point of view, idle time should be divided into controllable and uncontrollable. Idle time arising due to controllable causes should be properly analysed and responsibility should be fixed on appropriate individuals. It is advisable to prepare an Idle Time Card showing the analysis of idle time so that action may be taken, where necessary.

The following steps may be taken to control idle time:

- (a) Production should be properly planned so that imbalances in production are avoided or reduced.
- (b) Repairs and maintenance of plant and machinery should be regularly undertaken to avoid breakdown.
- (c) Raw materials, tools and instructions should reach the worker well in time so that no time is wasted in waiting for them.
- (d) Supervision should be tightened.

Overtime

Overtime occurs when a worker works beyond normal working hours. The normal working hours are laid down in the Factories Act. Accordingly, any worker working for more than 9 hours per day or more than 48 hours per week is entitled to overtime payment. The Factories Act also provides for payment of overtime wages at double the normal rates of wages. Overtime is defined '*as the time spent beyond normal working hours, which is usually paid at higher rate than the normal time rate.*' The extra amount beyond normal wages and salaries is called overtime premium. The overtime work is, therefore, a costly affair and should be avoided as far as possible due to the following disadvantages attached to it.

Disadvantages of Overtime

- (a) It leads to excessive labour cost.
- (b) During overtime hours, labour productivity is decreased because of diminishing labour efficiency.
- (c) It puts an extra strain on plant and machinery.
- (d) It has a bad effect on the health of workers.
- (e) Certain overheads, like lighting cost, increase because of work in the evening.
- (f) Workers may develop a tendency to work in overtime and take overtime wages as a part of their normal earnings.
- (g) If overtime work is not properly distributed among the workers, it may lead to discontent.

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Treatment of Overtime

Payment for overtime consists of two elements:

- (a) Normal amount of wages, salaries, etc.
- (b) Additional amount expended on overtime work, *i.e.*, overtime premium. This is over and above the normal amount of wages and salaries.

The normal amount of wages is charged to the cost unit or production order on which the worker is working. The difficulty lies in the treatment of overtime premium. This overtime premium is charged differently, under different circumstances, as follows:

1. **When overtime is job specific:** When overtime is spent on a specific job at the request of a customer due to urgency of work and the customer agrees to the entire charge of overtime premium, it should be charged to the job or work order concerned.
2. **When overtime is due to general pressure:** When a business receives more orders than it can cope with in the normal working hours and there is general pressure of work, it may be treated by one of the following two methods:
 - (i) Treat overtime premium as direct labour cost by inflating the wage rate and charging to different jobs at the inflated/average rate.
 - (ii) Alternatively, it may be treated as indirect wages and included in overheads.
3. **When overtime is due to abnormal reasons:** Overtime arising due to abnormal factors, like accident, power failure, fire and machine breakdown, or due to factors like defective planning or faulty management, it should not be included in the cost of products and it should be charged to costing Profit and Loss Account.

Control of Overtime

In order to keep the overtime premium to the minimum, proper control must be exercised on it. The following steps should be taken for this purpose:

- (a) All overtime work should be duly authorized by the Works Manager.
- (b) Overtime cost should be separately recorded for each department for proper planning in future.
- (c) Total overtime premium should be regularly reported to the Works Manager.
- (d) When overtime becomes a permanent feature, say, due to shortage of plant capacity, steps may be taken to install additional plant and machinery or introduce an additional shift to cope with additional work.

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Check Your Progress

5. How is payment for abnormal idle time dealt with?
6. What are the two elements of payment for overtime?

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5.5 WAGE RATES FOR COSTING AND SYSTEMS OF WAGE PAYMENT

The cost accounting department collects and analyses all costs relating to labour. For this purpose, it makes use of clock cards, job cards, daily or weekly time sheets, payroll sheets, etc.

The cost accounting department is also responsible for presenting clear and well-designed reports on labour. Each report should furnish information in the most practical manner. Such reports relate to normal and abnormal idle time, overtime, department labour costs, variances from budgeted labour costs, etc. Special reports may be prepared to inform the management of the effectiveness of labour policies and steps that need to be taken for proper control of labour costs.

Wages Analysis Sheet or Wages Abstract

The analysis of labour cost is made on a document known as Wages Analysis Sheet or Wages Abstract. The purpose of this is similar to that of Material Analysis Sheet.

Total labour cost is usually analysed into direct and indirect. In the wages analysis sheet, amount appearing against job number constitutes direct labour cost of jobs. The indirect labour cost has been given separately. The total of the direct and indirect labour cost is reconciled with the total wages as per the wages sheet of the period.

Labour remuneration

The term 'remuneration' is used to cover the total monetary earnings of employees. It includes wages according to time or piece basis and other financial incentives.

The efficiency in production can be increased by using improved equipment, by more effective utilization of plant and by adoption of better methods of production, but the most important contribution must come from labour. Accordingly, the methods of remuneration of labour should be so designed as to encourage workers to do their best. Methods of remuneration which allow high wages to be paid have the effect of increasing labour cost but may also result in

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increased production and productivity, thereby reducing the labour cost per unit. On the other hand, low wages generally result in high labour cost per unit due to lower productivity, high rate of labour turnover, etc.

Requisites of a Satisfactory System of Labour Remuneration

Before deciding on a particular system of labour remuneration, the following factors should be taken into account:

1. The system should be such as will produce the best quality and quantity of work.
2. It should be satisfactory from the point of view of both employer and employee and reward should be related to effort.
3. The scheme should be clearly defined and intelligible to workers. The workers should be able to calculate wages on their own. If the workers do not understand the system, they may view it with suspicion.
4. It should guarantee a minimum living wage to each worker, irrespective of his efficiency.
5. No maximum limit should be placed on the amount of individual earnings.
6. The earnings of the workers should not be affected by matters beyond their control. They should not, for example, be penalized for production losses due to power failure, machine breakdown, etc., for which they are not responsible.
7. It should reduce labour turnover and labour absenteeism.
8. The system should be flexible so that changes may be introduced as and when necessary.
9. The system should be capable of operation without excessive clerical work. Those methods should be avoided which demand much detailed recording of time, quantity of output, etc.
10. If possible, the system adopted should be one which is in vogue in that particular industry or in that particular locality.

Systems of Wage Payment

There are two basic methods of labour remuneration:

- (a) Time Rate System
- (b) Piece Rate System

In addition, there are a number of incentive plans to induce workers to work hard so as to produce more and earn more.

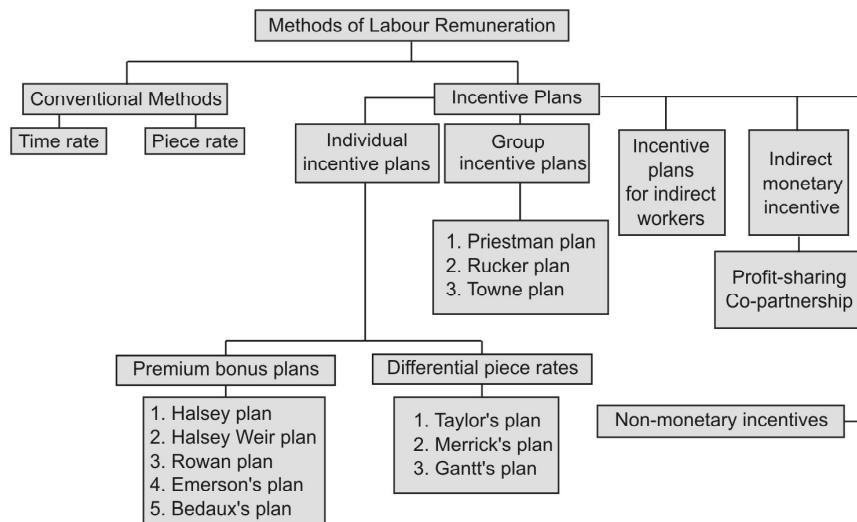


Fig. 5.1 Methods of Labour Remuneration

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5.5.1 Time Rate and Piece Rate System

You will first study the concepts of time rate and piece rate systems.

Time Rate System

Under time rate system, workers are paid according to the time for which they work. Payment may be on hourly basis, daily basis or monthly basis. In this system, no consideration is given to the quantity and quality of work done. When payment is made on hourly basis, total wages payable are calculated as follows:

$$\text{Wages} = \text{No. of hours worked} \times \text{Rate per hour}$$

For example, if a worker is paid at the rate of ₹25 per hour, his wages for a day of 8 hours will be: 8 hours $\times$ ₹25 = ₹200.

Though this is the oldest system of wage payment, it is still commonly used these days.

Suitability: Time wage system is suitable for the following type of situations:

- (i) Where quality of work is more important than quantity, *e.g.*, high class tailoring.
- (ii) Where output cannot be measured in quantitative terms, *e.g.*, in the case of indirect workers, like watchman, cleaners and sweepers
- (iii) Where output is beyond the control of the worker, *e.g.*, in process industries the flow of work is regulated by the speed of conveyor belt or where the work of a worker is dependent on the work of other workers.
- (iv) Where work is being done on a small scale so that close supervision is possible.
- (v) Where the worker is a learner or an apprentice.

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Advantages: The main advantages of time rate system are:

1. **Simplicity:** The system is simple and calculation of wages is easily understood by the workers.
2. **Security to workers:** Workers are assured of a certain amount of wages payable even if there is stoppage of work due to power failure, machine breakdown, etc. This gives a sense of security to workers.
3. **Quality of work:** As this method does not give weight to the quantity of work done, workers can concentrate on the quality of goods produced. Thus, the quality of work under this method is better.
4. **Accepted by trade unions:** Trade unions mostly favour this method because it treats all workers alike and no distinction is made between efficient and inefficient workers.
5. **Economical:** Under this method, no detailed records are required to be maintained regarding the work done by workers. This results in saving of clerical costs. Moreover, workers avoid over-speeding and cause less damage to plant and machinery and also materials. This also results in economy.

Disadvantages: The main disadvantages are:

1. **No incentive:** It offers no positive inducement to workers to improve performance as it does not distinguish between efficient and inefficient workers.
2. **Low quantity:** When workers are paid on time basis, they tend to be slow in work. This results in lower production quantity.
3. **Extra supervision costs:** Under this method, extra supervision is needed so that workers do not waste time. Appointment of additional supervisors increases cost.
4. **Costing difficulties:** From costing point of view, it creates difficulties in the calculation of labour cost per unit because the output is constantly, fluctuating.
5. **Idle time:** Workers waste a lot of time, resulting in increase in idle time.

Piece Rate System

Wages under this system are paid according to the quantity of work done. A rate is fixed per unit of production and wages are calculated by the following formula:

$$\text{Wages} = \text{Rate per unit} \times \text{No. of units produced}$$

For instance, if rate per unit is ₹17 and during a day a worker has completed 10 units, then his wages will be ₹17 × 10 units = ₹170.

This method does not give any consideration to the time taken by the worker in completing the work. Only quantity of work is taken into account for calculating wages.

Suitability of piece rate system: Conditions under which piece rates may be usefully employed are:

- (a) Where production is standardized and repetitive in nature
- (b) When the aim is continuous maximum production
- (c) Where the output of workers can be measured
- (d) Where workers continue at the same job for long periods
- (e) Where the standard time required to complete a job can be measured accurately

Advantages: Piece rate system has the following advantages:

1. **Incentive to efficient workers:** As remuneration is in proportion to the worker's effort, the method provides a strong incentive to work more.
2. **Increase in production:** Each worker tries his best to produce more to earn higher wages. This results in increase in production.
3. **Lower cost:** On account of increase in production, fixed cost per unit is reduced resulting in higher profit.
4. **Equitable:** This system is more equitable than time rate system because wages are paid according to the efficiency of each worker.
5. **Decrease in the need for supervision:** Strict supervision is not necessary because the workers are themselves interested in maximizing their earnings through the maximization of output.
6. **Simplifies costing:** As wages are paid at a rate per unit, this method simplifies cost ascertainment because labour cost per unit is known in advance.
7. **Simple and easy:** This method is simple and is easily understood by the workers.

Disadvantages: Piece rate system suffers from the following limitations:

1. **Poor quality of work:** This method lays too much emphasis on quantity of production and ignores quality of work. In order to maximize their wages, workers may try to produce more and more without caring for the quality of production.
2. **No security of wages:** This system does not guarantee a minimum wage to a worker. If a worker is not able to complete his day's work, for any reason, he is paid less wages. Thus, earnings of workers are uncertain.
3. **Misuse of materials and equipment:** In the greed to produce more, workers may cause wastage of materials and damage to plant and machinery.
4. **Injurious to health of workers:** In an effort to earn more wages, workers try to work excessively and with speed. This proves injurious to the health of workers.

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5. **Opposed by trade unions:** Piece rate system is generally opposed by trade unions because it creates inequality in the wages of workers. Slow and inefficient workers feel jealous of the higher wages of their fellow workers.
6. **Difficulties in fixing piece rate:** Fixing equitable piece rate is quite a difficult task and may require considerable amount of work in the form of time studies.
7. **Unsuitable in certain cases:** This method does not suit where work is of artistic and refined natures.

5.5.2 Incentive Plans

Both time rate system and piece rate system, discussed above, have their merits and demerits. Incentive plans attempt to combine the good points of both the systems.

The primary purpose of an incentive plan is to induce a worker to produce more to earn a higher wage. Naturally, producing more in the same period of time should result in higher pay for the worker. Because of greater number of units produced, it should also result in a lower cost per unit for fixed factory cost and also for labour cost.

Principles of a Good Incentive Scheme

A good incentive scheme should have the following features:

1. The scheme should be simple and easily understandable by workers so that a worker should be able to calculate his own wage easily.
2. The scheme should be fair to both employer and employee. It should link reward with effort.
3. The cost of operating the scheme should be reasonably low.
4. The standard of performance should be scientifically set and should be within the reasonable reach of an average worker.
5. No upper limit should be put on the earnings of workers.
6. The scheme should have the approval of workers and the union.
7. No worker should suffer a deduction of earnings for factors beyond his control such as machine breakdown, power failure, etc.
8. The scheme should provide a satisfactory system of supervision and production control.
9. The scheme should be conducive to the setting up of standard costs and budgetary control.
10. Standards once set should not be changed unless there is a change in the method of production or other factors.
11. The scheme must be relatively permanent and should not be frequently changed.

12. Indirect workers should also be included under the incentive scheme.
13. Workers should be properly educated about the scheme and motivated to attain high standards.

Labour Cost Control

(a) Individual Incentive Plans

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1. Halsey Premium Plan

This plan was introduced by F A Halsey in 1891. It is a simple combination of time and piece rate systems. The main *features* of this plan are as follows:

- (a) Workers are paid at a rate per hour for the actual time taken by them.
- (b) A standard time is set for each piece of work, job or operation.
- (c) If a worker takes standard time or more than the standard time to complete his work, he is paid wages for the actual time taken by him at the time rate. In other words, time wages are guaranteed.
- (d) If a worker takes less than the standard time, he is paid a bonus equal to 50% of the time saved at the time rate fixed. Thus, under this system, total earnings of a worker are equal to wages for the actual time taken by him plus a bonus.

The formula for calculating bonus and total earnings is as follows:

$$\text{Bonus} = 50\% \text{ of } [\text{Time saved} \times \text{Time rate}]$$

$$\text{Total earnings} = \text{Time rate} \times \text{Time taken} + 50\% \text{ of } [\text{Time saved} \times \text{Time rate}]$$

Example:

Standard time (or Allowed time)	= 50 hours
Wage rate per hour	= ₹3
Actual time taken	= 42 hours
Thus, time saved = 50 hrs – 42 hrs	= 8 hours
Earnings = ₹3 × 42 hrs + 50% of (8 hrs × ₹3)	
	= ₹126 + 12 = ₹138

2. Halsey Weir Plan

This method is precisely the same as Halsey Plan except that in Halsey Weir Plan the bonus is equal to 30% of the time saved.

3. Rowan Plan

This plan is also similar to Halsey Plan except in the calculation of bonus. The main features of Rowan Plan are as follows:

- (a) Wages are paid on time basis for the actual time worked by the workers.
- (b) A standard time is determined for each piece of work or job.
- (c) If a worker completes his work in standard time or in more than the standard time, he is paid wages for the time actually taken by him.

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(d) If a worker completes his work in less than the standard time, he is entitled to a bonus.

(e) Bonus is that proportion of wages of actual time taken which the time saved bears to the standard time. Its formula is:

$$\text{Bonus} = \frac{\text{Time saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Time rate}$$

$$\text{Earnings} = (\text{Time taken} \times \text{Time rate}) + \text{Bonus}$$

Example:

Standard time = 50 hours

Wage rate per hour = ₹3

Actual time taken = 42 hours

Calculate earnings and bonus under Rowan Plan.

Time Saved = 50 hrs – 42 hrs = 8 hours

$$\text{Bonus} = \frac{8 \text{ hrs}}{50 \text{ hrs}} \times 42 \text{ hours} \times ₹3 = ₹20.16$$

$$\begin{aligned} \text{Earnings} &= (\text{Time taken} \times \text{Time rate}) + \text{Bonus} \\ &= (42 \text{ hrs} \times ₹3) + ₹20.16 \\ &= ₹146.16 \end{aligned}$$

4. Taylor's Differential Piece Rate System

This system was introduced by F W Taylor, the father of scientific management. The main *features* of this incentive plan are as follows:

- (a) Day wages are not guaranteed, *i.e.*, it does not assure any minimum amount of wages to workers.
- (b) A standard time for each job is set very carefully after time and motion studies.
- (c) Two piece rates are set for each job—the lower rate and the higher rate. The lower piece rate is payable where a worker takes a longer time than the standard time to complete the work. Higher rate is payable when a worker completes the work within the standard time. In other words, lower piece rate is payable to inefficient workers and higher piece rate is payable to efficient workers. Usually, these rates are 83 per cent of the piece work rate for inefficient workers and 175 per cent of the piece work rate for efficient workers.

Example:

Standard production = 8 units per hour

Working hours per day = 8 hours

Lower rate	= ₹5 per unit
Higher rate	= ₹8.75 per unit
Worker X produces	= 7 units
Worker Y produces	= 9 units

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Wages of worker X and Y under Taylor's plan will be as follows:

Worker X – He has produced 7 units which is below standard. He will, therefore, be paid at the lower rate of ₹5 per unit. His wages will be 7 units @ ₹5 = ₹35.

Worker Y – He has produced 9 units which is above standard. He will, therefore, be paid at the higher rate. His wages will be 9 units @ ₹8.75 = ₹78.75.

It will be seen that there is a great difference between the wages of an efficient and an inefficient worker.

5. Merrick's Differential Piece Rate System (Multiple Piece Rate System)

This is a modification of Taylor's plan. While Taylor prescribed two rates, Merrick's plan lays down three rates. The lowest rate is for the beginners, the middle rate is for the developing workers and the highest rate is for the highly efficient workers. Efficiency of the workers is determined in terms of percentages. Thus, the rates of remuneration are:

Level of efficiency	Piece rate
Upto 83%	Ordinary piece rate
83% to 100%	110% of ordinary piece rate
Above 100%	120% of ordinary piece rate

Like Taylor's plan, this method also does not guarantee minimum wages. The general criticism levelled against Taylor's plan also applies to it except that it lessens the punitive character of Taylor's plan.

6. Gantt's Task and Bonus Plan

The main *features* of this plan are as follows:

- (a) Day wages on time basis are guaranteed to all workers.
- (b) This plan is a combination of time rate, differential piece rate and bonus.
- (c) A standard is set and remuneration is calculated as follows:
 - (i) When output is below standard—payment at time rate.
 - (ii) When output is at standard—payment at time rate plus 20% bonus.
 - (iii) When output is above standard—payment at high piece rate.

Example: Calculate the earnings of X, Y and Z when their output, in a day of 8 hours, is X–75 units, Y–80 units and Z–85 units respectively. Guaranteed time rate is ₹20 per hour and standard output is 10 units per hour. High piece rate is fixed at ₹3.50.

NOTES**Solution:**

Standard output in 8 hours = $10 \times 8 = 80$ units

Earnings of X: His output is below standard and thus he will be paid at time rate.

$$\begin{aligned}\therefore X's \text{ earnings} &= 8 \text{ hours} \times ₹20 \\ &= ₹160\end{aligned}$$

Earnings of Y: His output is at standard and thus he is entitled to a bonus of 20% on time rate. His rate per hour is $₹20 + 20\% = ₹24$

$$\begin{aligned}\therefore Y's \text{ earnings} &= 8 \text{ hours} \times ₹24 \\ &= ₹192\end{aligned}$$

Earnings of Z: His output is above standard and thus he will be paid at the high piece rate.

$$\begin{aligned}\therefore Z's \text{ earnings} &= 85 \text{ units} \times ₹3.50 \\ &= ₹297.50\end{aligned}$$

The advantage of Gantt's Task and Bonus Plan is that it provides security for the less efficient and a high incentive for a more efficient worker. Calculation of wages under this plan is also simple to understand.

7. Emerson's Efficiency Plan

This scheme is designed to give encouragement to the slow workers to perform better than before. Time wages are guaranteed. The standard output in this plan is fixed to represent 100% efficiency. A bonus is paid to a worker whose efficiency exceeds 66%. As efficiency increases, the bonus also increases gradually in steps, at a stated rate, so that at 100% efficiency, bonus would rise to 20% of wages. Beyond 100% the bonus increases at 1% of the basic rate for each 1per cent increase in efficiency. It can thus, be shown as below in a tabular form:

Efficiency	Bonus
(a) Below $66\frac{2}{3}\%$	No bonus (Only time wages)
(b) $66\frac{2}{3}\%$ to 100%	Bonus increases in steps and rises to 20% at 100% efficiency
(c) Over 100%	20% bonus plus 1% bonus for each increase of 1% in efficiency

Example:

Standard output in 8 hours = 60 units

Actual output in 8 hours = 72 units

Time rate = ₹2 per hour

Calculate the earnings under Emerson's plan.

$$\text{Efficiency in \%} = \frac{72}{60} \times 100 = 120\%$$

$$\begin{aligned}\text{Bonus \%} &= 20\% + 20\% \\ &= 40\%\end{aligned}$$

$$\text{Time wages} = 8 \text{ hours @ ₹2} = ₹16.00$$

$$\text{Add: Bonus 40\% of ₹16} = ₹6.40$$

$$\text{Total earnings} \quad \underline{\quad ₹22.40 \quad}$$

In this example, if the actual output of worker is upto 40 units, *i.e.*, $66\frac{2}{3}$ efficiency, he will not get any bonus and his wages will be simply time wages, *i.e.*, $8 \text{ hours} \times ₹2 = ₹16$. The worker will start earning bonus if his output in 8 hours is above 40 units. If he produces 60 units, *i.e.*, when his efficiency is 100%, his total earnings will be:

$$\begin{aligned}\text{Total earnings} &= \text{Time wages} + \text{Bonus} \\ &= (8 \text{ hrs} \times ₹2) + 20\% = 16 + 3.20 = ₹19.20\end{aligned}$$

8. Bedaux Plan

In this plan, standard time of each job is determined in minutes known as Bedaux points or *B*'s. One *B* unit represents the amount of work which an average worker can do under ordinary conditions in one minute. The standard time is determined by work study and each job is assigned a number of *B*'s.

Under this system, the worker receives his daily or hourly rate plus 75 per cent of the points saved, multiplied by one sixtieth of his hourly rate. The remaining balance of 25 per cent is paid to supervisors and indirect workers.

Thus:

$$\text{Bonus} = \frac{\text{No. of } B\text{'s saved} \times \text{hourly rate}}{60} \times \frac{75}{100}$$

$$\text{Earnings} = (\text{Hours worked} \times \text{Hourly rate}) + \text{Bonus}$$

Example:

Standard time for job = 600 *B*'s

Hourly rate ₹2, Time taken 8 hours, *i.e.*, 480 minutes

Points or *B*'s saved = $600 - 480 = 120$

$$\text{Bonus} = \frac{120 \times 2}{60} \times \frac{75}{100} = ₹3$$

$$\text{Earnings} = (8 \text{ hours} \times ₹2) + ₹3 \text{ bonus} = ₹19$$

If the worker takes 12 hours to complete the job, *i.e.* more than the standard time, he will be paid for the actual time taken, *i.e.* $12 \text{ hrs} \times ₹2 = ₹24$.

Time wages are thus guaranteed to those who are not able to save any points. It may be noted that the Bedaux Plan is not different from the Halsey Plan

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except that bonus is 75 per cent of the time saved instead of 50 per cent. The system is particularly suitable where output can be measured with greater accuracy and conditions are standardized. To make the system a success, very accurate time study is required for each operation to set standard time in terms of standard minutes.

(b) Group Bonus Plans

In the schemes discussed so far, the bonus to be paid has been calculated on the basis of individual worker's performance. But there are certain jobs or operations which are required to be done collectively, by a group of workers. In continuous production, for example, work flows in a sequence or in assembly work for televisions, radios, scooters, etc., a team of workers is engaged on various operations. As such, it becomes necessary to introduce bonus schemes for collective efficiency of the group as a whole. The intention is to create a collective interest in the work. The total bonus determined is distributed among the members of the group on an equitable basis. The following bases of distribution are commonly used:

- (a) Equal distribution, if skill and grade of workers in the group is uniform
- (b) On the basis of time wages of each worker
- (c) In proportion to the time rate of each worker, where each worker has devoted equal time
- (d) In a fixed ratio determined in advance on the basis of merit rating

Suitability: Group bonus schemes may be usefully employed in the following circumstances:

- (a) Where it is not possible to measure the performance of each individual worker
- (b) Where the workers constituting a group possess the same or equal skill and efficiency
- (c) Where the number of workers constituting a group is not very large
- (d) Where production is dependent on the collective effort of a group of workers as a whole

Types of Group Incentive Plans**1. Priestman Plan**

This plan was first used by M/s Priestman Bros Ltd of Hull in 1917. According to this plan, a standard is set for the output to be achieved weekly by a factory as a whole. This standard may be in terms of units or points (Bedaux Plan). The actual output of the factory is compared with the standard and if actual exceeds standard, the employees are paid a bonus in proportion to the increase.

2. Towne Plan

This plan was introduced in 1886 by Towne in the United States of America. Under this plan, actual labour cost is compared with the predetermined standard set for labour cost. If the labour cost is less than the standard so set, 50% of the saving so effected is distributed as bonus to individual workers *prorata* with the wages earned. The supervisory staff also gets a part of this bonus and thus encouragement is provided to reduce cost.

3. Rucker Plan (Share of Production Plan)

Under this plan, labour receives a constant proportion of the 'added value'. The term '*added value*' is defined by CIMA as 'the change in market value resulting from an alteration in the form, location or availability of a product or service, excluding the cost of bought-out materials or services.' Value added is not the same thing as conversion cost as it also includes profit. In this plan, ratio of wages to added value is determined and if the ratio of wages reduces because of increase in added value, bonus payment is made to bring the reduced wage ratio in level with the predetermined ratio.

(c) Incentive plans for indirect workers

As it is difficult to measure the output of indirect workers, they are generally excluded from the incentive plans. But indirect workers are as essential for production as direct workers and as such, full increase in production cannot be obtained without the cooperation of indirect workers. Therefore, incentive plans may be introduced for indirect workers either to increase the efficiency of the services they provide to direct workers or to induce foremen and supervisors to increase departmental efficiency and thus, reduce costs. Also payment of bonus to indirect workers, when it is also being paid to direct workers, will prevent labour unrest.

Bases of Payment of Bonus to Indirect Workers

The indirect workers may be paid a bonus on any one of the following bases:

1. Where indirect workers serve a group of direct workers, they may be paid a bonus on the basis of performance of the group of direct workers whom they serve, *e.g.*, maintenance workers attached to a particular department.
2. When indirect workers provide general services, *e.g.*, sweeping and storekeeping, bonus may be paid on the basis of the output of the whole factory.
3. On the basis of job evaluation and merit rating of indirect workers.
4. On some arbitrary basis, like enhanced day rate so as to include an element of bonus in the rate itself.

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NOTES**(d) Co-partnership and Profit sharing**

Co-partnership or co-ownership is a scheme whereby employees are given an opportunity to share in the capital of the business and to receive a part of the profit that accrues to their share of ownership. Some companies provide loans to employees to buy shares, while others reserve a specified number of shares for allotment to employees.

Under the profit-sharing schemes, the workers are paid in addition to wages, a predetermined share of the profits of the undertaking. In India, workers' share is governed by the Payment of Bonus Act, 1965.

A co-partnership scheme may be arranged in conjunction with a profit sharing scheme, whereby the bonus to workers is to be retained as an investment in the company. This investment may be in the form of special shares, not carrying voting rights but entitled to a fixed dividend or it may be in the form of a loan carrying higher rate of interest.

Both co-partnership and profit-sharing schemes enable the workers to share in the prosperity of the business as a whole and give them a tangible interest in its future.

(e) Non-monetary incentives

Workers are sometimes provided with certain incentives, not in the form of higher wages but in terms of favourable conditions of employment. Such incentives are given in the form of better amenities or facilities. Range of such incentives is extremely wide. Some such benefits are completely free, while in certain benefits there may be a partial contribution by employees.

Non-monetary incentives help in attracting better workers, reduce labour turnover and absenteeism, promote better industrial relations, encourage loyalty and keep the workers happy and satisfied.

Examples of non-monetary incentives are free medical facilities, free education to the workers' children, housing facilities, transport facilities, subsidized meals in canteens, superannuation and pension schemes, sports and recreation facilities, etc.

Check Your Progress

7. State two advantages of piece rate system.
8. Name the incentive plan in which three rates are prescribed.

5.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

Labour Cost Control

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1. The three methods of calculating rate are:
 - Separation method
 - Replacement method
 - Flux method
2. The avoidable causes of labour turnover are:
 - Low wages and allowances
 - Unhappy relations with co-workers and supervisors
 - Unsatisfactory working conditions
 - Trade union rivalry
 - Lack of medical facilities, transport facilities, etc
 - Inadequate job security and retirement benefits
3. The main function of the time-keeping department is to accurately record each worker's time of arrival and departure in the factory and also the time spent on different jobs or processes.
4. The main drawback of the daily time sheet is that it needs a lot of paperwork as considerable amount of time will be taken in preparing time sheets and in consolidating these records for purposes of ascertaining labour cost.
5. The payment for abnormal idle time is not included in cost and is transferred to Costing Profit and Loss Account.
6. Payment for overtime consists of two elements:
 - (a) Normal amount of wages, salaries, etc.
 - (b) Additional amount expended on overtime work, i.e., overtime premium
7. Two advantages of piece rate system are:
 - **Incentive to efficient workers:** As remuneration is in proportion to the worker's effort, the method provides a strong incentive to work more.
 - **Increase in production:** Each worker tries his best to produce more to earn higher wages. This results in increase in production.
8. It is Merrick's Differential Piece Rate System, in which three rates are prescribed. The lowest rate is for the beginners, the middle rate is for the developing workers and the highest rate is for the highly efficient workers.

5.7 SUMMARY

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- In all business organizations, it is a common feature that some workers leave the employment and new workers join in place of those leaving; this change in workforce is known as labour turnover.
- Total number of workers joining, including replacements, is called accession; the labour turnover rate in such a case may be calculated in respect of workers joining (accession) the organization during the period which includes all workers joining due to replacements and also due to expansion.
- Labour turnover reports should be prepared regularly to be placed before the management, giving a breakdown of the causes as to why the workers left.
- The cost of labour turnover may be broadly classified into two broad categories—(i) Preventive costs, and (ii) Replacement costs.
- The preventive cost of labour turnover should be apportioned to various departments on the basis of number of workers in each department.
- Work measurement is a technique of establishing normal or standard times after standardization of methods and establishment of a measure for the work contents of jobs or operations.
- Job analysis is the process of determining the tasks which comprise the job and the skills, knowledge, abilities and responsibilities required of the worker for its successful performance.
- The time-keeping department is an important part of a firm's system of accounting and control of labour cost; the main function is to accurately record each worker's time of arrival and departure in the factory and also the time spent on different jobs or processes.
- There are mainly three methods for recording attendance of workers: (i) attendance register, (ii) token or disc method, and (iii) time recording clocks.
- The appointment of casual workers is a very common source of fraud in the payment of wages; it is, therefore, very important to have a proper control over their appointments, their time of work and payment of their wages.
- Idle time due to productive causes is usually controllable by proper planning, strict supervision and proper maintenance of plant and machinery.
- According to the Factories Act, any worker working for more than 9 hours per day or more than 48 hours per week is entitled to overtime payment; the Act also provides for payment of overtime wages at double the normal rates of wages.

- The cost of paid leave cannot be charged to any work order or cost unit since no work is done during this period. It is, therefore, treated as indirect labour cost and charged to overheads.
- The analysis of labour cost is made on a document known as Wages Analysis Sheet or Wages Abstract.
- Methods of remuneration which allow high wages to be paid have the effect of increasing labour cost but may also result in increased production and productivity, thereby reducing the labour cost per unit.
- Under time rate system, workers are paid according to the time for which they work; and payment may be on hourly basis, daily basis or monthly basis.
- Under Halsey Plan and Rowan Plan, earnings per hour of workers keep on increasing.
- To make the Bedaux plan system a success, very accurate time study is required for each operation to set standard time in terms of standard minutes.
- In Rucker plan, ratio of wages to added value is determined and if the ratio of wages reduces because of increase in added value, bonus payment is made to bring the reduced wage ratio in level with the pre-determined ratio.
- A co-partnership scheme may be arranged in conjunction with a profit sharing scheme, whereby the bonus to workers is to be retained as an investment in the company; the investment may be in the form of special shares not carrying voting rights but entitled to a fixed dividend or in the form of a loan carrying higher rate of interest.
- Non-monetary incentives help in attracting better workers, reduce labour turnover and absenteeism, promote better industrial relations, encourage loyalty and keep the workers happy and satisfied.
- The three methods of recording attendance of workers include - attendance register, token or disc method and time recording clocks.

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5.8 KEY WORDS

- **Flux Method:** This shows the total change in the composition of labour force due to separations and replacement of workers.
- **Idle Time:** It represents time lost by workers who are paid on time basis.
- **Preventive Costs:** These costs are incurred to keep the workforce satisfied and to prevent or discourage them from leaving the organization.

5.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

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Short Answer Questions

1. How is labour turnover measured?
2. What are the causes of labour turnover?
3. Distinguish between time keeping and time booking.
4. What is the treatment of overtime?

Long Answer Questions

1. Discuss labour turnover due to new recruitment.
2. Describe the effect, costs, reduction and control of labour turnover.
3. From the following information, calculate the labour turnover rate and labour flux rate:
 - Number of workers at the beginning of the year 3,800
 - Number of workers at the end of the year 4,200

During the year, 40 workers leave while 160 workers are discharged. 600 workers are recruited during the year. Of these, 150 workers are recruited because of leavers and the rest are engaged in accordance with an expansion scheme.
4. Discuss, in detail, the methods of time-booking.
5. Distinguish between time wage system and piece wage system. State their relative merits and demerits.
6. Examine the concept and treatment of idle time. Explain the following methods of wage payment:
 - Taylor's Different Piece Rate System
 - Rowan Scheme
 - Emerson's Efficiency Plan
7. Explain the methods and records of time keeping. What are the functions of time keeping records?

5.10 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
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UNIT 6 OVERHEAD COST CONTROL

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Structure

- 6.0 Introduction
- 6.1 Objectives
- 6.2 Classification of Overheads
- 6.3 Allocation, Apportionment and Methods
- 6.4 Absorption of Overheads and Its Methods
 - 6.4.1 Types of Overhead Rates
- 6.5 Administration, Selling and Distribution Overheads
- 6.6 Under-Absorption and Over-Absorption of Overheads
- 6.7 Answers to Check Your Progress Questions
- 6.8 Summary
- 6.9 Key Words
- 6.10 Self Assessment Questions and Exercises
- 6.11 Further Readings

6.0 INTRODUCTION

Total cost may be classified into direct cost and indirect cost. The total of all direct costs (*i.e.*, direct material cost, direct labour cost and direct expenses) is known as *Prime cost* and the total of all indirect costs (*i.e.*, indirect material cost, indirect labour cost and indirect expenses) is termed as *Overhead cost*. Various other names of overheads are: (a) oncost; (b) supplementary cost; (c) burden; (d) non-productive cost, etc.

Thus, overhead cost is the total of all indirect expenditure. It comprises those costs which the cost accountant is either unable or unwilling to allocate to particular cost units.

Accounting and control of overhead costs is more complex than that of other elements of cost, *i.e.*, direct materials and direct labour. This is because overheads by definition, are indirect costs which cannot be conveniently allocated to cost units. Hence, there arises the knotty problem of apportioning these indirect costs to cost centres and cost units.

In this unit, you will learn about the classification of overheads alongwith methods of allocation, apportionment and absorption.

6.1 OBJECTIVES

After going through this unit, you will be able to:

- Analyse the classification of overhead costs according to functions, elements and behaviour variability

- Discuss the inclusions of primary and secondary distribution
- Describe the process of the absorption of overheads
- Explain the methods of overhead absorption
- Differentiate between over and under absorption

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6.2 CLASSIFICATION OF OVERHEADS

Overhead costs may be classified according to:

1. Functions
2. Elements
3. Behaviour

1. Classification according to Functions

The main groups of overheads on the basis of this classification are as follows:

- (a) Production overheads:** Also termed as factory overheads, works overheads or manufacturing overheads, they are indirect expenditures incurred in connection with production operations. They are the aggregate of factory indirect material cost, indirect wages and indirect expenses. Unlike direct materials and direct labour, production overheads are an invisible part of the finished product. Examples of these overheads are: lubricants, consumable stores, indirect wages, factory power and light, depreciation of plant and machinery, depreciation of factory building, insurance of plant and factory building, storekeeping expenses, repairs and maintenance.
- (b) Administration overheads:** These overheads are of general nature and consist of all costs incurred in the direction, control and administration (including secretarial, accounting and financial control) of an undertaking, which are not related directly to production or selling and distribution function. Examples are: general management salaries, audit fees, legal charges, postage and telephone, stationery and printing, office rent and rates, office lighting and salaries of office staff. These overheads are also known as office overheads or general overheads.
- (c) Selling and distribution overheads:** *Selling overheads* are the cost of seeking to create and stimulate demand or of securing orders. Examples: advertising, salaries and commission of sales personnel, showroom expenses, travelling expenses, bad debts, catalogues and price lists.

Distribution overheads comprise all expenditures incurred from the time product is completed in the factory till it reaches its destination or customer. It includes packing cost, carriage outward, delivery van expenses, warehousing costs, etc.

Selling overheads and distribution overheads are both related to sales function and thus are combined into one category of selling and distribution overheads.

These are often referred to as '*after production costs*' because these costs are incurred after production work is over.

2. Element-wise Classification

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Under this method, the classification is done according to the nature and sources of the expenditure. This method follows logically from the definition of overhead costs. On this basis, expenses are classified under three main groups given below:

- (a) **Indirect materials:** They are material costs, which cannot be allocated but which are to be apportioned to or absorbed by cost centres or cost units. Examples are stationery, coal, lubricants and tools for general use.
- (b) **Indirect wages:** Indirect wages are those which cannot be allocated but which are to be apportioned to or absorbed by cost centres or cost units. Examples are wages of sweeper, idle time wages, maintenance and repair wages, foreman's pay and chowkidar's pay.
- (c) **Indirect expenses:** Expenses which cannot be allocated but which are to be apportioned to or absorbed by cost centres or cost units are indirect expenses. For example, power, depreciation, insurance, taxes and rates and rent.

3. Classification according to Behaviour or Variability

Different overhead costs behave in different ways when volume of production changes. On the basis of behaviour, overheads may be classified into: (a) Fixed overheads; (b) Variable overheads; and (c) Semi-fixed or semi-variable overheads.

Fixed overheads: These overheads remain unaffected or fixed in total amount by fluctuations in volume of output. Examples are rent and rates, managerial salaries, building depreciation, postage, stationery and legal expenses.

Variable overheads: This is the cost which, in aggregate, tends to vary in direct proportion to changes in the volume of output. Variable overheads per unit remain fixed. Examples are indirect materials, indirect labour, salesmen's commission, power, light, fuel, etc.

Semi-variable overheads: These overheads are partly fixed and partly variable. In other words, semi-variable overhead costs vary in part with the volume of production and in part they are constant, whenever there is a change in volume of production. Examples are supervisory salaries, depreciation, repairs and maintenance, etc.

Importance of Classifying Costs into Fixed and Variable

The fixed-variable cost classification is of great importance in planning, decision making and control as discussed below:

1. **Preparation of budgets:** This classification helps in the preparation of budgets. For instance, when flexible budgets are prepared for different levels

of activity, the fixed cost remains constant at all levels of activity, whereas variable cost varies according to the actual level of output.

2. **Decision making:** As most problems of decision making relate to changes in volume, this classification acquires a special importance in managerial decision making. This is so because fixed and variable costs behave in different ways when volume of output changes.
3. **Control of costs:** From control point of view, cost may be controllable or uncontrollable. The fixed costs are mostly uncontrollable and if any control can be exercised, it can be done by the top management. Variable costs, on the other hand, are mostly controllable. For example, rent of building (fixed) is not easily controllable but cost of materials (variable) may be controlled by purchasing in economical lots, seasonal purchasing, etc. Classifying costs into fixed and variable, therefore, helps in the effective control of costs by pointing out where management should concentrate to control costs.
4. **Marginal costing and break-even analysis:** This technique is totally dependent on segregation of cost into fixed and variable.
5. **Absorption of overheads:** By classifying costs into fixed and variable, separate rates of absorption of overheads may be used for fixed and variable overheads. The under/over-absorption arising out of two types of overheads are different in nature and need different managerial action. For example, under-absorption of fixed overheads means the existence of surplus or idle capacity so suitable steps may be taken to effectively utilize idle capacity.
6. **Other uses:** In addition to points stated above, fixed-variable cost classification is useful in many other areas. For example, while planning capital expenditure, effect of the proposed project on total fixed and variable costs should be studied. Moreover, differential and comparative cost analysis are based on this classification.

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Segregation of Semi-variable Costs

The main purpose of classifying overhead costs into fixed and variable is to help the management in decision making and control of expenditure. As such, the semi-variable costs may present some problems and thus the cost accountant must split them into fixed and variable components. In other words, the extent to which an item of semi-fixed or semi-variable cost is fixed or variable has to be determined. The following methods are used for this purpose:

1. High and Low Points Method

Under this method, semi-variable costs at various level of output are considered. The difference between the highest and the lowest volume of output and the difference between the corresponding costs are worked out. Then the variable element per unit of output is calculated by applying the following formula:

$$\text{Variable element per unit} = \frac{\text{Difference in semi-variable costs (₹)}}{\text{Difference in output (units)}}$$

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2. Method of Averages

Under this method, data given is divided into two parts. Then average of output and cost is separately computed for these two parts. Variable element in the cost is then calculated by the following method:

$$\text{Variable element per unit} = \frac{\text{Difference in the average costs}}{\text{Difference in average output}}$$

3. Scatter Diagram Method

This is a graphic method. Under this method, the semi-variable costs incurred at levels of output are plotted on a graph, the X -axis of which represents the volume of production and Y -axis, the amount of expenditure. After plotting the points on the graph, a straight line is drawn in such a way as to represent an average of all those points. This is known as the *line of best fit* or *line of regression*. The point where this *line of best fit* intersects the X -axis, marks the fixed cost. A line from this point is drawn which is parallel to X -axis. This is fixed cost line. The difference between semi-variable cost line and fixed cost line represents variable component.

4. Simultaneous Equations Method

In this method, overhead costs are segregated by means of an equation. This equation for a straight line is:

$$Y = mX + c$$

where

Y = Total semi-variable cost

X = Volume of output

c = Fixed cost

m = Slope of variable cost line, *i.e.*, variable cost per unit of output.

For the purpose of separating fixed and variable components of the cost, the overhead cost is determined at various levels of output and pairs of values of X and Y are fitted in the above formula in order to compute the values of m and c .

Standing Order Numbers (Codification of Overheads)

After overheads are classified, it is found useful to allot a number or symbol to each group of expenses so that each such group is easily distinguished from others. Such numbers or symbols are codes for overheads and are called *standing order numbers*. Each standing order number denotes a particular type of expenditure so that items of expenses of similar nature, as and when they are incurred, are appropriately classified into one of these. A schedule or manual is maintained enlisting all standing order numbers. There cannot be a standard list of standing order numbers as the number and type under which overheads may be sub-grouped vary with the: (a) size of the factory; (b) type of expenses; and (c) the extent of control necessary.

Utility

Use of code numbers is preferred to lengthy names of overhead items because of the following reasons:

1. It is convenient to write a code number in place of an overhead item.
2. Use of code numbers helps in maintaining secrecy because item name is not revealed at the time of posting and processing of cost data.
3. Clerical effort is reduced as length in description is minimized.
4. Coding is essential in mechanized accounting.

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Overheads Distribution

Direct costs are charged direct to the cost centres or cost units without difficulty. But this is not possible in overhead costs. Distribution of overhead costs to cost units is one of the most complex problems of cost accounting. This is because overhead costs cannot be identified with individual cost units and there are no accounting means of exact distribution. Therefore, such costs are analysed and distributed to various cost centres and cost units on arbitrary basis. For example, it is not possible to exactly calculate the amount of rent that should be charged to a particular cost unit and thus, it has to be distributed on some arbitrary basis. The cost accountant is constantly searching for equitable bases to distribute overhead costs to units and divisions of business enterprise and quite often he needs to exercise his own judgement in this regard. For instance, he may apportion rent to various departments of the factory on the basis of area occupied by each such department. Similarly, labour welfare expenses may be apportioned on the basis of number of workers in each department. The procedure of distribution of overhead costs is discussed below.

Steps in Overheads Distribution

Unlike direct materials and direct wages, overheads cannot be charged to cost units directly. The various steps taken for distribution of overhead costs are as follows:

1. Classification and collection of overheads
2. Allocation and apportionment of overheads to production departments and service departments
3. Re-apportionment of service department costs to production departments
4. Absorption of overheads of each production department in cost units

These steps are explained in detail in the following sections.

Collection of Overheads

The procedure of classification of production overheads and of assigning standing order (code) numbers has already been discussed. Such classification and codification is pre-requisite for the collection of overheads.

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Production overheads should be collected under standing order numbers. The main sources from which overhead costs are collected are as follows:

- (a) *Invoice*—for collection of indirect expenses, like rent, insurance, etc.
- (b) *Stores Requisitions*—for collection of indirect materials.
- (c) *Wages Analysis Sheet*—for collection of indirect wages.
- (d) *Journal entries*—for collection of those overhead items which do not result in current cash outlay and need some adjustment, *e.g.*, depreciation, charge in lieu of rent, outstanding rent, etc.

Check Your Progress

- | |
|--|
| <ol style="list-style-type: none"> 1. What is the other name for production overhead? 2. State the difference between fixed and variable overhead. |
|--|

6.3 ALLOCATION, APPORTIONMENT AND METHODS

After overhead costs have been collected under various standing order numbers, the next step is to allocate and apportion the overheads to production and service departments. Such allocation and apportionment is known as departmentalization or primary distribution of overheads.

Departmentalization of overheads is the process of allocation and apportionment of overheads to different departments or cost centres. For smooth and efficient working, a factory is sub-divided into a number of departments, each of which denotes a particular activity of the factory, *e.g.*, purchase department, stores department, time-keeping department, personnel department, crushing department and melting shop. These departments are mainly of two types:

- (a) Production departments; and
- (b) Service departments.

These are discussed in the later pages.

Objectives of Departmentalization

Departmentalization of overheads serves the following purposes:

1. Ensures greater accuracy in cost ascertainment
2. Control of overhead costs
3. Use of different methods of absorption
4. Valuation of work-in-progress
5. Cost of service of departments
6. Forecasting and estimating

Allocation

Certain items of overhead costs can be directly identified with a particular department or cost centre as having been incurred for that cost centre. Allotment of such costs to departments or cost centres is known as allocation. Thus, allocation may be defined as *‘the assignment of whole items of cost directly to a cost centre.’* In other words, allocation is charging to a cost centre those overheads that result solely from the existence of that cost centre. A point to be clearly understood is that allocation can be made only when exact amount of overheads incurred in a cost centre is definitely known. For example, rent cannot normally be allocated since rent is payable for the factory as a whole and exact amount of rent for each department cannot be known. Indirect materials, on the other hand, can be easily allocated to various departments in which they are incurred. Other items which are allocated include indirect wages, overtime and idle time cost, power (when sub-metres are installed in departments), depreciation of machinery, supervision, etc.

In brief, in order that an overheads can be allocated, they should meet both of the following conditions:

- (a) The cost centre must have caused the overhead cost to be incurred; and
- (b) The exact amount incurred in a cost centre must be known.

Apportionment

Certain overhead costs cannot be directly charged to a department or cost centre. Such costs are common to a number of cost centres or departments and do not originate from any specific department. Distribution of such overhead costs to various departments is known as apportionment. Thus, apportionment may be defined as *‘the distribution of overheads to more than one cost centre, on some equitable basis.’* In other words, it is charging a fair share of an overhead cost to a cost centre. Where an item of overhead cost is common to various cost centres, it is allotted to different cost centres proportionately. Again taking the cases of rent, as it cannot be allocated, it is apportioned to various departments on some equitable basis, *i.e.*, in the ratio of area occupied. Similarly salary of a general manager cannot be allocated wholly to any one department as he attends in general to all the departments. It should, therefore, be apportioned to the required departments on some equitable basis. Other items which generally cannot be allocated but are apportioned include fire insurance, lighting and heating, time keeping expenses, canteen expenses, medical and other welfare expenses, etc.

Distinction between Allocation and Apportionment

The distinction between allocation and apportionment is important to understand. As seen above, the purpose of both cost allocation and cost apportionment is the identification or allotment of items of cost to cost centres or cost units. However, the main difference between the two procedures is that while allocation deals with whole items of costs, apportionment deals with proportions of the items of cost.

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Allocation is a direct process but apportionment may be made only indirectly and for which suitable bases are to be selected. Whether an item of cost can be allocated or apportioned does not depend upon the nature of cost but upon its relation with the cost centres or cost units to which it is to be charged.

Overheads should always be allocated, as far as possible. If an overhead cost cannot be allocated, it is apportioned. This involves finding some basis of apportionment that will enable the overhead cost to be equitably distributed over various production and service departments.

Production and Service Departments

Departments are classified into production and service departments. A *production department* is one that is engaged in the actual manufacture of the product by changing the shape, form or nature of material worked upon or by assembling the parts into finished product. A *service department*, on the other hand, is one which is rendering a service to production departments. It contributes in an indirect manner to the manufacture of the product but it does not itself change the shape, form or nature of material that is converted into the finished product.

Principles of Apportionment

Apportionment of overheads to various production and service departments is based on the following principles:

1. **Service or use:** This is the most common principle of apportionment of overhead costs. It is based on the theory that greater the amount of service or benefit received by a department, the larger should be the share of the cost to be borne by that department. For example, rent is apportioned to various departments according to the floor space occupied; telephone cost according to the number of extension telephones in each department, and so on.
2. **Survey method:** This method is used for those overhead costs that are not directly related to departments and whose remoteness necessitates an arbitrary distribution. For example, salary of a general manager of a company may be apportioned on the basis of the results of a survey which may reveal that 30% of his salary should be apportioned to sales, 10% to administration and 60% to various producing departments. Similarly, lighting expenses may be apportioned on the basis of a survey of the number of light points, size, estimated hours of use, etc.
3. **Ability-to-pay method:** This is based on the theory of taxation which holds that those who have the largest income should bear the highest proportion of the tax burden. In overhead cost distribution, those departments which have the largest income may be charged with the largest amount of overheads. This method is generally considered inequitable because it penalizes the efficient and profitable departments to the advantage of inefficient ones.

Bases of Apportionment

Overhead Cost Control

The following are some of the common bases of apportionment of overheads:

Overhead Cost	Bases of Apportionment
1. (i) Rent and other building expenses (ii) Lighting and heating (iii) Fire precaution service (iv) Air-conditioning	Floor area, or volume of department
2. (i) Fringe benefits (ii) Labour welfare expenses (iii) Time keeping (iv) Personnel office (v) Supervision	Number of workers
3. (i) Compensation to workers (ii) Holiday pay (iii) ESI and PF contribution (iv) Fringe benefits	Direct wages
4. General overheads	Direct labour hours, or Direct wages, or Machine hours
5. (i) Depreciation of plant and machinery (ii) Repairs and maintenance of plant and machinery (iii) Insurance of stock	Capital values
6. (i) Power/steam consumption (ii) Internal transport (iii) Managerial salaries	Technical estimates
7. Lighting expenses	No. of light points, or Area
8. Electric power	Horse power of machines, or Number of machine hours, or Value of machines
9. (i) Material handling (ii) Stores overheads	Weight of materials, or Volume of materials, or Value of materials

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The choice of an appropriate basis is really a matter of judgement. For example, welfare expenses may be apportioned on the basis of number of employees or total wages. Similarly lighting expenses may be apportioned on the basis of number of light points in each department or on the basis of floor area.

For allocation and apportionment of overheads, a statement called of 'Overheads Distribution Summary' is prepared as shown in Illustration 6.1.

Illustration 6.1: Mosich Co. Ltd, has three production departments *A*, *B* and *C* and two service departments *D* and *E*. The following figures are extracted from the records of the company:

	₹		₹
Rent and rates	5,000	General lighting	600
Indirect wages	1,500	Power	1,500
Depreciation of machinery	10,000	Sundry expenses	10,000

The following further details are available:

	<i>Total</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
Floor space (Sq. ft)	20,000	4,000	5,000	6,000	4,000	1,000
Light points	120	20	30	40	20	10
Direct wages (₹)	10,000	3,000	2,000	3,000	1,500	500
H.P. of machines	150	60	30	50	10	—
Value of machinery (₹)	2,50,000	60,000	80,000	1,00,000	5,000	5,000

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Apportion the costs to various departments on the most equitable basis and prepare Overhead Distribution Summary.

Solution:

Overheads Distribution Summary

<i>Item</i>	<i>Basis of apportionment</i>	<i>Total</i>	<i>Producing Deptts</i>			<i>Service Deptts</i>	
			<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
			₹	₹	₹	₹	₹
Direct wages	Actual	2,000	—	—	—	1,500	500
Rent and rates	Floor space	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	1,500	450	300	450	225	75
Power	H.P. of machines	1,500	600	300	500	100	—
Depreciation of machinery	Value of machines	10,000	2,400	3,200	4,000	200	200
Sundry expenses	Direct wages	10,000	3,000	2,000	3,000	1,500	500
Total		30,600	7,550	7,200	9,650	4,625	1,575

Note: It should be noted that direct wages have been charged only for service departments because for service departments, all costs are indirect.

Re-apportionment of Service Department Costs (Secondary Distribution)

Once the overheads have been allocated and apportioned to production and service departments and totalled, the next step is to re-apportion the service department costs to production departments. This is necessary because our ultimate objective is to charge overheads to cost units, and no cost units are produced in service departments. Therefore, the costs of service departments must be charged to production departments which directly come in contact with cost units. This is called secondary distribution.

The method of re-apportionment of service department costs is similar to apportionment of overheads discussed earlier.

Thus, the costs of service departments are apportioned on the basis of service rendered, *i.e.*, the benefits received by the beneficiary departments.

Apportionment to Production Departments Only

Overhead Cost Control

In this case, cost of each service department is apportioned only to production departments without apportioning it to other service departments.

Apportionment to Production as well as Service Departments

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Quite often, a service department renders services not only to production department but also to other service departments. For example, maintenance department looks after not only the plant and machinery of production department but also the equipment of other service departments like power house, material handling, etc. Similarly, power house supplies electricity not only to production departments but also to service departments like canteen, maintenance departments, etc.

This type of inter-service department apportionment may be either on reciprocal basis or non-reciprocal basis.

Apportionment on non-reciprocal basis (Stepladder Method): This method is used when a service department renders services to other service departments but does not receive services of the other service departments, *i.e.*, when service departments are not inter-dependent. In this method, the service departments are arranged in descending order of their serviceability. The cost of the most serviceable department, *i.e.*, the department which serves the largest number of departments is first apportioned to other service departments. The service department which serves the next largest number of departments is taken up next and its cost (including the prorated cost of the first service department) is apportioned to other service and production departments excepting the first service department. In the same way, while apportioning the cost of the third service department in this order, the first two service departments are ignored. This process is continued till the cost of the last service department is apportioned. It should be noted that the cost of the last service department is apportioned only to production departments.

Apportionment on reciprocal basis: This method is used when service departments are mutually dependent. This means a service department not only provides its services to other service departments but also receives services of other service departments. For example, boiler house and pump room are the two service departments. Boiler house has to depend upon pump room for supply of water and pump room has to depend upon the boiler house for supply of steam power for driving the pump. Thus, both boiler house and pump room depend upon each other for their services.

The following methods may be used for apportionment of overhead costs on a reciprocal basis:

1. Simultaneous Equations Method
2. Repeated Distribution Method
3. Trial and Error Method

1. **Simultaneous Equations Method:** In this method, the following algebraic equations help in finding out cost of service departments.

$$X = a + bY$$

$$Y = a + bX$$

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2. **Repeated Distribution Method:** In this method the following steps are taken to apportion the service departments costs:

1. The costs of the first service department are apportioned in the normal way according to the given percentages. This will close the account of the first servicedepartment.
2. Then apply the given percentages for the apportionment of second service department costs which include their own cost plus amount apportioned from the first service department. This closes the account of the second service department but reopens the account of the first service department.
3. The same procedure should be followed in the case of all other service departments. This completes the first cycle of apportionment.
4. The procedure should be repeated again starting with the first service department whose total now consists only of amounts apportioned from other service departments. In this way, service department costs keep on reducing with each cycle of distribution because each time, a substantial amount is charged to the production departments.
5. This process is continued until the amounts involved become insignificant.

It should be noted that unlike Simultaneous Equations Method, this method produces approximate results. But the advantage of this method is that it can be conveniently applied where the number of service departments is more than two.

3. **Trial and Error Method:** In this method the cost of first service department is apportioned to other service departments only in the given percentage. The cost of the second service department then is apportioned to the first and other service departments. In this way, when the cost of all service departments has been apportioned, the process is repeated till the service department costs are reduced to negligible amounts. In this way, the total cost of each service department is found out by trial and error.

It will be seen that this is a modification of repeated distribution method where production departments are initially ignored for the purpose of redistribution. Like Repeated Distribution Method, this method may also give approximate results.

It is important to note that all the three methods produce the same result.

Illustration 6.2: A company has three production departments and two service departments. Distribution summary of overheads is as follows:

*Production Departments**A* ₹3,000*B* ₹2,000*C* ₹1,000*Service Departments*

1 ₹234

2 ₹300

*Overhead Cost Control***NOTES**

The expenses of service departments are charged on a percentage basis which is as follows:

	<i>A</i>	<i>B</i>	<i>C</i>	<i>1</i>	<i>2</i>
1.	20%	40%	30%	—	10%
2.	40%	20%	20%	20%	—

Find out the total overheads of production departments using the following methods:

(a) Simultaneous Equations Method (b) Repeated Distribution Method

Solution:**(a) Simultaneous Equations Method**

Let x denote total overheads of service department 1

y denote total overheads of service department 2

Therefore, $x = 234 + 0.2y$... (i)

$y = 300 + 0.1x$... (ii)

To solve the equations, re-arrange these and multiply by 10 to eliminate decimals.

$10x - 2y = 2,340$... (i)

$-x + 10y = 3,000$... (ii)

Multiplying second equation by 10 and adding

$10x - 2y = 2,340$

$-10x + 100y = 30,000$

$98y = 32,340$

$y = 32,340 \div 98$

$y = 330$; and $x = 300$

Secondary Distribution Summary

	<i>Total</i>	<i>Production Departments</i>		
		<i>A</i>	<i>B</i>	<i>C</i>
	₹	₹	₹	₹
Total as per primary summary	6,000	3,000	2,000	1,000
Service Deptt 1 (90% of 300)	270	60	120	90
Service Deptt 2 (80% of 330)	264	132	66	66
Total	6,534	3,192	2,186	1,156

(b) Repeated Distribution Method**NOTES**

Items	Production Deptts			Service Deptts	
	A ₹	B ₹	C ₹	X ₹	Y ₹
Total as per primary summary	3,000	2,000	1,000	234	300
Service Deptt 1	47	94	70	(-) 234	23
Deptt 2	129	65	65	64	(-) 323
Deptt 1	14	25	19	(-) 64	6
Deptt 2	2	2	2	—	—
Total	3,192	2,186	1,156	—	—

Check Your Progress

3. State the difference between allocation and apportionment.
4. What is trial and error method?

6.4 ABSORPTION OF OVERHEADS AND ITS METHODS

Once departmentalization of overheads has been completed, the total cost of each production department comprises the following:

- (i) Costs allocated and apportioned to production departments.
- (ii) Costs of service departments re-apportioned to production departments.

The total overhead cost pertaining to a production department or cost centre is then charged to or absorbed in the cost of the products or cost units passing through that centre. This is known as absorption.

The absorption of overheads is the last step in the distribution plan of overheads. It is defined as *charging of overheads to cost units*. In other words, overhead absorption is the apportionment of overheads of the cost centres over cost units. Absorption of overheads is also known as *levy*, *recovery* or *application* of overheads.

There are two steps in the absorption of overheads:

1. Computation of overheads absorption rate; and
2. Application of these rates to cost units.

1. Computation of Overheads Absorption Rate: Absorption rates are computed for the purpose of absorption of overheads in costs of the cost units. There are mainly six methods for determining absorption rates which have been described later in this unit. In all these methods, the overhead rate is computed by dividing the total amount of overheads of department or cost centre by the number of units in the base, such as number of cost units, machine hours, labour hours, direct labour cost, price cost, etc. This is shown as follows:

$$\text{Overheads absorption rate} = \frac{\text{Total overheads of cost centre}}{\text{Total units in base}}$$

It should be noted that only one rate is computed for any single group of overheads.

2. Application of rates to cost units: In order to arrive at the overhead cost of each cost unit, the overhead rate is multiplied by the number of units of base in the cost unit. Thus:

$$\text{Overhead absorbed} = \text{No. of units of base in the cost unit} \times \text{Overhead rate}$$

For example, machine hour rate is ₹25 and a cost unit has used 12 hours of the machine, overheads absorbed will be = 12 hours × ₹25 = ₹300.

Methods of Absorption of Production Overheads

Various methods of absorption discussed below are used to determine the overheads absorption rate for production overheads.

1. Direct Materials Cost Percentage Rate: Under this method, the amount of overheads to be absorbed by a cost unit is determined by the cost of direct materials consumed in producing it. This rate is computed by dividing the total overheads by the total cost of direct materials consumed in the department. Thus,

$$\text{Overhead rate} = \frac{\text{Production overheads}}{\text{Direct materials}} \times 100$$

Example: Production overheads ₹40,000
Direct materials ₹200,000

$$\text{Overhead rate} = \frac{40,000}{200,000} \times 100 = 20\%$$

Thus, if the direct material cost of a job or cost unit is ₹1,200, the overheads to be absorbed by it will be ₹240, i.e., 20% of ₹1,200.

2. Direct Labour Cost Percentage Rate: The overhead rate under this method is computed by dividing the production overheads by the direct labour cost.

$$\text{Overhead rate} = \frac{\text{Production overheads}}{\text{Direct labour cost}} \times 100$$

Example: Production overheads = ₹40,000
Direct labour cost = ₹1,00,000

$$\text{Overhead rate} = \frac{40,000}{1,00,000} \times 100 = 40\%$$

Thus a job for which direct wages are ₹200 will absorb production overheads of ₹80, i.e., 40% of ₹200.

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3. Prime Cost Percentage Rate: This method is based on the premise that both materials and labour give rise to factory overheads and thus the total of the two, *i.e.*, prime cost should be taken as the base for absorption of factory overheads. In a way, this is a combination of the material cost and labour cost methods.

Overhead rate in this method is calculated by dividing the production overheads by prime cost.

$$\text{Overhead rate} = \frac{\text{Production overheads}}{\text{Prime cost}} \times 100$$

Example: Production overheads = ₹40,000
 Prime cost = ₹2,50,000
 Overhead rate = $\frac{40,000}{2,50,000} \times 100 = 16\%$

Thus, if prime cost of a job is ₹500, production overheads to be absorbed by that job should be ₹80, *i.e.*, 16% of ₹500.

Although overheads are related more to labour cost than material costs, this method gives equal importance to both material and labour. When the cost of materials is predominating item of prime cost, the time factor will be ignored. This is shown below:

	<i>Job I</i>	<i>Job II</i>
	₹	₹
Direct materials	1,000	100
Direct labour @ ₹5 per hour	100	1,000
Prime cost	1,100	1,100
Production overhead (40% of prime cost)	440	440
Works cost	1,540	1,540

It is seen that although Job II takes much longer time than Job I, the charge to both the jobs for production overheads is the same. The above illustration also shows that this method is likely to degenerate into either material cost method or labour cost method. This is because in Job I direct material is the main constituent of prime cost and in Job II labour cost is the main constituent but the charge to both the jobs is the same.

4. Direct Labour Hour Rate: This is a rate per hour and not a percentage rate. It is obtained by dividing the total production overheads by the total number of direct labour hours for the period.

$$\text{Overhead rate} = \frac{\text{Production overheads}}{\text{Direct labour hours}}$$

Example: Production overheads = ₹40,000

Direct labour hours = 50,000 hours

$$\text{Overhead rate} = \frac{₹40,000}{50,000 \text{ hours}} = 80 \text{ paise per hour}$$

Thus, if a job takes 20 labour hours for production, ₹16 (*i.e.*, 20 hours @ 80 paise) will be charged to that job for production overhead.

Illustration 6.3: Aggarwal and Co. has three production departments—*A*, *B* and *C* and one service department *S*. The following particulars are available for one month of 25 working days of 8 hours each. All departments work all days with full attendance.

	Total <i>S</i>	Service deptt <i>A</i>	Production deptt <i>B</i>	Production deptt <i>C</i>	Production deptt
Power and lighting	₹1,100	240	200	300	360
Supervisor's salary	₹2,000	20%	30%	30%	20%
Rent	₹500				
Welfare	₹600				
Others	₹1,200	200	200	400	400
Number of workers		10	30	40	20
Floor area in sq. ft		500	600	800	600
Service rendered by service department to production departments		50%	30%	20%	

Calculate the 'Labour Hour Rate' of each of the departments *A*, *B* and *C*.

Solution:

Computation of Labour Hour Rate

	Service deptt <i>S</i> ₹	Production deptt <i>A</i> ₹	Production deptt <i>B</i> ₹	Production deptt <i>C</i> ₹
Power and lighting	240	200	300	360
Supervisor's salary	400	600	600	400
Rent (floor area)	100	120	160	120
Welfare (No. of workers)	60	180	240	120
Others	200	200	400	400
Total	1,000	1,300	1,700	1,400
Share of Service deptt	(-) 1000	500	300	200
(A) Total overheads		1,800	2,000	1,600
(B) Labour hours				
(No of days × Hrs × No. of workers)		6,000	8,000	4,000
Labour Hour Rate (A) ÷ (B)		₹0.30	₹0.25	₹0.40

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5. Machine Hour Rate: Machine hour rate is the overhead cost of running a machine for one hour. This rate is obtained by dividing the amount of factory overheads apportioned to a machine by the number of machine hours for the period under consideration.

$$\begin{array}{lcl} \text{Example: Production overheads of Machine I} & = & ₹25,000 \\ \text{No. of machine hours} & = & 2,000 \end{array}$$

$$\text{Machine hour rate} = \frac{\text{Production overheads}}{\text{No. of machine hours}} = \frac{25,000}{2,000} = ₹12.50$$

If Machine I has been used for a job for 30 hours, overheads to be absorbed by that job will amount to ₹375, *i.e.*, 30 hrs × ₹12.50.

Computation of Machine Hour Rate: The following steps are taken for the computation of machine hour rate:

- (i) The factory overheads are first apportioned to production departments as discussed earlier under allocation and apportionment.
- (ii) Overheads of the department are further apportioned to different machines or groups of machines. For this purpose each machine or a group of machines is treated as a cost centre or a small department. Bases of apportionment of different expenses are given here.
- (iii) Specific overheads, like power, depreciation, etc., should be directly allocated to the machine.
- (iv) The overheads relating to the machine should be divided between (a) Fixed or standard charges, and (b) Variable charges. Fixed charges are those which remain constant irrespective of the use of the machine, *e.g.*, rent, supervisor's salary, etc. Variable charges vary with the use of machines, *e.g.*, power, depreciation, etc.
- (v) The working hours of a machine are estimated for the period.
- (vi) Overheads pertaining to the machine are totalled and divided by the number of effective machine hours. The resultant figure will be machine hour rate. The time required for setting the machine (unless it is treated as producing time) should be deducted from the total working hours to arrive at effective hours.

Treatment of depreciation: Depreciation is a semi-variable item. In the computation of machine hour rate, some accountants treat it as a fixed cost while others treat it as a variable cost. In fact, whether it is to be treated as fixed or variable cost, depends upon the method of computing depreciation. In this unit, it has been mostly treated as a variable item.

Bases of Apportionment of Different Overheads to Machines

Overhead Cost Control

Items of overheads	Basis of apportionment
1. Rent and rates	Ratio of floor area occupied by each machine
2. Insurance	Insured value of each machine
3. Supervision	Estimated time devoted by the supervisor to each machine
4. Lighting	No. of light points used for each machine, or floor area occupied by each machine
5. Depreciation	Capital values/machine hours or multiple of both
6. Repairs and maintenance	Capital values/machine hours
7. Lubricating oil and other consumable stores	Capital values/machine hours

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Comprehensive (or composite) machine hour rate: When the direct wages of machine operators are included in machine hour rate, it is known as *comprehensive machine hour rate*. Thus in a comprehensive machine hour rate, overheads and direct wages are absorbed by a single rate.

Illustration 6.4: From the following information compute the machine hour rate in respect of machine No. 10 for the month of January:

Cost of machine ₹32,000

Estimated scrap value ₹2,000

Effective working life 10,000 hours

Repairs and maintenance over the life period of machine ₹2,500

Standing charges allocated to this machine for January, ₹400

Power consumed by the machine @ ₹0.30 per unit, ₹600

The machine consumes 10 units of power per hour.

Solution:

Computation of Machine Hour Rate

	₹ per hr
Standing charges (400 ÷ 200*)	2.00
Variable Charges:	
1. Repairs and Maintenance (₹2,500 ÷ 10,000 hrs)	0.25
2. Power (10 units @ 30 Paise)	3.00
3. Depreciation $\left(\frac{32,000 - 2,000}{10,000 \text{ hrs}} \right)$	3.00
Machine Hour Rate	8.25

***Working Notes:** No. of machine hours during the month of January is computed below:

No. of power units consumed in January = ₹600 ÷ ₹0.30 = 2,000 units

No. of machine hours = 2,000 units ÷ 10 units = 200 hours.

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6. Rate per Unit of Output: It is the simplest of all the methods. This rate is determined by dividing the total overheads of a department by the number of units produced.

Example: Production overheads = ₹22,000
No. of units produced = 1,000

$$\text{Overheads rate} = \frac{\text{Amount of overheads}}{\text{No. of units}} = \frac{22,000}{1,000} = ₹22 \text{ per unit}$$

Thus, each unit produced will absorb ₹22 for production overheads. Though this method has the advantage of simplicity, but unfortunately it can be advantageously used only when all the cost units produced are identical. Stated conversely, this method cannot be applied where a number of products of different sizes, grades, qualities, etc., are produced according to customer's specifications and which consume different amounts of time in production.

Illustration 6.5: Following particulars related to the production department of a factory for the month of June.

Material used	₹80,000
Direct wages	₹72,000
Direct labour hours worked	20,000
Hours of machine operation	25,000
Overhead charges allocated to the department	₹90,000

Cost data of a particular work order carried out in the above department during June are given below:

Material used	₹8,000
Direct wages	₹6,250
Labour hours booked	3,300
Machine hour booked	2,400

What would be the factory cost of the work order under the following methods of charging overheads.

- (i) Direct labour cost rate
- (ii) Machine hour rate
- (iii) Direct labour hour rate

Solution:

Computation of Factory Overheads Rates:

$$(i) \text{ Direct Labour Cost Rate: } \frac{\text{Overheads}}{\text{Direct wages}} \times 100 = \frac{90,000}{72,000} \times 100 = 125\%$$

$$(ii) \text{ Machine Hour Rate: } \frac{\text{Overheads}}{\text{No. of machine hours}} = \frac{\text{₹90,000}}{25,000 \text{ hrs}} = \text{₹3.60 per hour}$$

$$(iii) \text{ Direct Labour Hour Rate: } \frac{\text{Overheads}}{\text{No. of labour hours}} = \frac{\text{₹90,000}}{20,000 \text{ hrs}} = \text{₹4.50 per hour}$$

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Statement of Factory Cost

	Direct labour cost rate ₹	Machine hour rate ₹	Direct labour hour rate ₹
Direct material	8,000	8,000	8,000
Direct wages	6,250	6,250	6,250
Prime Cost	<u>14,250</u>	<u>14,250</u>	<u>14,250</u>
Factory overheads:			
(i) 125% of ₹6,250	7,812.50	—	—
(ii) @ ₹3.60 for 2,400 hrs	—	8,640	—
(iii) @ ₹4.50 for 3,300 hrs	—	—	14,850
Factory Cost	<u>22,062.50</u>	<u>22,890</u>	<u>29,100</u>

6.4.1 Types of Overhead Rates

Overhead rates may be: (i) actual or predetermined; and (ii) blanket or multiple. These are described below.

Actual and Predetermined Rates

Overheads absorption rate may be based on actual figures or estimated figures.

Actual Rate: It is calculated by dividing the actual overheads by actual base.

Thus:

$$\text{Actual overhead rate} = \frac{\text{Actual amount of overheads}}{\text{Actual base}}$$

On account of certain limitations of actual rate, it is not always desirable to use it for the absorption of overheads. These limitations are:

1. Actual rate cannot be computed until the end of the accounting period. This results in delay in computing cost.
2. When costs are used to calculate the selling prices for quotations and tenders, there is bound to be a considerable delay before the sales department can invoice customers due to delay in information from costing department.
3. Actual rate may vary from period to period due to fluctuations in the amount of overheads, the volume of output and efficiency of operations. This makes comparisons difficult.
4. These rates do not provide any basis for cost control.

Predetermined Rate: This rate is determined in advance of the period in which it is to be used. It is computed by dividing the estimated or budgeted amount of overheads by the budgeted base. Thus:

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$$\text{Predetermined rate} = \frac{\text{Budgeted amount of overheads}}{\text{Budgeted base}}$$

As compared to actual rate, a predetermined rate is of greater practical utility. This is because a predetermined rate enables prompt preparation of tenders and quotations and fixation of selling prices. Cost control is also facilitated by comparing the actual overheads with the predetermined overheads recovered. The use of predetermined rates thus, helps in deriving some of the benefits of standard costing and budgetary control.

Blanket and Multiple Rates

A *blanket overhead rate* is a single overhead rate for the entire factory. It is computed as follows.

$$\text{Blanket rate} = \frac{\text{Total overheads for the factory}}{\text{Total number of units of base for the factory}}$$

Blanket overhead rate should not be used except when output is uniform. Otherwise it will result in overcosting or undercosting of certain cost units. Moreover, when a blanket rate is used, performance of individual departments or cost centres cannot be properly assessed and exercise of control becomes difficult. Blanket rate is also known as *Plant-wide* or *Plant-wise* rate.

Multiple rates means a number of separate rates for each department, cost centre, etc. For instance, separate rates may be calculated for each of the following:

- (a) Production department
- (b) Service department
- (c) Cost centre
- (d) Product
- (e) Fixed overheads and variable overheads

The following formula is used to calculate the multiple rates:

$$\text{Overhead rate} = \frac{\text{Overheads of department or cost centre}}{\text{Corresponding base}}$$

Blanket rates have a very limited application and can be usefully employed in (i) small firms, or (ii) when one single product is produced, or (iii) when a firm is producing more than one product and all of these products pass through all the departments and the incidence of overheads is uniform. Except in these situations,

use of blanket overhead rate may result in distortion of cost. The main disadvantages of blanket rates are as follows:

1. The use of blanket rate gives misleading and erroneous results, particularly where a firm is producing several products and all of these products pass through a number of production departments or cost centres.
2. When a blanket rate is used, performance of individual departments or cost centres cannot be properly assessed and exercise of control becomes difficult.
3. The use of blanket rate may produce an erroneous work-in-progress valuation because products included in work-in-progress might not have passed through all the departments and if a blanket rate is charged for its valuation, the work-in-progress will be over-valued to the extent of facilities not used in it.

Multiple rates are of more practical utility and should always be preferred over blanket rate for the sake of accuracy and control.

Requisites of a Good Method of Absorption

A satisfactory method of absorption should have the following characteristics:

1. It should be simple and easy to operate.
2. It should give accurate results and provide an equitable basis for overheads absorption.
3. Time factor should be given due consideration.
4. The method should distinguish between work done by skilled and unskilled workers.
5. It should also make a distinction between work done by hand labour and machines.
6. It should be economical in application and should not require maintenance of unnecessary clerical records.
7. Multiple rates should be preferred to blanket rates.

Capacity Utilization and Overheads

Capacity of a factory refers to its ability to produce with the resources and facilities available at its disposal. If, for instance, with all the resources of men, materials and machines available at its command, a company can produce 500 units of a product per day, the capacity of the factory is said to be 500 units of production per day. Plant capacity may be expressed in terms of any of the following:

- (a) **Units of products:** For example tonnes of steel, meters of cable, number of cars or scooters, number of passenger kilometres, etc.

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- (b) **Production hours or machine hours:** For example, if in a factory there are 40 machines and each of these machines can be operated for 8 hours per day, the plant capacity in terms of production hours will be $40 \times 8 = 320$ production hours per day.

Capacity Levels

The various types of capacity levels are:

1. **Maximum Capacity:** This is the maximum production capability of a plant which can be achieved only under perfect conditions, *i.e.*, when there is no loss of operating time. As some loss of time is bound to occur, this capacity can never be achieved in practice and it is for this reason that it is known as a *theoretical* capacity.
2. **Practical Capacity:** Also known as operating capacity, this is the maximum capacity less output or time lost due to unavoidable factors like plant repairs and maintenance, setting up time, holidays, etc., and other normal losses.
3. **Capacity Based on Sales Expectancy:** This is a capacity which is based on expected sales and is determined after a careful study of the market conditions. A concern may not be able to sell the entire output which it is capable of producing. This capacity level is usually less than practical capacity because of lack of orders from the customers.
4. **Actual Capacity:** This is the capacity actually achieved during a particular period. This is known only after the period is over and may be below or above the capacity based on sales expectancy.
5. **Normal Capacity:** This is the long-term average of the capacity based on sales expectancy. In other words, the concept of normal capacity is based on the average utilization of plant capacity over a long period. An overhead rate based on normal capacity does not fluctuate much because the long-term average levels out highs and lows that occur in a business. Normal capacity is thus also known as average capacity.

Capacity Levels and Overhead Rates

The capacity level that is selected for calculating the fixed overhead rate may significantly affect the overhead absorption rate and thus affect the product cost and selling price.

It was stated earlier that overhead rates can be actual or predetermined. Determination of actual rates is based on the actual level of capacity and thus presents no difficulty. However, when predetermined rates are to be used, capacity level selected will affect the overhead rate. For example, annual fixed overheads are ₹10 lakh and annual capacity is 10,000 labour hours. The overhead rate for charging to the cost of products is ₹100 per hour (*i.e.*, ₹10 lakh ÷ 10,000 hours). Suppose there is a decline in the demand and actual work done is only 8,000

labour hours, the revised overhead rate will be ₹125 per hour (*i.e.*, ₹10 lakh ÷ 8,000 hrs). If the demand falls further to work only for 5,000 hours, the overhead rate will increase further to ₹200 per hour (*i.e.*, ₹10 lakh ÷ 5,000 hours). It is thus recommended that companies use normal capacity level to calculate overhead rate so that cost of products are not distorted by short-term changes in demand. Overhead rates based on normal capacity provide a better approximation of long-term average costs.

Illustration 6.6: A company has a maximum capacity of working 5,000 direct labour hours, at 100 per cent capacity. Practical capacity is 90 per cent and normal capacity 80 per cent. At 100 per cent capacity, overheads are budgeted as follows:

Fixed overheads	₹20,000
Variable overheads	₹10,000

Show the effect of various capacity levels on the overhead absorption rates.

Solution:

**Effect of Various Capacity Levels on Predetermined
Overheads Absorption Rates**

	<i>Maximum capacity</i>	<i>Practical capacity</i>	<i>Normal capacity</i>
Percentage of capacity utilization	100%	90%	80%
Direct labour hours	5,000	4,500	4,000
Budgeted factory overheads:	₹	₹	₹
Fixed	20,000	20,000	20,000
Variable	10,000	9,000	8,000
Total	30,000	29,000	28,000
	₹	₹	₹
Fixed overhead rate per direct labour hour (Fixed overheads ÷ Labour hrs)	4.00	4.44	5.00
Variable overhead rate per direct labour hour (Variable overheads ÷ Labour hours)	2.00	2.00	2.00
Total overhead rate per direct labour hour (Total overheads ÷ Labour hours)	6.00	6.44	7.00

In the above illustration, it should be noted that overhead rates are different at different capacity levels due to the influence of fixed overheads. When actual capacity utilization is lower, it results in under-absorption of overheads and *vice versa*; when actual capacity utilization is higher, there is over-absorption of overheads.

Idle Capacity

This is the difference between practical capacity and capacity based on sales expectancy or actual capacity. In other words, idle capacity is the production capacity lost due to reasons like lack of orders from customers, absenteeism, shortage of materials, etc. It is a temporary phenomenon and can be wiped out when difficulties causing idle capacity are overcome.

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Suppose maximum capacity of a plant = 500 units per day of 8 hrs each.
Normal loss of time is 10 per cent.

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$$\begin{aligned}\text{Practical capacity} &= \text{Maximum capacity} - \text{Normal loss of time} \\ &= 100\% - 10\% = 90\% \\ &= 500 \text{ units} - 50 \text{ units} \\ &= 450 \text{ units per day}\end{aligned}$$

Actual capacity is only 360 units per day or $90\% \times 360/450 = 72\%$

$$\begin{aligned}\text{Idle capacity} &= \text{Practical capacity} - \text{Actual capacity} \\ &= 90\% - 72\% = 18\% \\ &= 450 \text{ units} - 360 \text{ units} \\ &= 90 \text{ units per day}\end{aligned}$$

Idle Capacity and Idle Time

Idle time is the loss of labour time which arises due to waiting for materials, tools, job instructions or due to machine breakdown or power failure or due to changing from one job to another. This may be avoidable or unavoidable. Although no work is done during the period of idle time, wages are paid to the workers for this lost time.

Idle capacity, on the other hand, represents unused production potential and is the difference between practical capacity and actual capacity. Idle capacity is a wide term and the cost of idle time forms a part of the cost of idle capacity.

Cost of Idle Capacity

Idle capacity costs are represented mostly by fixed charges of owning and maintaining plant and machinery and of employee services which are not used at their maximum potential. This is so because fixed costs continue to be incurred even if the plant is kept idle.

The cost of idle capacity is clearly brought out if overheads absorption rate is calculated on practical capacity—as the base. It comes out in the form of under-absorption of overheads.

The cost of idle capacity and the reasons due to which capacity remains unutilized can be found out by computing overheads capacity variance and by preparing idle time reports, plant utilization reports and idle machine time reports. These reports are prepared periodically which clearly bring out the period for which plant remained unutilized and the cost of such capacity that is not utilized.

Illustration 6.7: Flakt India Ltd manufactures component part *XE* at the rate of 2 units per hour. The factory normally operates 6 days a week on a single eight-hour shift. During the year, it is closed for 20 working days for holidays. Normal loss of machine time for cleaning, oiling, etc., is 160 hours per year. Fixed overhead

cost per annum is ₹37,128. Normal sales for the component averages 2,500 units per year. The expected sales volume for the year 2010 was 2,400 units.

Overhead Cost Control

Compute the idle capacity cost when overhead rates are based on practical capacity.

Solution:

Maximum capacity

$$= \text{Total days in the year} \times \text{No. of hours worked per day} \\ = 365 \times 8 = 2,920 \text{ hours}$$

Practical capacity

$$= \text{Maximum capacity} - \text{Normal loss}$$

Maximum capacity		2,920 hrs
Less: Sundays (52 days × 8 hrs)	416	
Holidays (20 days × 8 hrs)	160	
Loss due to cleaning, oiling, etc.	160	736 hrs
	Practical capacity	2,184 hrs

$$\text{Normal capacity} = \text{Normal sales} \div \text{Units per hour} \\ = 2,500 \text{ units} \div 2 \text{ units per hour} = 1,250 \text{ hours}$$

$$\text{Capacity based on sales expectancy} = 2,400 \text{ units} \div 2 \text{ units per hour} \\ = 1,200 \text{ hours}$$

Absorption rate per hour, based on practical capacity (for fixed cost only)

$$= \frac{\text{Fixed overhead cost (₹)}}{\text{Practical capacity (hours)}} = \frac{₹37,128}{2,184 \text{ hours}} = ₹17$$

per hour

$$\text{Idle capacity} = \text{Practical capacity} - \text{Capacity based on sales expectancy} \\ = 2,184 - 1,200 = 984 \text{ hrs}$$

$$\text{Cost of idle capacity} = \text{Idle capacity} \times \text{Overhead rate} \\ = 984 \text{ hrs} \times ₹17 = ₹16,728$$

Note: Idle capacity has been taken as the difference between practical capacity and capacity based on sales expectancy. It may also be taken as the difference between practical capacity and actual capacity, if information in this respect is available.

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Check Your Progress

- What are the two steps involved in the absorption of overheads?
- What is machine hour rate?

6.5 ADMINISTRATION, SELLING AND DISTRIBUTION OVERHEADS

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Uptill now you have learnt about the treatment of production and service overheads, in this section, you will learn about administration, selling and distribution overheads.

Administration Overheads (Office Or General Overheads)

Office and administration overheads pertain to general management and administration of business. They may be defined as *the indirect expenditures incurred in formulating the policy, directing the organization and controlling the operations of an undertaking*. These overheads are of a general character and are incurred for the business as a whole. They have little or no direct connection with production or sales activities. As production and sales cannot function without some sort of administrative control, these overheads serve the purpose of such a control. Expenses of activities of board of directors, accounting, secretarial, audit, legal, financial, etc., are included in administrative overheads. These overheads are generally constant in nature and are not affected by any fluctuations in the volume of production or sales.

Accounting Treatment

Classification and collection of office and administrative overheads is done in the same way as that of production overheads. Separate standing order numbers are allotted to each item of such an overhead cost, such as legal charges, travelling expenses, office rent, audit fees, etc. These overhead costs are then allocated and apportioned to various administrative departments, like general office, law department, accounts department and secretarial department.

Absorption of Administration Overheads

Office and administrative overheads generally constitute a small portion of the total cost as compared to production overheads. For the purpose of absorption of these overheads, a single (blanket) overhead rate is computed by any one of the following methods:

1. **Percentage of works cost:** Administration overhead cost is generally absorbed as a percentage of works cost. Such a rate is computed by the following formula:

$$\text{Overhead rate} = \frac{\text{Admn. overheads}}{\text{works cost}} \times 100$$

For example, if administration overheads are ₹12,000 and works cost is ₹2,40,000, the overhead rate is computed as follows:

$$\text{Admn. overhead rate} = \frac{12,000}{2,40,000} = 5\%$$

2. **Percentage of sales:** Sometimes office and administration overheads are absorbed as a percentage of sales. Its formula is:

$$\text{Overhead rate} = \frac{\text{Administration overheads}}{\text{Sales}} \times 100$$

3. **As a percentage of conversion cost:** Conversion cost is the cost of converting raw material into finished goods. It includes cost of direct labour and factory overheads. This method is rarely used.

Overhead rate is calculated by the following formula:

$$\text{Overhead rate} = \frac{\text{Administration overheads}}{\text{Total conversion cost}} \times 100$$

Selling and Distribution Overheads

Selling and distribution costs are usually incurred after the production of products or services is completed, and therefore, such costs are sometimes known as ‘after-production costs.’

Selling cost is the cost of seeking to create and stimulate demand (sometimes termed marketing) and of securing orders. These costs are thus incurred for increasing sales to the existing and potential customers. Examples are advertisement, samples and free gifts, show-room expenses, etc.

Distribution cost is the cost of the sequence of operations which begins with making the packed product available for dispatch and ends with making the reconditioned returned empty packages, if any, available for re-use. Thus distribution costs are incurred in placing the articles in the possession of the customers. Examples are carriage outwards, insurance of goods-in-transit, maintenance of delivery vans and warehousing.

For costing purposes, selling costs and distribution costs are generally considered together, although in some cases these may be dealt with separately.

Difference between selling overheads and distribution overheads: Selling overheads and distribution overheads differ in their nature and purpose. Selling overheads are incurred for promoting sales and securing orders while distribution overheads are mainly incurred in moving the goods from the company’s godown to customers’ place. The object of selling overheads is to solicit orders and to make efforts to find and retain customers. The object of distribution overheads is the safe delivery of the goods to the customers.

Special Features of Selling and Distribution Overheads

Selling and distribution overhead costs have certain peculiar features which have a bearing on the accounting and control of these costs. These features are:

- (a) Unlike production costs, most of the selling and distribution costs cannot be identified with the units of products.

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- (b) Selling costs are incurred as a matter of policy of management.
- (c) Selling costs are not always related to the volume of sales.
- (d) The characteristics and attitude of the customers also affect selling costs.
- (e) The same product may be sold in near or distant market. This will affect cost of packing and transportation.
- (f) Selling costs vary widely depending upon the degree of competition.

Accounting Treatment

The accounting procedure of selling and distribution cost comprises:

1. Classification, collection and analysis of these expenses
2. Apportionment and allocation to cost centres
3. Absorption by products or product groups

These three stages are discussed below:

1. **Classification, collection and analysis:** This is the first step and is similar to classification and collection of production overheads. Selling and distribution overheads may be classified on the basis of products, sales territories, channels of distribution, salesmen, etc.

When classification of expenses is complete, expenses are collected under standing order numbers provided for this purpose.

2. **Apportionment and allocation to cost centres:** In this step, selling and distribution overheads are allocated or apportioned to various products, sales territories or other cost centres. Some of the common bases used for distribution of selling and distribution overheads are given below.

<i>Expenses</i>	<i>Basis for distribution</i>
1. Remuneration of salesmen	Direct allocation
2. Advertising	Direct allocation, or value of sales or space used
3. Catalogues	Direct allocation or space used
4. Showroom expenses	Direct allocation or space used
5. Packing	Direct allocation
6. Collection of overdue accounts	No. of orders or sales value
7. Insurance	Value of stocks
8. Transport—outside carrier	Direct allocation
9. Own transport	Direct allocation or weight of product carried
10. Warehousing	Cubic ft of product stores × time (days)

3. **Absorption of selling and distribution overheads:** Absorption of selling and distribution overheads means charging of these overheads to various products, jobs or orders.

Methods of Absorption

Various methods for absorption of selling and distribution overheads are as follows:

1. **A rate per unit of sales:** This method is employed when the company is selling one uniform type of product. The total selling and distribution overheads to be absorbed are divided by the number of units sold to arrive at a rate per unit.

For example, a company is manufacturing only one type of TV picture tube. During the month of May, its selling and distribution overheads amounted to ₹75,000 and during this period, the number of picture tubes sold is 1,000. The rate per unit for the absorption of selling and distribution overheads will be $₹75,000 \div 1000 = ₹75$.

2. **A percentage of selling price:** This method is recommended when the concern is selling more than one type of product. A percentage of selling and distribution overheads to selling price is ascertained from an analysis of past records. Overhead rate is calculated by the following formula:

$$\text{Overhead rate} = \frac{\text{Selling and distribution overheads}}{\text{Sales}} \times 100$$

Example: Selling and distribution overheads	₹5,000
Total sales	₹1,00,000

$$\text{Overhead rate} = \frac{5,000}{1,00,000} \times 100 = 5\% \text{ of selling price}$$

3. **A percentage of works cost:** In this method, a percentage of selling overheads to works cost is ascertained. This percentage rate is applied for the absorption of selling and distribution overheads.

Overhead rate is calculated as follows:

$$\text{Overhead rate} = \frac{\text{Selling and distribution overheads}}{\text{Total works cost}}$$

Example: Selling and distribution overheads	₹5,000
Works cost	₹40,000

$$\text{Overhead rate} = \frac{5,000}{40,000} \times 100 = 12.50\%$$

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6.6 UNDER-ABSORPTION AND OVER-ABSORPTION OF OVERHEADS

Overheads may be absorbed either on the basis of actual rates or predetermined rates. When actual rates are used, the overheads absorbed should be exactly equal to the overheads incurred. In such a case there is no problem of under- or

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over-absorption of overheads. But when a predetermined rate is employed, overheads absorbed may not be equal to the amount of actual overheads incurred. Thus, whenever the overheads absorbed are not equal to the amount of actual overheads, it is a case of either under-absorption or over-absorption of overheads.

Under-absorption: When the amount of overheads absorbed is less than the amount of overheads actually incurred, it is called under-absorption or under-recovery. This has the effect of under-stating the cost because the overheads incurred are not fully recovered in the cost of jobs, processes, etc.

Over-absorption: When the amount of overheads absorbed is more than the amount of actual overheads incurred, it is known as over-absorption or over-recovery. It has the effect of over-stating the cost of jobs, processes, etc.

Example: Predetermined overhead rate = ₹5 per machine hour

Actual machine hours = 1,500

Actual overheads = ₹9,000

Overheads absorbed = 1,500 hrs × ₹5 = ₹7,500

Under-absorption = ₹9,000 – ₹7,500 = ₹1,500

In this example, if the actual machine hours worked were 1,900, then:

Overheads absorbed = 1,900 hrs × ₹5 = ₹9,500

Overhead over-absorbed = ₹9,500 – ₹9,000 = ₹500

Causes of Under or Over-absorption

Under or over-absorption of overheads may arise due to one or more of the following reasons:

1. Faulty estimation of overhead costs
2. Faulty estimation of the quantity of output
3. Seasonal fluctuation in the amount of overheads in certain industries
4. Unforeseen changes in the production capacity
5. Unexpected changes in the method of production affecting changes in the amount of overheads

Whatever be the reason, under- or over-absorption is caused mainly due to wrong estimation either of the overhead costs or of the base such as machine hours, production quantity, etc.

Accounting Treatment of Under and Over-absorption

Under or over-absorbed amounts of overheads are disposed of in accordance with any of the following methods, depending upon the circumstances:

1. **Use of supplementary rates:** Where the amount of under or over-absorbed overheads is significant, a supplementary overhead absorption rate is calculated to adjust this amount in the cost. However, adjustment is made in the cost of:

(i) work-in-progress; (ii) finished stock; and (iii) cost of sales. In the case of under-absorption, the overhead cost is adjusted by a *plus rate* since the amount is to be added, whereas over-absorption is adjusted by a *minus rate* since the amount is to be deducted.

Illustration 6.8: A company absorbs overheads on predetermined rates. For the year ending 31 Dec. 2009, factory overheads absorbed were ₹3,66,250. Actual amount of overheads incurred totalled ₹4,26,890. The following figures are also derived from the trial balance.

Finished stock	₹2,30,732
Cost of goods sold	₹8,40,588
Work-in-progress	₹1,41,480

How would you dispose of under/over-absorbed overheads by use of supplementary rate method.

Solution:

$$\begin{aligned}\text{Under-absorbed overheads} &= \text{Actual overheads} - \text{Absorbed overheads} \\ &= ₹4,26,890 - 3,66,250 = \text{₹60,640} \\ \text{Total cost incurred} &= ₹230,732 + 840,588 + 1,41,480 \\ &= ₹12,12,800\end{aligned}$$

$$\text{Supplementary Rate} = \frac{\text{Unabsorbed amount}}{\text{Total cost}} \times \frac{60,640}{12,12,800}$$

As there is under-absorption of overheads, it is a plus rate, *i.e.*, the cost of finished goods, work-in-progress and cost of goods sold will be increased by 5% as shown below:

Finished goods	=	₹2,30,732 × 5%	=	₹11,536.60
Work-in-progress	=	₹1,41,480 × 5%	=	₹7,074.00
Cost of goods sold	=	₹8,40,588 × 5%	=	₹42,029.40
Total				<u>60,640.00</u>

2. Writing off to Costing Profit and Loss Account: This method is used when the under or over-absorbed amount is quite negligible and it is not worthwhile to absorb it by supplementary rate. Under-absorption due to abnormal factors, like idle capacity or defective planning, is also transferred to Costing Profit and Loss Account.

This method suffers from the shortcoming that stocks of work-in-progress and finished goods remain under or over-valued and are carried over to the next accounting period at such values.

3. Carry over to the next year: Under this method the under or over-absorbed amount is transferred to Overhead Reserve Account or Suspense Account for carrying over to the next accounting year. This procedure is open to criticism on

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the ground that it is not logical to carry over the overheads of one year to the subsequent years for absorption. But, this method can be usefully employed where normal business cycle extends over more than one year and overheads are determined on a long-term basis.

Illustration 6.9: During the year ending 31 March 2009, the factory overhead costs of three production departments of an organization are as under—

X	₹48,950
Y	₹89,200
Z	₹64,500

The basis of absorption of overheads is given below:

Department	X	₹5 per machine hour for 10,000 hours
	Y	75% of direct labour cost of ₹1,20,000
	Z	₹4 per piece for 15,000 pieces

Calculate the department-wise under or over-absorption of overheads and present the data in a tabular form.

Solution:

Amount of cost absorbed factory overheads is calculated as follows:

	₹
X @ ₹5 per machine hour for 10,000 hours	50,000
Y @ 75% of direct labour cost of ₹1,20,000	90,000
Z @ ₹4 per piece for 15,000 piece	60,000
Total overheads absorbed	2,00,000

Statement Showing Department-wise Under/Over-absorption

Department	Actual overheads ₹	Absorbed overheads ₹	Under absorption ₹	Over absorption ₹
X	48,950	50,000	—	1,050
Y	89,200	90,000	—	800
Z	64,500	60,000	4,500	—
Total	2,02,650	2,00,000	4,500	1,850

Net under-absorption (₹) = 4,500 – 1,850 = 2,650

or 2,02,650 – 2,00,000 = ₹2,650

Check Your Progress

- State the difference between selling and distribution cost.
- Under what circumstances can under and over absorption of overheads occur?

6.7 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

Overhead Cost Control

1. Production overhead is also known as factory overhead, works overhead or manufacturing overhead.
2. Fixed overheads remain unaffected or fixed in total amount by fluctuations in volume of output. Variable overhead is the cost which, in aggregate, tends to vary in direct proportion to changes in the volume of output. Variable overhead per unit remains fixed.
3. The purpose of both cost allocation and cost apportionment is the identification or allotment of items of cost to cost centres or cost units. However, the main difference between the two procedures is that while allocation deals with whole items of costs, apportionment deals with proportions of items of cost.
4. Under trial and error method, the cost of first service department is apportioned to other service departments only in the given percentage. The cost of the second service department then is apportioned to the first and other service departments.
5. There are two steps in the absorption of overheads: Computation of overhead absorption rate, and Application of these rates to cost units.
6. Machine hour rate is the overhead cost of running a machine for one hour. This rate is obtained by dividing the amount of factory overhead apportioned to a machine by the number of machine hours for the period under consideration.
7. Selling cost is 'the cost of seeking to create and stimulate demand (sometimes termed marketing) and of securing orders.' These costs are thus incurred for increasing sales to the existing and potential customers.' Distribution cost is 'the cost of the sequence of operations which begins with making the packed product available for dispatch and ends with making the re-conditioned returned empty packages, if any, available for re-use.'
8. Under- or over-absorption of overheads may arise due to one or more of the following reasons: Faulty estimation of overhead costs, Faulty estimation of the quantity of output, Seasonal fluctuation in the amount of overheads in certain industries, Unforeseen changes in the production capacity, and Unexpected changes in the method of production affecting changes in the amount of overheads.

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6.8 SUMMARY

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- Total cost may be classified into direct cost and indirect cost. The total of all direct costs is known as Prime cost and the total of all indirect costs is termed as Overhead cost.
- Classifications of overhead costs: functions, elements and behaviour.
- On the basis of functions, overheads may be classified into: (i) production overheads, (ii) administration overheads, and (iii) selling and distribution overheads.
- On the basis of behaviour, overheads may be classified into: (i) fixed overhead, (ii) variable overhead, and (iii) semi-fixed or semi-variable overhead.
- On the basis of behaviour, overheads may be classified into: (i) indirect materials, (ii) indirect wages and (iii) indirect expenses.
- After overhead costs have been collected under various standing order numbers, the next step is to allocate and apportion the overheads to production and service departments.
- ‘Allocation’ is a direct process, but ‘apportionment’ may be made only indirectly and for which suitable bases are to be selected.
- Apportionment on reciprocal basis method is used when service departments are mutually dependent.
- The absorption of overheads is the last step in the distribution plan of overheads.
- Overhead rates may be (i) actual or pre-determined; and (ii) blanket or multiple.
- Office and administration overheads pertain to general management and administration of business. They may be defined as the indirect expenditures incurred in formulating the policy, directing the organization and controlling the operations of an undertaking.
- Selling overheads are incurred for promoting sales and securing orders while distribution overheads are mainly incurred in moving the goods from the company’s godown to customers’ place.
- Whenever the overheads absorbed are not equal to the amount of actual overheads, it is a case of either under-absorption or over-absorption of overheads.

6.9 KEY WORDS

- **Allocation:** It is charging to a cost centre those overheads that result solely from the existence of that cost centre
- **Apportionment:** It is charging a fair share of an overhead to a cost centre
- **Distribution Overhead:** It comprises all expenditure incurred from the time the product is completed in the factory till it reaches its destination or customer; includes packing cost, carriage outward, delivery van expenses, warehousing costs, etc.
- **Idle Capacity:** This is the difference between practical capacity and capacity based on sales expectancy or actual capacity
- **Production Overhead:** It is the aggregate of factory indirect material cost, indirect wages and indirect expenses
- **Selling Overhead:** It is the cost of seeking to create and stimulate demand or of securing orders

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6.10 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What is the advantage of classifying overheads into fixed and variable items?
2. List the steps taken for distribution of overhead costs.
3. State the objectives of departmentalization.
4. What are the principles of apportionment?
5. State the steps involved in the computation of machine hour rate.
6. What are the special features of selling and distribution overhead?

Long Answer Questions

1. What are the different methods of classifying overheads? Indicate the advantages of classifying overheads on the basis of variability.
2. Explain with illustration the classification of 'fixed', 'semi-fixed' and 'variable' expenses.
3. What are the bases of apportionment of overhead expenses among departments? Name the overhead for which each basis will be suitable.
4. 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

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blanket rate based on the percentage of total factory overheads to total factory wages. The relevant data for a month are given as follows:

Departments	Direct	Direct	Factory	Direct	Machine
		Materials	Wages	Overheads	Labour
	₹	₹	Hours		Hours
Budget:					
Machining	6,50,000	80,000	3,60,000	20,000	80,000
Assembly	1,70,000	3,50,000	1,40,000	1,00,000	10,000
Packing	1,00,000	70,000	1,25,000	50,000	—
Actuals:					
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	—

The details of one of the representative jobs produced during the month are as under:

Job No. CW 7083

Department	Direct	Direct	Direct	Machine
	Materials	Wages	Labour	Hours
	₹	Hours		
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 overheads 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 No. CW 7083 based on the overhead application rates calculated in (ii) above.
- Calculate the department-wise and total under or over-recovery of overheads based on the company's current policy and the method(s) recommended by you.

[Ans. (i) 125%; Selling price ₹ 4,660.50;

(ii) Machining dept.— Machine hour rate ₹ 4.50, Assembly dept.—

Direct labour hour rate ₹ 1.40; Packing dept. Direct labour hour rate ₹ 2.50,

(iii) ₹ 4,989.40; (iv) Over/under (–) recovery; Current Method—Machining ₹ 2,70,000 (–); Assembly ₹ 2,53,500; Packing ₹ 22,500 (–) As per recommended method—Machining ₹ 42,000; Assembly ₹ 42,000; Packing ₹ 15,000]

6.11 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
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Overhead Cost Control

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UNIT 7 METHODS OF COSTING: JOB COSTING

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Structure

- 7.0 Introduction
- 7.1 Objectives
- 7.2 Job Costing
- 7.3 Contract Costing, Target Costing and Escalation Clause
 - 7.3.1 Distinction between Contract Costing and Job Costing
 - 7.3.2 Contract Costing, Target Costing and Escalation Clause
- 7.4 Answers to Check Your Progress Questions
- 7.5 Summary
- 7.6 Key Words
- 7.7 Self Assessment Questions and Exercises
- 7.8 Further Readings

7.0 INTRODUCTION

Determining the cost of production is different in varied industries. Some of the factors which affect the method of costing are the manufacturing process as well as the method that is utilized by the industry for measuring the finished product of the final output. You have already learnt in Unit 2 that methods of costing are mainly of two types: Specific order costing (job or terminal costing) and Operation costing (Process or period costing). In this unit, you will learn about the concept of specific order costing including a focus on job costing and a mention of contract costing. You will learn the other types of costing including unit costing, process costing, contract costing, operating costing, batch costing and standard costing in the subsequent units.

7.1 OBJECTIVES

After going through this unit, you will be able to:

- Describe the meaning and objective of job costing
- Explain the job costing procedure
- Discuss the features of contract costing

7.2 JOB COSTING

*Methods of Costing:
Job Costing*

All industries may be broadly classified into two categories:

1. Job order industries
2. Mass production industries

In job order industries, production work is done against orders from customers. Each job work needs special treatment and can be clearly distinguished from other jobs. Each job is completed as per customer's specifications. Examples of job order industries are printing press, construction of buildings, bridges, roads and ship building

In mass production, firms manufacture uniform types of products. Since production is of standard products, it is on a mass scale and on a continuous basis. No customer order or specifications are required for production. Examples of mass production industries are textiles, paper, sugar, chemicals and steel.

Job costing

Job costing or job order costing is a method of cost ascertainment used in job order industries. Special features of such industries are as follows:

- (a) Production is against customer's orders and not for stocks.
- (b) Each job has its own characteristics and requires special attention.
- (c) The flow of production from one department to another is not uniform. It is the nature of job which determines the department through which it is to be processed.

Objectives of Job Costing

The following are the main objectives of job costing:

1. Cost of each job/order is ascertained separately. This helps in finding out the profit or loss on each individual job.
2. It enables the management to know those jobs which are more profitable and those which are unprofitable.
3. It provides a basis for determining the cost of similar jobs undertaken in future. It thus helps in future production planning.
4. It helps the management in controlling costs by comparing the actual costs with the estimated costs.

7.3 CONTRACT COSTING, TARGET COSTING AND ESCALATION CLAUSE

The following steps are taken in job costing:

1. **Job number:** When an order has been accepted, an individual job number must be assigned to each job so that separate jobs are identifiable at all stages of

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production. Assignment of job numbers also facilitates reference for costing purposes in the ledger and is conveniently short for use on various forms and documents.

2. Production order: The production control department then makes out a Production Order, thereby authorizing to start work on the job. Several copies of the production order are prepared, the copies often being in different colours to distinguish between them more easily. These copies are passed on to the following:

- (i) All departmental foremen concerned with the job
- (ii) Storekeeper for issuance of materials
- (iii) Tool room for an advance notification of tools required

PRODUCTION ORDER			
Name of the Customer.....		Job No.	
Date of Commencement.....		Date.	
Date of Completion.....		Bill of Material No.	
Special Instructions.....		Drawing attached Yes/No.	
<i>Quantity</i>	<i>Description</i>	<i>Machines to be used</i>	<i>Tools required</i>
(Sign)..... Production authorized by: Head of Production Control Deptt			

Fig. 7.1 Production Order for Job

The columns provided in the production order differ widely, depending largely upon the nature of production. Sometimes orders are accompanied by the blue prints and contain a bill of materials and detailed instructions as to which tools and machinery are to be used.

3. Job cost sheet: The unique accounting document under job costing is the job cost sheet. Receipt of production order is the signal for the cost accountant to prepare a job cost sheet on which he will record the cost of materials used and the labour and machine time taken. Each concern has to design a job cost sheet to suit its needs. A simple pro forma of job cost sheet is given in Fig. 7.2.

Job cost sheets are not prepared for specified periods but they are made out for each job regardless of the time taken for its completion. However, material, labour and overhead costs are posted periodically to the relevant cost sheet.

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JOB COST SHEET											
Customer.....						Job No.					
Date of Commencement.....						Date of Completion					
Material Cost			Labour Cost				Factory Overheads (Absorbed)				
Date	Material Req. No.	Amount ₹	Date	Hours	Rate ₹	Amt ₹	Deptt	Hours	Rate ₹	Am ₹	
Total			Total				Total				
Profit/Loss			Cost Summary								
	₹										₹
Price Quoted			Material								
Less: Cost			Labour								
			Prime cost								
Profit or Loss			Factory overheads								
			Works cost								
			Adm. overheads								
			Cost of production								
			Selling and dist overheads								
			Total cost								

Fig. 7.2 Job Cost Sheet

The material, labour and overheads to be absorbed into jobs are collected and recorded in the following way:

- Direct materials:** Material requisitions or bills on materials show the quantities of materials issued to jobs from store. When copies of these documents reach the cost office, they are priced and entered in the stores ledger account in the 'issues' column. Each requisition shows the job number to which the material is to be charged. Summaries of material requisitions are prepared at regular intervals on Materials Abstract or Materials Issue Analysis Sheet. These summaries facilitate debiting the job with total cost of materials rather than charging with many small items. These totals are also used for entries in stores ledger control account and work-in-progress control account.
- Direct wages:** As explained earlier in the unit on labour cost, the wages payable to workers are calculated on clock cards, job cards, time sheets, etc. The summaries of job cards are made on Wages Abstract or Wages Analysis Sheets, which show the direct wages chargeable to each job. The total of wages chargeable to various jobs is debited to work-in-progress control account.
- Direct expenses:** Direct expenses which can be identified with specific jobs are directly charged to these jobs, the total being debited to work-in-progress control account.

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- (d) **Overheads:** Indirect materials, indirect wages and indirect expenses which cannot be identified with specific jobs are apportioned to cost centres in the manner described earlier in the Unit 6. Absorption of overheads by the jobs passing through the cost centres is based upon percentage of direct wages or direct material cost, direct labour hours or machine hours, etc. These methods of absorption have also been discussed in detail in Unit 6.

The direct materials, wages and expenses and the overheads absorbed are totalled to give the total cost.

Completion of Jobs

When jobs are completed, the cost is transferred to cost of sales account. The total cost of jobs completed during each period is set against the sales to determine the profit or loss for the, period.

Illustration 7.1: A factory uses job costing. The following data are obtained from its books for the year ended 31 December 2017:

	₹		₹
Direct materials	90,000	Selling and distribution overheads	52,500
Direct wages	75,000	Administration overheads	42,000
Profit	60,900	Factory Overheads	45,000

- (a) Prepare a Job Cost Sheet indicating the Prime cost, Works cost, Production cost, Cost of sales and the Sales value.
- (b) In 2010, the factory received an order for a number of jobs. It is estimated that direct materials required will be ₹1,20,000 and direct labour will cost ₹75,000. What should be the price for these jobs if factory intends to earn the same rate of profit on sales assuming that the selling and distribution overheads have gone up by 15%? The factory recovers factory overheads as a percentage of direct wages and administration and selling and distribution overheads as a percentage of works cost, based on cost rates prevailing in the previous year. (CA Inter)

Solution:

Production Statement for the year ended 31 December 2017

		₹
Direct materials		90,000
Direct wages		75,000
	Prime Cost	1,65,000
Factory overheads		45,000
	Works Cost	2,10,000
Administration overheads		42,000
	Cost of Production	2,52,000
Selling and distribution overheads		52,500
	Cost of Sales	3,04,500
PROFIT		60,900
	Sales Value	3,65,400

Calculation of Rates

Methods of Costing:
Job Costing

1. % of factory overheads to direct wages $= \frac{45,000}{75,000} \times 100 = 60\%$
2. % of administration overheads to works cost $= \frac{42,000}{2,10,000} \times 100 = 20\%$
3. Selling and distribution overheads ₹2,500
Add 15% increase 7875
60,375

Selling and distribution overheads % to works cost
 $= \frac{60,375}{2,10,000} \times 100 = 28.75\%$
4. % of profit to sales $= \frac{60,900}{3,65,400} \times 100$
 $= 16.67\% \left(\frac{1}{6} \text{ of sales or } \frac{1}{5} \text{ of total cost} \right)$

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Job Cost Sheet

(Statement showing Estimated Cost and Price of Jobs in 2018)

	₹
Direct materials	1,20,000
Direct wages	75,000
Prime Cost	1,95,000
Factory overheads (60% of direct labour)	45,000
Works Cost	2,40,000
Administration overheads (20% of works cost)	48,000
Cost of Production	2,88,000
Selling and distribution overheads (28.75% of works cost)	69,000
Total Cost	3,57,000
PROFIT (1/5 of cost)	71,400
Selling Price	4,28,400

7.3.1 Distinction between Contract Costing and Job Costing

Contract costing, also known as terminal costing, is a variant of job costing. In this method of costing, each contract is a cost unit and an account is opened for each contract in the books of the contractor to ascertain profit/loss thereon.

Contract Costing and Job Costing—Distinction

Main points of distinction between contract and job costing are as follows:

1. The number of jobs undertaken at a time are usually large as compared to number of contracts because contracts are generally much bigger in size.
2. In contract costing, most of the costs are chargeable direct to contract accounts. Under job costing, direct allocation to such an extent is not possible.

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3. Allocation and apportionment of overhead costs is simpler in contract costing as compared to job costing.
4. Contract is generally big while job is small. It is well said, 'a job is a small contract and a contract is a big job.'
5. Jobs are usually carried out in factory premises while contract work is done at site.

7.3.2 Contract Costing, Target Costing and Escalation Clause

Features of Contract Costing

Contract costing usually shows the following features:

1. Contracts are generally of large size and, therefore, a contractor usually carries out a small number of contracts in the course of one year.
2. A contract generally takes more than one year to complete.
3. Work on contracts is carried out at the site of contracts and not in factory premises.
4. Each contract undertaken is treated as a cost unit.
5. A separate contract account is prepared for each contract in the books of the contractor to ascertain profit or loss on each contract.
6. Most of the materials are specially purchased for each contract. These will, therefore, be charged direct from the supplier's invoices. Any materials drawn from the store is charged to contract on the basis of material requisition notes.
7. Nearly all labour is direct.
8. Most expenses (*e.g.*, electricity, telephone, insurance, etc.) are also direct.
9. Specialist sub-contractors may be employed for say, electrical fittings, welding work, glass work, etc.
10. Plant and equipment may be purchased for the contract or may be hired for the duration of the contract.
11. Payments by the customer (contractee) are made at various stages of completion of the contract based on architect's certificate for the completed stage. An amount, known as retention money, is withheld by the contractee as per agreed terms.
12. Penalties may be incurred by the contractor for failing to complete the work within the agreed period.

Target Costing

*Methods of Costing:
Job Costing*

This method of costing is used to calculate product costs by deducting desired profit margin from market price of the product/service. This setting of cost is the reverse of cost-plus pricing (discussed in Unit 10).

It is known as the method of cost reduction/optimization method.

The following are the fundamental steps of target costing:

- Estimate competitive sales price
- Setting of the desired and reasonable profit margin
- Calculate target costs = estimated selling price less desired profit margin
- Ascertain the actual costs of the product
- Calculate cost gap = difference between actual and target costs
- Try to eliminate (or reduce) the cost

You will learn more about the concept, types and procedure of contract costing in Unit 10.

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Check Your Progress

1. Mention examples of job order industries.
2. List the people to whom the production order copies are passed on to.
3. What is the signal for the cost accountant to prepare a job cost sheet?

7.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Examples of job order industries include printing press, construction of buildings, bridges, roads and ship building.
2. The production order copies are passed on to the following people:
 - All departmental foremen concerned with the job
 - Storekeeper for insurance of materials
 - Tool room for an advance notification of tools required
3. Receipt of production order is the signal for the cost accountant to prepare a job cost sheet on which he will record the cost of materials used and the labour and machine time taken.

7.5 SUMMARY

- In job order industries, production work is done against orders from customers. Each job work needs special treatment and can be clearly

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distinguished from other jobs. Each job is completed as per customer's specifications.

- Job costing or job order costing is a method of cost ascertainment used in job order industries.
- Objectives of job costing are: cost of each job is ascertained separately, it enables management to know which jobs are more profitable, helps in future production planning and helps in management in controlling costs by comparing estimated and actual costs.
- The steps in the job costing procedure include: assigning of job number, making of the production order, preparation of job cost sheet, and completion of jobs to cost of sales account.
- Contract costing, also known as terminal costing, is a variant of job costing. In this method of costing, each contract is a cost unit and an account is opened for each contract in the books of the contractor to ascertain profit/loss thereon.

7.6 KEY WORDS

- **Job Order Industries:** It refers to industries where production work is done against orders from customers
- **Job Costing:** It is a method of cost ascertainment used in job order industries
- **Contract Costing:** Also known as terminal costing, it is a method of costing in which each contract is a cost unit and an account is opened for each contract in the books of the contractor to ascertain profit/loss thereon

7.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a note on job costing and the industries which adopt job costing.
2. What are the main features of job costing? Give a pro forma cost sheet under such a system.
3. Differentiate between contract and job costing.

Long Answer Questions

1. What are the main features of job costing? Describe briefly the procedure of recording costs under job order costing.
2. Discuss the features of contract costing.

3. R K Ltd has to quote a price for Job No. 450. The cost estimator has produced the following data:

Direct materials: 34 units @ ₹2 per unit
Direct labour: Deptt A – 12 hours @ ₹2 per hour
Deptt B – 20 hours @ ₹1.80 per hour

The following additional information is extracted from the company's budgets:

Deptt A variable overheads	₹18,000
Hours to be worked	₹18,000
Deptt B variable overheads	₹18,000
Hours to be worked	₹10,000
Fixed overheads for the company	₹1,00,000
Total hours to be worked	₹50,000

Profit is taken at 20% of the selling price.

You are required to prepare a Job Cost Sheet.

*Methods of Costing:
Job Costing*

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7.8 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
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UNIT 8 UNIT COSTING

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Structure

- 8.0 Introduction
- 8.1 Objectives
- 8.2 Meaning of Unit Costing
 - 8.2.1 Procedure in Unit Costing and Preparation of Cost Sheet
- 8.3 Answers to Check Your Progress Questions
- 8.4 Summary
- 8.5 Key Words
- 8.6 Self Assessment Questions and Exercises
- 8.7 Further Readings

8.0 INTRODUCTION

In the previous unit, you learnt about the concept of job costing and contract costing. In this unit, you will study unit costing. Cost ascertainment in industries where similar or singular grade products are manufactured is done through unit costing. Examples of such industries include paper, bricks, steel, breweries, dairies, sugar mills, etc. Unit costing helps to determine not just the total cost of production but also cost per unit. It has several other advantages including assistance in the determination of selling price of the product, get an idea about the profitable volume of product, have a control of the costs, compare previous and current costs, etc. In this unit, you will learn about the concept of unit costing, the costing procedure, the purposes and preparation of cost sheet.

8.1 OBJECTIVES

After going through this unit, you will be able to:

- Explain the meaning of unit costing
- Describe cost accumulation
- Discuss the procedure in unit costing and the preparation of cost sheet

8.2 MEANING OF UNIT COSTING

Output costing (or unit costing or single costing) is a method of cost ascertainment which is used in those industries which have the following features :

- (i) Production consists of a single product or a few varieties of the same product with variations in size, shape, quality, etc., and
- (ii) Production is uniform and on continuous basis.

Cost Accumulation

Collecting cost information through a formal accounting system is known as cost accumulation in cost accounting. This cost information is extremely crucial to the management of the companies as through its analysis and study, they become equipped to take efficient and effective decisions for the company. Broadly cost accumulation can be divided into two categories:

- Job cost system
- Process cost system

As the name suggests, the former is related to collection of costs related to material, labour and overhead for individual jobs, whereas the latter is concerned with accumulating costs by cost centre and then assigning an average cost to the products.

Cost accumulation under unit costing, requires information related to cost of raw materials consumed, cost of labour and cost of overheads.

8.2.1 Procedure in Unit Costing and Preparation of Cost Sheet

In order to ascertain the cost of products, a cost sheet is prepared periodically. As the production is uniform and cost units are identical, the cost per unit is the average cost. It is ascertained by dividing the total cost by the number of units produced. Cost unit may be 1,000 bricks, a barrel of beer, a gallon of milk, a tonne of steel/cement/sugar, etc. The cost sheet is designed to show the total cost as well as cost per unit of output for the given period.

Cost Sheet

Cost sheet is defined as '*a document which provides for the assembly of the detailed cost of a cost centre or cost unit.*'

Thus cost sheet is a periodical statement of cost, designed to show in detail the various elements of cost of goods produced, like prime cost, factory cost, cost of production and total cost. It is prepared at regular intervals, *e.g.*, weekly, monthly, quarterly, yearly, etc. Comparative figures of the previous period may also be shown in the cost sheet so that assessment can be made about the progress of the business.

Though the term *Production Statement* is used interchangeably with Cost Sheet, the former is an expanded form of the latter. In addition to cost elements, a production statement includes items of sales, stocks and profits. When the details of cost sheet or production statement are shown in a T-shape account, it is known as *Production Account*. Other terms used are *Cost Statement* and *Statement of Cost and Profit*.

Purposes: Cost sheet serves the following purposes:

1. It reveals the total cost and cost per unit of goods produced.
2. It discloses the break-up of total cost into different elements of cost.

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3. It provides a comparative study of the cost of current period with that of the corresponding previous period.
4. It acts as a guide to management in fixation of selling prices and quotation of tenders.

Specimen of a **simple cost sheet** is given below:

Cost Sheet (or Statement of Cost) for the period.....

		No. of units produced.....	
<i>Particulars</i>		<i>Total cost</i> ₹	<i>Cost per unit</i> ₹
Direct Materials			
Direct Labour			
Direct (or Chargeable) Expenses			
	Prime Cost		
Works Overheads			
	Works Cost		
Office and Administrative Overheads			
	Cost of Production		
Selling and Distribution Overheads			
	Total Cost or Cost of Sales		
Profit or Loss			
Sales			

Treatment of Stocks

Stocks may be of the following three types:

- (a) Stocks of raw materials
- (b) Stocks of work-in-progress
- (c) Stocks of finished goods

Stocks of Raw Materials: In order to calculate the value of raw materials consumed during the period, opening stock of raw materials is added to the raw materials purchased and closing stock is subtracted. This is shown below with *assumed* figures:

	₹
Opening stock of raw materials	12,000
Add: Purchases	42,000
	54,000
Less: Closing stock of raw materials	9,000
Cost of materials consumed	45,000

Stocks of Work-in-progress: This is the stock of semi-finished goods. In cost sheet, opening stock of work-in-progress is added in prime cost along with factory overhead and closing stock of work-in-progress is subtracted therefrom. Thus opening and closing stocks of work-in-progress are adjusted in works or factory cost as shown below (*with assumed figures*):

	₹
Prime cost	62,000
<i>Add:</i> Factory overheads	<u>27,000</u>
Current manufacturing cost	89,000
<i>Add:</i> Opening stock of work-in-progress	<u>13,000</u>
Total goods processed during the period	1,02,000
<i>Less:</i> Closing stock of work-in-progress	<u>11,000</u>
<i>Works or factory cost</i>	<u>91,000</u>

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Stock of Finished Goods: In cost sheet, finished goods are adjusted after calculating cost of production. Opening stock of finished goods is added to cost of production and closing stock of finished goods is subtracted therefrom. The resultant figure is called *cost of goods sold*. This is illustrated below (*with assumed figures*):

	₹
Cost of production	1,15,000
<i>Add:</i> Opening stock of finished goods	<u>17,000</u>
Cost of goods available for sale	1,32,000
<i>Less:</i> Closing stock of finished goods	<u>12,000</u>
<i>Cost of goods sold</i>	<u>1,20,000</u>

The treatment of the above three types of stocks is illustrated in the following specimen cost sheet.

Cost Sheet for the period.....

Production.....units.

<i>Particulars</i>	<i>Total cost</i> ₹	<i>Cost per unit</i> ₹
Opening stock of raw materials	XXX	
<i>Add:</i> Purchases	XXX	
<i>Add:</i> Expenses on purchases	<u>XXX</u>	
	XXX	
<i>Less:</i> Closing stock of raw materials	<u>XXX</u>	
Cost of material consumed		
Direct wages		
Direct expenses		
Prime Cost		
<i>Add:</i> Factory overheads		
<i>Add:</i> Opening stock of work-in-progress		
<i>Less:</i> Closing stock of work-in-progress		
Factory or Works Cost		
<i>Add:</i> Administrative overheads		
Cost of Production		
<i>Add:</i> Opening stock of finished goods		
<i>Less:</i> Closing stock of finished goods		
Cost of Goods Sold		
<i>Add:</i> Selling and distribution overheads		
Cost of Sales		
Profit (or Loss)		
Sales		

Items Excluded from Cost

The following items are of financial nature and are thus not included while preparing a cost sheet:

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1. Cash discount
2. Interest paid
3. Preliminary expenses written off
4. Goodwill written off
5. Provision for taxation
6. Provision for bad debts
7. Transfer to reserves
8. Donations
9. Income tax paid
10. Dividend paid
11. Profit/loss on sale of fixed assets
12. Damages payable at law, etc.

Treatment of Scrap

Scrap may be defined as *an unavoidable residue material arising in certain types of manufacturing processes*. Examples of scrap are trimmings, turnings or boring from metals or timber, on which operations are performed. Scrap usually has a small realizable value. Such realizable value of scrap is deducted from either factory overheads or factory cost while preparing a cost sheet.

Illustrative Cost Sheet (Detailed)

		Units produced.....	
Particulars		Total cost ₹	Cost per unit ₹
	Opening Stock of Raw Materials		
Add:	Purchases	...	...
Add:	Carriage Inward	...	...
Add:	Octroi and Customs Duty	...	...
		...	...
Less:	Closing Stock of Raw Materials	...	...
	<i>Cost of Direct Materials Consumed</i>	...	...
	Direct or Productive Wages	...	...
	Direct (or Chargeable) Expenses	...	...
	Prime Cost	...	...
Add:	<i>Works or Factory Overheads:</i>		
	Indirect Materials	...	
	Indirect Wages	...	
	Leave Wages	...	
	Overtime Premium	...	
	Fuel and Power	...	
	Rent and Taxes	...	
	Insurance	...	

Factory Lighting	...		Unit Costing
Supervision	...		
Works Stationery	...		
Canteen and Welfare Expenses	...		
Repairs	...		
Haulage	...		
Works Salaries	...		
Depreciation of Plant & Machinery	...		
Works Expenses	...		
Gas and Water	...		
Drawing Office Salaries	...		
Technical Director's Fees	...		
Laboratory Expenses	...		
Works Telephone Expenses	...		
Internal Transport Expenses	...		
Less: Sale of Scrap	...		
Add: Operating Stock of Work-in-progress	...		
Less: Closing Stock of Work-in-progress	...		
Works Cost	...		
Add: Office and Administrative Overheads:	...		
Office Salaries	.....		
Director's Fees	.....		
Office Rent and Rates	.....		
Office Stationery and Printing	.....		
Sundry Office Expenses	.....		
Depreciation of Office Furniture	.....		
Subscription to Trade Journals	.....		
Office Lighting	.....		
Establishment Charges	.....		
Director's Travelling Expenses	.....		
Postage	.....		
Legal Charges	.....		
Audit Fees	.....		
Depreciation and Repair of Office Equipment	.....		
Cost of Production	.....		
Add: Opening Stock of Finished Goods	.....		
Less: Closing Stock of Finished Goods	.....		
Cost of Goods Sold	.....	.....	
Add: Selling and Distribution Overheads:	.....		
Advertising	.....		
Showroom Expenses	.....		
Bad Debts	.....		
Salesmen's Salaries and Expenses	.....		
Packing Expenses	.....		
Carriage Outward	.....		
Commission of Sales Agents	.....		
Counting House Salaries	.....		
Cost of Catalogues	.....		
Expenses of Delivery Vans	.....		
Collection Charges	.....		
Travelling Expenses	.....		
Cost of Tenders	.....		
Warehouse Expenses			
Cost of Mailing Literature			
Sales Manager's Salaries			

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Sales Director's Fees		
Showroom Expenses		
Sales Office Expenses		
Depreciation and Repairs of Delivery Vans		
Expenses of Sales Branches	.....	
Cost of Sales (or Total Cost)	.....	
PROFIT	.....	
Sales	.....	

Illustration 8.1: The following particulars have been extracted from the books of J K Production Co. Ltd, for the year ended 31 March 2010.

	₹
Stock of materials as on 1 April 2009	47,000
Stock of materials as on 31 March 2010	45,000
Materials purchased	2,08,000
Drawing office salaries	9,600
Counting house salaries	14,000
Carriage inwards	8,200
Carriage outwards	5,100
Donations to relief fund	4,300
Sales	4,87,000
Bad debts written off	4,700
Repairs of plant, machinery and tools	8,600
Rent, rates, taxes and insurance (factory)	3,000
Rent, rates, taxes and insurance (office)	1,000
Travelling expenses	3,700
Travelling salaries and commission	7,800
Production wages	1,45,000
Depreciation written off on machinery, plant and tools	9,100
Depreciation written off on office furniture	600
Director's fees	6,000
Gas and water charges (factory)	1,000
Gas and water charges (office)	300
General charges	5,000
Manager's salary	18,000

Out of 48 working hours in a week, the time devoted by the manager to the factory and office was on an average 30 hours and 18 hours, respectively, throughout the accounting year. Prepare a cost sheet showing different elements of cost.

Solution:

Unit Costing

Cost Sheet for the year ending 31 March 2010

	₹	₹
Opening stock of raw materials	47,000	
Add: Purchases	2,08,000	
Add: Carriage inwards	<u>8,200</u>	
	2,63,200	
Less: Closing stock	<u>45,000</u>	
Cost of materials consumed		2,18,200
Production wages		<u>1,45,000</u>
Prime Cost		3,63,200
Factory overheads:		
Rent and rates	3,000	
Drawing office salaries	9,600	
Depreciation of plant	9,100	
Repairs of plant	8,600	
Factory gas and water	1,000	
Manager's salary $\left(18,000 \times \frac{30}{48}\right)$	<u>11,250</u>	<u>42,550</u>
Factory Cost		4,05,750
Administration overheads:		
Office rent and rates	1,000	
Depreciation on furniture	600	
Director's fees	6,000	
Gas and water	300	
General charges	5,000	
Manager's salary $\left(18,000 \times \frac{18}{48}\right)$	<u>6,750</u>	<u>19,650</u>
Cost of production		4,25,400
Selling and distribution overheads:		
Counting house salaries	14,000	
Carriage outwards	5,100	
Bad debts	4,700	
Travelling expenses	3,700	
Travelling salaries	<u>7,800</u>	<u>35,300</u>
Cost of Sales		4,60,700
PROFIT		26,300
Sales		<u>4,87,000</u>

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Note: Donation to relief fund is not included in cost.

Production Account

When information shown in a cost sheet is presented in the form of a T-shape account, it is known as Production Account. In this account, debit side shows the various item of cost while credit side shows the sales of finished goods. Opening stock is written on the debit side while closing stock is written on the credit side.

Alternatively, closing stock may be shown as a deduction from the items in debit side. In this way this account shows the total cost. The balance in this account shows profit or loss, as the case may be.

Illustration 8.2: Prepare a Production Account from the information extrated from the books of J K Production Co. Ltd as given in Illustration 8.1.

Solution:

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Production Account <i>for the year ending 31 March 2010</i>			
	₹		₹
To Opening stock of raw materials	47,000	By Prime cost c/d	3,63,200
Add: Purchases	2,08,000		
Add: Carriage inwards	8,200		
	<u>2,63,200</u>		
Less: Closing stock	<u>45,000</u>		
Cost of materials consumed	2,18,200		
To Production wages	<u>1,45,000</u>		
	<u>3,63,200</u>		<u>3,63,200</u>
To Prime Cost b/d	3,63,200	By Factory cost c/d	4,05,750
To Factory overheads:			
Rent and rates	3,000		
Drawing office salaries	9,600		
Depreciation of plant	9,100		
Repairs of plant	8,600		
Factory gas and water	1,000		
Manager's salary (18,000 × 30/48)	<u>11,250</u>		
	<u>4,05,750</u>		<u>4,05,750</u>
To Factory Cost b/d	4,05,750	By Cost of production c/d	4,25,400
To Administration overheads:			
Office rent and rates	1,000		
Depreciation on furniture	600		
Director's fees	6,000		
Gas and water	300		
General charges	5,000		
Manager's salary (18,000 × 18/48)	<u>6,750</u>		
	<u>4,25,400</u>		<u>4,25,400</u>
To Cost of Production b/d	4,25,400	By Cost of sales c/d	4,60,700
To Selling and dist. overheads:			
Counting house salaries	14,000		
Carriage outwards	5,100		
Bad debts	4,700		
Travelling expenses	3,700		
Travelling salaries, etc.	<u>7,800</u>		
	<u>4,60,700</u>		<u>4,60,700</u>
To Cost of Sales b/d	4,60,700	By Sales	4,87,000
To Profit	<u>26,300</u>		
	<u>4,87,000</u>		<u>4,87,000</u>

Price Quotations and Estimated Cost Sheet

Quite often the management has to quote prices of its products in advance or has to submit tenders for goods to be supplied. For this purpose an estimated cost sheet has to be prepared. Such an estimated cost sheet is prepared to show the estimated cost of products to be manufactured. In this cost sheet, cost of direct materials, direct wages and various types of overheads are predetermined on the

basis of past costs after taking into account the present conditions and also the anticipated changes in the future price level. Overheads are absorbed on the basis of a suitable method of absorption like percentage of direct materials, or wages or machine hour rate, etc. These methods were discussed in the overhead chapter.

Calculation of profit: After the total cost has been estimated, a desired percentage of profit is added to arrive at the price to be quoted. Such profit may be given as a percentage of cost or percentage of selling price. In order to calculate the amount of profit, it is easy to assume that figure as 100 on which profit percentage is given and then calculate the amount of profit.

Example 1:

Given: Total cost = ₹50,000
 Profit = 20% of cost
 Suppose cost = ₹100
 Profit = $100 \times 20\% = ₹20$

∴ When cost is ₹50,000:

$$\text{Profit} = 50,000 \times \frac{20}{100} = ₹10,000$$

Check Your Progress

1. What are the three types of stocks?
2. What are the inclusions of the estimated cost sheet for quotations?
3. How is profit calculated for the estimated cost sheet?

8.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The three types of stocks include:
 - Stocks of raw materials
 - Stocks of work-in-progress
 - Stocks of finished goods
2. An estimated cost sheet is prepared to show the estimated cost of products to be manufactured. In this cost sheet, cost of direct materials, direct wages and various types of overheads are predetermined on the basis of past costs after taking into account the present conditions and also the anticipated changes in the future price level.
3. After the total cost has been estimated, a desired percentage of profit is added to arrive at the price to be quoted. Such profit may be given as a percentage of cost or percentage of selling price. In order to calculate the amount of profit, it is easy to assume that figure as 100 on which profit percentage is given and then calculate the amount of profit.

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8.4 SUMMARY

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- In order to ascertain the cost of products, a cost sheet is prepared periodically. As the production is uniform and cost units are identical, the cost per unit is the average cost. It is ascertained by dividing the total cost by the number of units produced.
- Cost sheet is defined as ‘a document which provides for the assembly of the detailed cost of a cost centre or cost unit’.
- Though the term production statement is used interchangeably with cost sheet, the former is an expanded form of the latter. In addition to cost elements, a production statement includes items of sales, stocks and profits.
- Scrap may be defined as an unavoidable residue material arising in certain types of manufacturing processes. Examples of scrap are trimmings, turnings or boring from metals or timber, on which operations are performed.
- Scrap usually has a small realizable value. Such realizable value of scrap is deducted from either factory overheads or factory cost while preparing a cost sheet.
- When information shown in a cost sheet is presented in the form of a T-shape account, it is known as production account. In this account, debit side shows the various item of cost while credit side shows the sales of finished goods.
- Opening stock is written on the debit side while closing stock is written on the credit side.
- Alternatively, closing stock may be shown as a deduction from the items in debit side. In this way this account shows the total cost. The balance in this account shows profit or loss, as the case may be.
- Quite often the management has to quote prices of its products in advance or has to submit tenders for goods to be supplied. For this purpose an estimated cost sheet has to be prepared. Such an estimated cost sheet is prepared to show the estimated cost of products to be manufactured.
- In this cost sheet, cost of direct materials, direct wages and various types of overheads are predetermined on the basis of past costs after taking into account the present conditions and also the anticipated changes in the future price level.
- Overheads are absorbed on the basis of a suitable method of absorption like percentage of direct materials, or wages or machine hour rate, etc.
- After the total cost has been estimated, a desired percentage of profit is added to arrive at the price to be quoted. Such profit may be given as a percentage of cost or percentage of selling price.

- In order to calculate the amount of profit, it is easy to assume that figure as 100 on which profit percentage is given and then calculate the amount of profit.

Unit Costing

8.5 KEY WORDS

- **Output Costing:** Output costing is a method of cost ascertainment, which is used in those industries in which production consists of a single product or a few varieties of the same product, like cement industry, steel mills, paper mills and sugar mills.
- **Cost Sheet:** Cost sheet is a periodical statement of cost, designed to show in detail, the various elements of cost of goods produced like prime cost, factory cost, cost of production and total cost.
- **Estimated Cost Sheet:** In estimated cost sheet, a fixed percentage of profit is added in the estimated total cost to arrive at the selling price to be quoted.

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8.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a short note on the treatment of stocks.
2. What items are excluded from the cost sheet? Give relevant examples.

Long-Answer Questions

1. What is unit or output costing? In what industries is it used?
2. What is a cost sheet? Explain the purposes served by it.
3. The following data relate to the manufacturing of a standard product during the four weeks ending on 31 March 2017:

Raw materials consumed	₹20,000
Direct wages	₹12,000
Machine-hours worked	1,000 hours
Machine-hour rate	₹2 per hour
Office overhead	20% on works cost
Selling overheads	₹0.40 per unit
Units produced	20,000 units
Units sold at ₹3 each	18,000 units

Prepare a Cost Sheet and show the profit.

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4. A factory produces a standard product. The following information is given to you from which you are required to prepare a 'Cost Sheet' for the period ended 31 July 2017:

Consumable materials:	₹
Opening stock	10,000
Purchases	85,000
Closing stock	4,000
Direct wages	20,000
Other direct expenses	10,000
Factory overheads	100% of direct labour
Office overheads	10% of works cost
Selling and distribution expenses	₹2 per unit sold
Units of finished product:	
In hand at the beginning of the period	Units 1,000 (value ₹16,000)
Produced during the period	10,000 units
In hand at the end of the period	2,000 units

Also, find out the selling price per unit on the basis that profit mark-up is uniformly made to yield a profit of 20% of the selling price. There was no work-in-progress either at the beginning or at the end of the period.

8.7 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
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- Shillinglow, G. 1982. *Managerial Costing Accounting*. Homewood: Richard D. Irwin.
- Morse, W. J. 1978. *Cost Accounting*. Massachusetts: Addison-Wesley Publishing Co.
- Lal, Jawahar. 2003. *Cost Accounting*. New Delhi: Tata McGraw Hill.

BLOCK - III**PROCESS, CONTRACT AND OPERATING COSTING****NOTES****UNIT 9 PROCESS COSTING****Structure**

- 9.0 Introduction
- 9.1 Objectives
- 9.2 Process Costing: Features and Process Cost Accounts
 - 9.2.1 Features
 - 9.2.2 Job Costing vs. Process Costing
 - 9.2.3 Process Costing Procedure and Process Cost Accounts
 - 9.2.4 Important Adjustments including Inter-Process Profits
- 9.3 Accounting for Joint and By Products
- 9.4 Answers to Check Your Progress Questions
- 9.5 Summary
- 9.6 Key Words
- 9.7 Self Assessment Questions and Exercises
- 9.8 Further Readings

9.0 INTRODUCTION

Process costing is probably the most widely used method of cost ascertainment. It is used in mass production industries producing standard products, like steel, sugar and chemicals. In all such industries, goods produced are identical and all factory processes are standardized. Goods are produced without waiting for any instructions or orders from customers and are put into warehouse for sale. Raw materials move down the production line through a number of processes in a particular sequence and costs are compiled for each process or department by preparing a separate account for each process. In this unit, you will learn about the concept of process costing and its important adjustments.

In most of the industries in which process costing is used, two or more products are unavoidably produced from the same process and same raw materials. These products are produced in natural proportions which cannot be changed at the will of the management. For example, in an oil refinery, when crude oil is processed, many products are simultaneously produced from the same set of inputs. Examples of these products are petrol, kerosene oil, diesel, grease and lubricating oils. Such products are known as joint products or by-products.

In this unit, you will also study accounting for joint or by-products.

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9.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the features of process costing
- Compare process and job costing
- Explain the preparation of process cost accounts
- Describe important adjustment of inter-process profits
- Explain accounting for joint products and by products

9.2 PROCESS COSTING: FEATURES AND PROCESS COST ACCOUNTS

In this section, you will learn about the features of process costing, its difference from job costing, the procedure to make process cost accounts and some important adjustments.

9.2.1 Features

1. The production is continuous and the final product is the result of a sequence of processes.
2. Costs are accumulated process-wise.
3. The products are standardized and homogeneous.
4. The cost per unit produced is the average cost which is calculated by dividing the total process cost by the number of units produced.
5. The finished product of each but last process becomes the raw material for the next process in sequence and that of the last process is transferred to the finished goods stock.
6. The sequence of operations or processes is specific and predetermined.
7. Some loss of materials in processes (due to chemical action, evaporation, etc.) is unavoidable.
8. Processing of raw materials may give rise to the production of several products. These several products produced from the same raw material may be termed as joint products or by-products.

9.2.2 Job Costing vs. Process Costing

A comparison of process and job costing methods will help in the better understanding of process costing system.

Process costing	Job costing
1. Costs are compiled process-wise and cost per unit is the average cost, <i>i.e.</i>, the total cost of the process divided by the number of units produced. 2. Production is of standardized products and cost units are identical. 3. Production is for stocks. 4. Costs are computed at the end of a specific period. 5. The cost of one process is transferred to the next process in the sequence. 6. On account of continuous nature of production, work-in-progress in the beginning and end of the accounting period is a regular feature. 7. Cost control is comparatively easier. This is because factory processes and products are standardized.	1. Costs are separately ascertained for each job, which is cost unit. 2. Production is of non-standard items with specifications and instructions from the customers. 3. Production is against orders from customers. 4. Costs are calculated when a job is completed. 5. Cost of a job is not transferred to another job but to finished stock account. 6. There may or may not be work-in-progress in the beginning and end of the accounting period. 7. Cost control is comparatively more difficult because each cost unit or job needs individual attention.

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9.2.3 Process Costing Procedure and Process Cost Accounts

The essential stages in process costing procedure are:

1. The factory is divided into a number of processes and an account is maintained for each process.
2. Each process account is debited with material cost, labour cost, direct expenses and overheads allocated or apportioned to the process.
3. The output of a process is transferred to the next process in the sequence. In other words, finished output of one process becomes input of the next process.
4. The finished output of the last process (*i.e.*, the final product) is transferred to the Finished Goods Account.

Illustration 9.1: A product passes through three distinct processes to completion. These processes are numbered respectively, 1, 2 and 3. During the week ended 31 January, 1,000 units are produced. The following information is obtained:

	Process 1	Process 2	Process 3
	₹	₹	₹
Materials	6,000	13,000	2,000
Labour	5,000	4,000	5,000
Direct expenses	1,000	200	1,000

The indirect expenses for the period were ₹2,800, apportioned to the processes on the basis of labour cost.

Prepare process accounts showing total cost and cost per unit.

NOTES**Solution:****Process 1 Account***Output: 1,000 units*

<i>Particulars</i>	<i>Per unit ₹</i>	<i>Total ₹</i>	<i>Particulars</i>	<i>Per unit ₹</i>	<i>Total ₹</i>
To Materials	6	6,000	By Output transferred		
To Labour	5	5,000	to Process 2	13	13,000
To Direct expenses	1	1,000			
To Indirect expenses*	1	1,000			
	13	13,000		13	13,000

$$\begin{aligned}
 \text{*Indirect expenses as a \% of labour} &= \frac{2,800}{5,000 + 4,000 + 5,000} \times 100 \\
 &= \frac{2,800}{1,4000} \times 100 = 20\%
 \end{aligned}$$

Process 2 Account*Output: 1,000 units*

<i>Particulars</i>	<i>Per unit ₹</i>	<i>Total ₹</i>	<i>Particulars</i>	<i>Per unit ₹</i>	<i>Total ₹</i>
To Process I (Transfer)	13.00	13,000	By Output transferred		
To Materials	3.00	3,000	to Process 3	21.00	21,000
To Labour	4.00	4,000			
To Direct expenses	0.20	200			
To Indirect expenses	0.80	800			
	21.00	21,000		21.00	21,000

Process 3 Account*Output: 1,000 units*

<i>Particulars</i>	<i>Per unit ₹</i>	<i>Total ₹</i>	<i>Particulars</i>	<i>Per unit ₹</i>	<i>Total ₹</i>
To Process 2	21	21,000	By Output transferred		
To Materials	2	2,000	to finished stock	30	30,000
To Labour	5	5,000			
To Direct expenses	1	1,000			
To Indirect expenses	1	1,000			
	30	30,000		30	30,000

Finished Stock Account

	<i>Units</i>	<i>₹</i>
To Process 3	1,000	30,000

9.2.4 Important Adjustments including Inter-Process Profits

There are certain accounting adjustments which are peculiar to process costing and accordingly, this section is broadly divided into three sections:

- (1) Process losses and wastages

(2) Valuation of work-in-progress—Equivalent Production

Process Costing

(3) Inter process profits

In this section, you will only learn about inter-process profits in detail.

(1) Process Losses and Wastages

In industries which employ process costing, a certain amount of loss occurs at various stages of production. Such a loss may arise due to chemical reaction, evaporation, inefficiency, etc. It is, therefore, necessary to keep accurate records of both input and output. Where loss occurs at a late stage in manufacture, it is apparent that financial loss is greater. This is because more and more costs are incurred in processes as products move towards completion stage.

Process losses may be classified into (a) normal, and (b) abnormal.

Normal Process Loss

That amount of loss which cannot be avoided because of the nature of material or process is normal process loss. Such a loss is quite expected under normal conditions. It is caused by factors, like chemical change, evaporation, withdrawals for tests or sampling and unavoidable spoiled quantities.

Abnormal Process Loss

This type of loss consists of loss due to carelessness, machine breakdown, accident, use of defective materials, etc. Thus, it arises due to abnormal factors and represents a loss which is over and above the normal loss.

Accounting procedure for normal and abnormal loss differs.

Accounting Treatment of Normal Loss

It is a fundamental costing principle that the cost of normal losses should be borne by the good production. Normal loss is generally determined as a percentage of input. Sometimes such a loss is due to loss of weight, say, due to evaporation or chemical action. Since such a wastage is not physically present, obviously it cannot have any value.

However, when normal loss is physically present in the form of scrap, it may have some value, i.e., it may be sold at some price. Whenever scrapped material has any value, it is credited to the Process Account.

Accounting Treatment of Abnormal Process Loss

It has been stated earlier that abnormal loss is due to carelessness, accidents, machine breakdown and other abnormal reasons. Unlike normal loss, abnormal loss is not absorbed by good production, rather it is transferred to Costing Profit and Loss Account. This is because if the cost of abnormal loss were to fall upon the good production, the cost thereof will fluctuate and the information provided

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would be misleading. In order to overcome this and also to disclose the cost of abnormal loss, the following procedure may be adopted:

- (a) Allow for normal loss in the manner described earlier.
- (b) After considering normal loss, find out the cost per unit in that process. This is done by the following formula:

$$\text{Cost per unit} = \frac{\text{Total cost} - \text{Value of normal loss}}{\text{Units introduced} - \text{Normal loss units}}$$

- (c) Multiply the cost per unit (calculated as above) by the number of units of abnormal loss. This gives the total value of abnormal loss.
- (d) Credit the relevant Process Account with the quantity and value of abnormal loss.
- (e) The balance figure in the Process Account is the cost of good units produced in the process. This can also be found by multiplying cost per unit with the number of good units produced.
- (f) Open 'Abnormal Loss Account' and debit it with the quantity and value of abnormal loss shown in the Process Account. Sale proceeds from abnormal loss are credited to Abnormal Loss Account. Any balance left in this account is net loss and transferred to Costing Profit and Loss Account.

Abnormal Gain or Effectiveness

The normal process loss represents the loss that would be expected under normal conditions. It is an estimated figure. The actual loss may be greater or less than the normal loss. If the actual loss is greater than normal loss, it is known as abnormal loss. But if actual loss is less than normal loss, a gain is obtained which is termed as *abnormal gain or effectiveness*. The value of abnormal gain is calculated in a manner similar to abnormal loss. It is shown on the debit side of the Process Account and credit side of the Abnormal Gain Account. Like abnormal loss, it is ultimately transferred to Costing Profit and Loss Account.

It should be noted that the method of valuation of abnormal gain is the same as that of abnormal loss.

Illustration 9.2: A product passes through three processes *A*, *B* and *C*. The normal wastage of each process is as follows: Process *A* – 3 per cent, Process *B* – 5 per cent, and Process *C* – 8 per cent. Wastage of Process *A* was sold at 25 p. per unit, that of Process *B* at 50 p. per unit and that of Process *C* at ₹1 per unit.

10,000 units were issued to Process *A* in the beginning of October 2017 at a cost of ₹1 per unit. The other expenses were as follows:

	Process A	Process B	Process C
Sundry materials	₹1,000	₹1,500	₹500
Labour	5,000	8,000	6,500
Direct expenses	1,050	1,188	2,009
Actual output	9,500 units	9,100 units	8,100 units

Prepare the Process Accounts, assuming that there were no opening or closing stocks. Also give the Abnormal Wastage and Abnormal Gain Accounts.

Process Costing

Solution:

Process A Account

Particulars	Units	₹	Particulars	Units	₹
To Units introduced	10,000	10,000	By Normal wastage	300	75
To Sundry materials		1,000	(3% of 10,000)		
To Labour		5,000	By Abnormal wastage	200	350*
To Direct expenses		1,050	By Process B (transfer)	9,500	16,625
	10,000	17,050		10,000	17,050

$$\text{*Value of abnormal wastage} = \frac{₹17,050 - ₹75}{10,000 - 300 \text{ units}} \times 200 \text{ units} = ₹350$$

Process B Account

Particulars	Units	₹	Particulars	Units	₹
To Process A	9,500	16,625	By Normal wastage	475	238
To Sundry materials		1,500	(5% of 9,500)		
To Labour		8,000	By Process C (transfer)	9,100	27,300
To Direct exp.		1,118			
To Abnormal gain	75	225*			
	9,575	27,538		9,575	27,538

$$\text{*Abnormal gain} = \frac{₹27,313 - ₹238}{9,500 - 475 \text{ units}} \text{ units} = ₹225$$

Process C Account

Particulars	Units	₹	Particulars	Units	₹
To Process B	9,100	27,300	By Normal wastage	728	728
(transfer)			8% of 9,100)		
To Sundry materials		500	By Abnormal wastage	272	1156*
To Labour		6,500	By Finished goods		
To Direct expenses		2,009	(transfer)	8,100	34,425
	9,100	36,309		9,100	36,309

$$\text{*Abnormal wastage} = \frac{₹36,309 - ₹728}{9,100 - 728 \text{ units}} \times 272 \text{ units} = ₹1,156$$

Abnormal Wastage Account

Particulars	Units	₹	Particulars	Units	₹
To Process A	200	350	By Sales of scrap in		
To Process B	272	1,156	Process A @ ₹0.25	200	50
			Process C @ ₹1	272	272
			By Profit and Loss		
			A/c (B/F)		1,184
	472	1,506		472	1,506

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Abnormal Gain Account

Particulars	Units	₹	Particulars	Units	₹
To Normal wastage A/c shortfall in the sale of normal wastage @ ₹0.50 per unit	75	38	By Process B	75	225
To Profit & Loss A/c (B.F.)		187			
	75	225		75	225

When the Output of a Process is Partly Sold and Partly Transferred to the Next Process

Sometimes the output of a process may be partly sold and partly transferred to the next process for further processing. For example, in a textile mill, part of the output of a spinning process may be sold and the remaining output is passed on to the weaving process for further processing. A part of the output so sold will contain an element of profit or loss which will be revealed in the Process Account. But when a part of the output is sent to warehouse for sale, it is at cost and does not contain an element of profit or loss.

Illustration 9.3: XYZ Ltd manufactures and sells three chemicals produced by consecutive processes known as X, Y and Z. In each process 2% of the total weight put in is lost and 10% is scrap, which from processes X and Y realized ₹100 a tonne and from Z ₹200 a tonne. The products of the three processes are dealt with as follows:

	X	Y	Z
Sent to warehouse for sale	25%	50%	100%
Passed on the next process	75%	50%	—

The following particulars relate to the month of May:

Materials used (tonnes)	1,000	140	1,348
Cost per tonne of materials (₹)	120	200	80
Mfg. expenses (₹)	30,800	25,760	18,100

Prepare an account for each process, showing the cost per tonne of each product.

Solution:

Process X Account

Particulars	Tonnes	₹	Particulars	Tonnes	₹
To Materials (@ ₹120)	1,000	1,20,000	By Loss in weight (2% of 1,000)	20	—
To Mfg. exp.		30,800	By Scrap (10% of 1,000)	100	10,000
			By Warehouse (25% of 880)	220	35,200
			By Process Y (transfer)	660	1,05,600
	1,000	1,50,800		1,000	1,50,800

Working Notes:

Process Costing

1. Transfer to warehouse = $\frac{₹1,50,800 - ₹10,000}{880 \text{ tonnes}} \times 220 \text{ tonnes} = ₹35,200$.

Similar calculation has been made in Process Y.

2. As the question is silent about the nature of loss, it is presumed that both weight loss and scrap are normal.

NOTES**Process Y Account**

Particulars	Tonnes	₹	Particulars	Tonnes	₹
To Process X (transfer)	660	1,05,600	By Loss in weight (2% of 800)	16	—
To Materials	140	28,000	By Scrap	80	8,000
To Mfg. exp.	—	25,760	By Warehouse	352	75,680
			By Process Z (transfer)	352	75,680
	800	1,59,360		800	1,59,360

Process Z Account

Particulars	Tonnes	₹	Particulars	Tonnes	₹
To Process Y (transfer)	352	75,680	By Loss in Weight (2% of 1700)	34	—
To Materials	1,348	1,07,840	By Scrap	170	34,000
To Mfg. exp.	—	18,100	By Warehouse (transfer)	1,496	1,67,620
	1,700	2,01,620		1,700	2,01,620

(2) Work-in-Progress (Equivalent Production)

Process costing mainly deals with continuous type of production. At the end of the accounting period, there may be some work-in-progress, i.e., semi-finished goods may be in the pipeline. The valuation of such work-in-progress is done in terms of equivalent or effective production.

Equivalent Production

Equivalent production represents the production of a process in terms of completed units. Work-in-progress at the end of an accounting period are converted into equivalent completed units. This is done by the following formula:

$$\text{Equivalent production} = \text{Completed units} + \left(\text{No. of units of work in progress} \right) \times \left(\text{Degree of completion in \%} \right)$$

For example, if there are 50 units in work-in-progress and these are estimated to be 60% complete, then their equivalent production is $50 \text{ units} \times 60\% = 30 \text{ units}$.

In each process, an estimate is made of the degree of completion of work-in-progress in terms of percentage. Such an estimate must be accurate because any error in such estimation will lead to erroneous valuation of work-in-progress stock which enters into final accounts.

Evaluation of Equivalent Production

After work-in-progress has been converted into equivalent completed units, the following steps are taken to evaluate it:

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- (i) Find out the total cost (net) for each element of cost, i.e., material, labour and overheads. Scrap value of normal loss is deducted from the material cost.
- (ii) Ascertain the cost per unit of equivalent production separately for each element of cost. This is done by dividing the total cost of each element by the respective number of equivalent units.
- (iii) At this rate of cost per unit, ascertain the value of finished production and work-in-progress.

For the purpose of computation of equivalent production and its evaluation, the following three statements are generally prepared:

- (a) Statement of equivalent production
- (b) Statement of cost (per unit)
- (c) Statement of evaluation

These three statements may also be combined in one comprehensive statement called 'Statement of Production, Cost and Evaluation.'

For clear understanding, treatment on equivalent production are classified into the following two categories.

- (a) *When there is no opening stock*, i.e., when there is only closing stock of work-in-progress. In such a situation there may or may not be process losses.
- (b) *When there is opening as well as closing stock*—Here also, there may or may not be process losses.

When there is no opening stock of work-in-progress but there are process losses—as discussed earlier, losses are inherent in process operations. Normal and abnormal process losses are treated differently in the calculation of equivalent production.

Normal Loss—Equivalent units of normal loss are taken as nil. In other words, normal loss is not added in the equivalent production. However, realizable value of normal scrap is deducted from the cost of material so as to calculate the net material cost. This net material cost becomes the basis of calculating the material cost per unit in the statement of cost.

Abnormal Loss—This is treated as if this were good production lost. Abnormal loss, thus, is added to equivalent production with due consideration to its degree of completion. Unless the degree of completion is specified, it may be assumed that abnormal loss units are 100% complete in respect of all elements of cost.

Abnormal Gain—Units of abnormal gain are represented by good finished production. It is therefore, always taken as 100% complete in respect of all elements of cost, i.e., material, labour and overheads. Abnormal gain is deducted to obtain equivalent production.

When there is opening as well as closing stock of work-in-progress

In such a case there are two methods of calculating equivalent production:

- (i) FIFO Method, and (ii) Average Cost Method.

These methods have been discussed in detail, further.

FIFO (First-in, First out) Method

This method is based on the assumption that work-in-progress moves on a first-in-first out basis. This means that unfinished work on the opening stock is completed first, before work on any new units is taken up. Thus no units from opening work-in-progress will be left incomplete and none of these find a place in the closing work-in-progress. In other words, closing stock will be calculated out of the materials introduced during the current period and will be valued at the current cost. The costs incurred during the current period will be distributed over opening stock of work-in-progress (for its completion), units introduced and completed during the period and closing stock of work-in-progress. This is done by dividing the costs incurred by the relevant equivalent production so as to arrive at the per unit cost of equivalent production.

FIFO method gives satisfactory results when prices of materials, rates of wages and overheads are relatively stable.

Computation of Equivalent Production under FIFO Method. The following steps are taken in the computation of equivalent production:

- (i) State the opening stock of work-in-progress in equivalent completed units. This is done by applying the percentage of work needed to complete the unfinished work of the previous period. For example, if there are 200 units of opening work-in-progress which are 70% complete, then the equivalent units of this will be $200 \times 30\%$ (work required to complete the incomplete portion) = 60 units.
- (ii) Ascertain the number of units introduced into the process and deduct the number of units of closing work-in-progress. This gives the number of units started and completed during the period. Add these units to the opening stock of work-in-progress calculated in (i) above.
- (iii) Add to the above the equivalent completed unit of closing work-in-progress. This can be determined by applying the percentage of work done on the finished units at the end of the period.

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NOTES**Average Cost Method**

In this method, the cost of opening work-in-progress is not kept separately but is averaged with the additional costs incurred during the period. This method thus combines the cost of opening work-in-progress and new production. Information relating to degree of completion of opening WIP is not required.

In order to find out the cost per unit of equivalent production, the cost of each element (material, labour and overheads) applicable to the opening work-in-progress is added to the cost incurred in the current period for that element. A single cumulative total and unit cost is obtained. Units completed and transferred as well as closing work-in-progress will be valued at this average unit cost.

FIFO Method vs Average Cost Method

Both FIFO and average methods have certain advantages and it cannot be said that one method is either simpler or more accurate than the other. The main difference between these two methods is regarding the treatment of the opening stock-in-progress.

In FIFO method, opening stock of work-in-progress is kept as a separate figure. Costs incurred to complete this opening work-in-progress are added to the opening work-in-progress cost and the sum of these two costs is the total cost of completed units of opening work-in-progress at which it is transferred to the next process. The units which are introduced in the process and finished during the same period have their own cost per unit which may be different from the completed cost per unit of opening work-in-progress.

In average cost method, on the other hand, the cost of opening work-in-progress is added to material, labour and overhead costs incurred during the period. The cost per unit is computed by dividing the total of these costs by equivalent units.

How to choose between FIFO and Average Method

Both FIFO and Average methods have advantages and disadvantages. If one were to choose between these methods in an examination question, the following rules may be followed:

1. **Use FIFO** – If the cost of the opening work-in-progress in one lump sum figure and the stage of completion is given. For Example:

Given:	Opening work-in-progress	1,000 units
	Cost	₹18,000
Stage of completion:	Materials	100%
	Labour	60%
	Overheads	60%

2. **Use Average** – If the cost of opening work-in-progress is given in terms of materials, labour and overhead but the stage of completion is not given. For example:

Given:	Opening work-in-progress	1,000 units
	Cost—Materials	₹10,000
	Labour	₹4,000
	Overheads	₹4,000

Process Costing

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3. **FIFO or Average—Your Choice** – If the degree of completion and the cost in terms of materials, labour and overheads of the opening work-in-progress are given, then one has a choice between FIFO and Average methods.

For example:

Given:	Opening work-in-progress	1,000 units
Degree of completion and cost:		
Material	(100% Complete)	₹10,000
Labour	(60% Complete)	₹4,000
Overhead	(60% Complete)	₹4,000

4. Where the question specifies a method to be followed, then that method must be followed.

Illustration 9.4: The following information relates to Process X for May 2017:

Opening work-in-progress	200 units		
Introduced during the month	1,600 units		
Completed during the month	1,480 units		
Closing work-in-progress	320 units		
<i>Degree of Completion</i>	<i>Material</i>	<i>Labour</i>	<i>Overheads</i>
Opening work-in-progress	100%	50%	50%
Closing work-in-progress	100%	25%	25%
<i>Costs:</i>	<i>₹</i>	<i>₹</i>	<i>₹</i>
Opening work-in-progress	2,400	320	3,210
Costs incurred during the period	19,200	6,368	6,368

Assuming materials were introduced in the beginning of the process and labour and overhead were incurred uniformly throughout the process, prepare process account using:

- FIFO Method
- Average Method

Solution:**(a) FIFO Method****NOTES**

(i)

Statement of Production

Input Units	Particulars	Output Units	Equivalent Production					
			Material		Labour		Overheads	
			Qty	%	Qty	%	Qty	%
200	Opening WIP	200	—	—	100	50	100	50
1,600	Units introduced	—	—	—	—	—	—	—
—	Finished output	1,280*	1,280	100	1,280	100	1,280	100
—	Closing WIP	320	320	100	80	25	80	25
1,800	Total	1,800	1,600		1,460		1,460	

* Units introduced and completed during the month
 = Units completed – Units of opening W.I.P
 = 1,480 – 200 = 1,280 units.

(ii)

Statement of Cost

Cost element	₹ (A)	Equivalent units (B)	Cost per unit (₹) (A ÷ B)
Material	19,200	1,600	12.00
Labour	6,368	1,460	4.36
Overheads	6,368	1,460	<u>4.36</u>
Total			20.72

(iii)

Statement of Evaluation

Particulars	Elements of cost	Equivalent units	Per unit ₹	Cost ₹	Total cost
Opening WIP	Material	—	—	—	—
	Labour	100	4.36	436	
	Overheads	100	4.36	<u>436</u>	872
Finished Production	Material	1,280	12.00	15,360	
	Labour	1,280	4.36	5,583	
	Overheads	1,280	4.36	<u>5,583</u>	26,526
Closing WIP	Material	320	12.00	3,840	
	Labour	80	4.36	349	
	Overheads	80	4.36	349	4,538

Process A Account

Particulars	Units	₹	Particulars	Units	₹
To Opening WIP (2,400 + 320 + 320)	200	3040	By Completed production (3,040 + 872 + 26,526)	1,480	30,438
To Material	1,600	19,200	By Closing WIP	320	4,538
To Labour		6,368			
To Overheads		6,368			
	1,800	34,976		1,800	34,976

(b) Average Method

Process Costing

(i) Statement of Production

Cost element	₹ (A)	Equivalent units (B)	Cost per unit (₹) (A ÷ B)
Material	19,200	1,600	12.00
Labour	6,368	1,460	4.36
Overheads	6,368	1,460	4.36
Total			20.72

NOTES

(ii) Statement of Cost

₹	Opening W.I.P.	+	Cost incurred	=	Total	Equivalent units	Cost per unit
₹	₹	₹	₹	₹	₹	₹	₹
Material	2,400	+	19,200	=	21,600	÷ 1,800	= 12.00
Labour	320	+	6,368	=	6,688	÷ 1,560	= 4.29
Overheads	320	+	6,368	=	6,688	÷ 1,560	= 4.29
Total							20.58

(iii) Statement of Evaluation

Particulars	Element of cost	Equivalent units	Per unit ₹	Cost ₹	Total cost ₹
Finished units	Material	1,480	12.00	17,760	
	Labour	1,480	4.29	6,345	
	Overheads	1,480	4.29	6,345	30,450
Closing WIP	Material	320	12.00	3,840	
	Labour	80	4.29	343	
	Overheads	80	4.29	343	4,526

Process Account

Particulars	Units	₹	Particulars	Units	₹
To Opening WIP	200	3,040	By Finished output	1,480	30,450
To Material	1,600	19,200			
To Labour	—	6,368	By Closing WIP	320	4,526
To Overheads	—	6,368			
	1,800	34,976		1,800	34,976

(3) Internal Process Profits

In some businesses, it is a practice to charge the output of each process to the next process not at cost but at a price showing profit to the transferor process. The transfer price may be either the current market price or cost plus a fixed percentage. Thus each process is charged with its input at current price and no process obtains the benefits of saving or has to bear the losses caused by the efficiency or inefficiency of the earlier processes. In brief, the objects of such internal process profit are:

- (a) To show whether the cost in each process competes with the market prices.

- (b) To make each process stand on its own efficiency and economy.
- (c) To assist in making decisions, such as to buy a partly-processed material rather than to process work internally or to sell a partly-processed product or to process it further.

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Internal process profits have the disadvantage of complicating the costing records. The complications brought into the accounts arise from the fact that inter-process profit, so introduced, remains included in the price of process stocks, finished stocks and work-in-progress. For balance sheet purposes, such stocks have to be reduced to actual cost because a firm cannot make profits by trading with itself.

The inclusion of inter-process profits should be best avoided unless the benefits outweigh the added complications. However, the object of internal process profits can also be achieved by making separate cost analysis and reports outside the costing records or by adopting a standard costing system where standard should be set for each process.

The procedure involved in inter-process profits is demonstrated in the following illustration.

Illustration 9.5: 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 2010:

<i>Particulars</i>	<i>Processes</i>		<i>Finished Stock</i>
	<i>I</i>	<i>II</i>	
Opening stock	₹7500	₹9000	₹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. Stocks in processes are valued at prime cost. Finished stock is valued at the price at which it is received from Process II. Sales during the period is ₹1,40,000.

Required: Process Cost Accounts and Finished Stock Account showing the profit element at each stage.
(CA Inter)

Process Costing

Solution:

Process I Account							
	<i>Cost</i> ₹	<i>Profit</i> ₹	<i>Total</i> ₹		<i>Cost</i> ₹	<i>Profit</i> ₹	<i>Total</i> ₹
To Opening stock	7,500	—	7,500	By Process II	40,500	13,500	54,000
To Direct material	15,000	—	15,000				
To Direct wages	<u>11,200</u>	<u>—</u>	<u>11,200</u>				
	33,700		33,700				
Less: Closing stock	<u>3,700</u>		<u>3,700</u>				
	30,000	—	30,000				
To Factory overheads	<u>10,500</u>	<u>—</u>	<u>10,500</u>				
	40,500	—	40,500				
To Profit	<u>—</u>	<u>13,500</u>	<u>13,500</u>		<u> </u>	<u> </u>	<u> </u>
	40,500	13,500	54,000		40,500	13,500	54,000

Process II Account							
	Cost ₹	Profit ₹	Total ₹		Cost ₹	Profit ₹	Total ₹
To Opening stock	7,500	1,500	9,000	By Finished stock a/c	75,750	36,750	1,12,500
To Process I	40,500	13,500	54,000				
To Direct material	15,750	—	15,750				
To Direct wages	<u>11,250</u>	<u>—</u>	<u>11,250</u>				
	75,000	15,000	90,000				
Less: Closing stock	<u>3,750</u>	<u>750</u>	<u>4,500</u>				
	71,250	14,250	85,500				
To Factory overheads	<u>4,500</u>	<u>—</u>	<u>4,500</u>				
	75,750	14,250	90,000				
To Profit	<u>—</u>	<u>22,500</u>	<u>22,500</u>				
	75,750	36,750	1,12,500		75,750	36,750	1,12,500

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Finished Stock Account

	Cost ₹	Profit ₹	Total ₹		Cost ₹	Profit ₹	Total ₹
To Opening stock	14,250	8,250	22,500	By Sales	82,500	57,500	1,40,000
To Process II	<u>75,750</u>	<u>36,750</u>	<u>1,12,500</u>				
	90,000	45,000	1,35,000				
Less: Closing stock	<u>7,500</u>	<u>3,750</u>	<u>11,250</u>				
	82,500	41,250	1,23,750				
To Profit	<u>—</u>	<u>16,250</u>	<u>16,250</u>				
	82,500	57,500	1,40,000		82,500	57,500	1,40,000

Working Notes:

1. Reserve for unrealized profit in closing stock

Process I: Nil

Process II:

$$\text{Cost of stock} = \frac{\text{Cost}}{\text{Total}} \times \text{Closing stock} = \frac{75,000}{90,000} \times 4,500 = ₹3,750$$

$$\text{Profit} = \text{Total} - \text{Cost} = 4,500 - 3,750 = ₹750$$

Finished Stock

$$\text{Cost of stock} = \frac{\text{Cost}}{\text{Total}} \times \text{Closing stock} = \frac{90,000}{1,35,000} \times 11,250 = ₹7,500$$

$$\text{Profit} = \text{Total} - \text{Cost} = 11,250 - 7,500 = ₹3,750$$

2. Profit for the month

	₹	₹
Process I:	...	13,500
Process II:	22,500	
Add: Unrealized profit in opening stock	<u>1,500</u>	
	24,000	
Less: Unrealized profit in closing stock	<u>750</u>	23,250
Finished stock	16,250	
Add: Unrealized profit in opening stock	<u>8,250</u>	
	24,500	
Less: Unrealized profit in closing stock	<u>3,750</u>	<u>20,750</u>
Total profit		<u>57,500</u>

Check Your Progress

1. How is the finished output of the last process treated?
2. What is normal process loss?
3. State the disadvantage of internal process profits.

9.3 ACCOUNTING FOR JOINT AND BY PRODUCTS

The term joint products is used for two or more products of almost equal economic value, which are simultaneously produced from the same manufacturing process and the same raw material. Joint products thus represent two or more products separated in the course of processing, each product being in such proportion and of such economic significance that no single one of them can be regarded as the main product.

Characteristics of joint products are:

- (a) Joint products are produced from the same raw material in natural proportions
- (b) They are produced simultaneously by a common process
- (c) They are comparatively of almost equal value
- (d) Joint products may be saleable after separation or may be further processed by incurring additional costs to make them saleable or an improved product

A classic example of joint products, as given above, is found in oil refining, where items like petrol, diesel, naptha and kerosene are produced from the crude oil. Other examples are in flour mill, where joint products are white flour, brown flour, animal feeding stuff; in meat canning where joint products are hides, canned meat, fertilizers, etc. The term joint product is also used to describe various qualities of the same product, as for example, many grades of coal which may be produced in coal mining.

Accounting for Joint Products

Accounting for joint products means the apportionment of joint cost to each of the joint product. Such apportionment serves the following objectives:

- (a) To determine the cost per unit of products
- (b) To help in inventory valuation
- (c) To determine the profit or loss on each line of product
- (d) To determine the price of each product

The various methods of apportionment of joint costs (discussed below) are based mainly on individual opinion and tend to produce only approximate results. This is because no perfectly logical basis exists for the apportionment of joint costs to products and most of the methods are arbitrary. Therefore, while selecting a particular methods it should be kept in mind that the method should be logical, appropriate and reliable and should be consistently followed. Following are the main methods of apportionment of joint costs over joint products:

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1. **Sales Value Method:** Under this method, joint costs are apportioned to various joint products on the basis of sales value of each such product. The sale value method has the following variants:

(a) *On the basis of unit prices:* In this method, the selling prices per unit of various joint products is taken as the basis for apportionment of joint costs. In other words, joint cost is apportioned to various joint products in the ratio of selling prices of individual joint products without any regard to the quantities. It is thus suitable when the number of units of production of all the products are equal. It is illustrated below with assumed figures.

Example: Joint cost ₹9,000

Products per unit	Selling price (Ratio 12 : 8 : 4) ₹	Apportioned cost ₹
A	12	4,500
B	8	3,000
C	4	1,500
Joint cost ₹9,000		

(b) *On the basis of sales value:* In this method, the apportionment is done on the basis of weighted sales value, i.e., number of units produced and sold × selling price per unit. This method thus gives due consideration to the quantities of various joint products produced. The difference between the method based on unit selling prices discussed earlier and this method is that while the former gives no consideration to the quantities of joint products produced, the latter gives due importance to the quantities. This method will give satisfactory results even when number of units of different joint products are widely different. The method is illustrated below with assumed figures:

Example: Joint cost ₹9,000

Products (24 : 48 : 28)	Selling price per unit (a) ₹	Production quantities units (b)	Sales value (a) × (b) (c) ₹	Apportioned joint cost (d) ₹
A	12	200	2,400	2,160
B	8	600	4,800	4,320
C	4	700	2,800	2,520
Total			10,000	9,000

2. **Reverse Cost Method** (Net realisable value method): In this method, the joint cost is apportioned on the basis of net value of each product. The net realisable value is calculated by deducting the following from the sales value.

- (a) Estimated profit margin
- (b) Selling and distribution costs, if any
- (c) After split off processing costs

The net realisable values of individual products so obtained are taken as the basis for apportioning joint costs. This is known as reverse cost method because net realisable values are calculated by working backwards from sales values. This method is particularly used when products are not sold at their stage at split off point but require further processing. Operation of this method is illustrated below.

Illustration 9.6: In processing a basic raw material, three joint products 'X', 'Y' and 'Z' are produced. The joint expenses of manufacturing are: Materials ₹10,000; Labour ₹8,000; Overheads ₹9,000 (Total ₹27,000). Subsequent expenses are as follows:

	X ₹	Y ₹	Z ₹
Material	2,000	1,600	1,800
Labour	2,500	1,400	1,700
Overheads	2,500	1,000	1,500
Total	7,000	4,000	5,000
Sales Value	42,000	20,000	18,000
Estimated profit on sales	50%	50%	33 1/3%

Show how you would apportion the joint costs of manufacture by Reverse Cost Method.

Solution:

Statement of Apportionment of Joint Costs

	X ₹	Y ₹	Z ₹
Sales value	42,000	20,000	18,000
Less: Estimated profit on sales	21,000	10,000	6,000
Estimate total cost	21,000	10,000	12,000
Less: Subsequent costs (total)	7,000	4,000	5,000
Joint costs (₹27,000) apportioned	14,000	6,000	7,000

3. Physical Units Method: Under this method, the joint cost is apportioned on the basis of relative weight, volume or quantity, etc., of each product, obtained at the point where the split-off occurs. For the method to be suitable, the unit of measurement should be applicable for all products, e.g., usually gases, liquids and solids cannot be taken together. However, where joint products cannot be measured by the same measurement unit, the joint products must be converted to a denominator common to all the units produced. For instance in the manufacture of coke, products such as coke, coal tar, benzol, sulphate of ammonia, gas, etc., are measured in different units. The yield of these recovered units is measured on the basis of quantity of product extracted per tonne of coal. This is illustrated as follows:

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Illustration 9.7: The following data have been extracted from the books of Coke Co. Ltd:

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<i>Joint products</i>	<i>Yield (in lbs) of recovered products per tonne of coal</i>
Coke	1,420
Coal tar	120
Benzol	22
Sulphate of ammonia	26
Gas	412
	<u>2,000</u>

The price of coal is ₹80 per tonne. The direct labour and overhead costs to the point of split-off are ₹40 and ₹60, respectively, per tonne of coal.

Calculate the material, labour and total cost of each product on the basis of weight.

Solution:

Statement of Apportionment of Joint Cost

	<i>Yield in lbs</i>	<i>% of total</i>	<i>Apportionment of Cost</i>			
			<i>Coal labour</i>	<i>Direct</i>	<i>Overheads</i>	<i>Total</i>
			₹	₹	₹	₹
Coke	1,420	71.0	56.80	28.40	42.60	127.80
Coal tar	120	6.0	4.80	2.40	3.60	10.80
Benzol	22	1.1	0.88	0.44	0.66	1.98
Sulphate of ammonia	26	1.3	1.04	0.52	0.78	2.34
Gas	412	20.6	16.48	8.24	12.36	37.08
Total	2,000	100	80.00	40.00	60.00	180.00

4. Average Unit Cost Method: In this method, the joint cost is apportioned by using the average unit cost which is obtained by dividing the total joint cost by the total number of units produced of all the products. The average cost per unit of each product is the same. The procedure is illustrated as follows.

Illustration 9.8: From the following particulars, find out the cost of joint products A, B and C under the average unit cost method.

(a) Pre-separation point cost ₹30,000

(b) Other production data:

<i>Product</i>	<i>Units produced</i>
X	1,000
Y	400
Z	600
	2,000

Solution:

Process Costing

$$\text{Average unit cost} = \frac{\text{joint cost}}{\text{Total no. of units produced}} = \frac{\text{₹30,000}}{2,000 \text{ units}} = \text{₹15 per unit}$$

Statement of Apportionment of Joint Cost

Product	Units produced	Average cost (A)	Apportioned cost ₹(B) (₹)A
× B = C			
X	1,000	15	15,000
Y	400	15	6,000
Z	600	15	9,000
Total	2,000		30,000

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5. Survey Method: This method apportions the joint cost to various products, on the basis of the results of a survey or technical evaluation. In this survey, various factors, like volume, selling price, marketing process, etc., are studied and points or weights are assigned to each product. Costs are apportioned on the basis of such weights or points.

Illustration 9.9: X, Y and Z are the three joint products in a factory. Their joint cost is ₹30,000. Quantities produced are as follows:

X	1,000
Y	400
Z	600

On the basis of technical evaluation, points allotted to X, Y and Z products are 3.2, 5 and 8 per unit, respectively. Apportion the joint cost.

Solution:**Statement of Apportionment of Joint Cost**

Product produced	Units assigned	Points units	Weighted weighted	*Cost per cost unit	Apportioned (32 : 20 : 48)
	(a)	(b)	(c) = (a) × (b)	(d)	(e)
				₹	₹
X	1,000	3.2	3,200	3.00	9,600
Y	400	5.0	2,000	3.00	6,000
Z	600	8.0	4,800	3.00	14,400
Total			10,000	3.00	30,000

$$* \frac{\text{Joint cost}}{\text{Total no. of weighted units}} = \frac{₹30,000}{10,000} = ₹3 \text{ per unit.}$$

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By-Products

By-products are products of relatively small value which are incidentally and unavoidably produced in the course of manufacturing the main product. For example, in sugar mills, the main product is sugar. But baggasse and molasses of comparatively smaller value are incidentally produced and thus are by-products. Other examples of by-products are oil cake produced in the extraction of edible oil; cotton seed produced in cotton textile industry, etc. These by-products are unavoidably produced and are of secondary value. The sales value of these by-products is much less as compared to the main product. For example, sales value of by-products bagasse and molasses is much less than that of the main product sugar.

By-products may be:

- (a) Those sold in their original form without further processing
- (b) Those which require further processing in order to be saleable

Examples of By-products

<i>Industry</i>	<i>By-products</i>
1. Sugar	Bagasse, Molasses
2. Cotton textile	Cotton seed
3. Edible oil	Oil cake
4. Meat	Bones
5. Rice mills	Husk

Distinction between Joint Products and By-products

There are no hard and fast rules to distinguish between joint products and by-products. A product may be treated as a joint product in one business and the same product may be treated as a by-product in another business. However, the following factors should be considered to determine if a product is a joint product or a by-product.

- (a) **Relative sales value:** If the sales value of all the products are more or less equal, they are treated as joint products. If, however, there are wide differences in the relative sales values of products, the product with the greater sales value is treated as the main product and the products of lower value are treated as by-products.
- (b) **Objective of manufacture:** If the objective of manufacturing is product *A*, then unwanted products *B* and *C* be treated as by-products.

- (c) **Policy of management:** The management may decide to treat a particular product as the main product and the other products as by-products. Alternatively, it may choose to treat all products as joint products.

By-products, Scrap and Waste

By-products should not be confused with waste or scrap. Waste is used to describe a material which has no value or even negative value, if it has to be disposed of at some cost. Examples of waste are gases, smoke and other unsaleable residues from the manufacturing process.

Scrap is also different from by-products in the sense that it is the leftover part of the raw materials whereas by-products are different from the material which went into the production process. Small pieces of wood left in furniture manufacture or metal sheet pieces left in utensil manufacture are examples of scrap, whereas minor chemicals, having some value, emerging from a chemical process are classified as by-products. Sale value of scrap is relatively less than that of by-products. However accounting treatment for scrap and by-products is quite similar.

Accounting for By-products

Various methods of accounting for by-products are as follows:

1. **Where by-products are of small total value:** In such a case it is not considered practicable to apportion any part of the joint cost to by-products. The net income realized by the sale of by-products may be treated in any one of the following two ways:

- (i) It may be treated as 'miscellaneous income' and credited to the Costing Profit and Loss Account.
- (ii) It may be credited to the process account in which the by-product has arisen.

In determining the net income from by-products, the following should be deducted from the sales value of by-products: (i) any selling and distribution expenses incurred in the sale of by-products; and (ii) any costs incurred in further processing of by-products to make them saleable.

2. **Where by-products are of considerable total value:** Where by-products are of considerable sales value, it is proper to apportion a part of the joint cost to by-products. Such apportioned cost of by-products is debited to by-product account and credited to the main product account or the relevant process account. Any cost incurred in further processing of the by-product is debited to by-product account. The by-product account is credited with its sales value and any profit/loss arising out of this account is transferred to costing Profit and Loss Account.

The apportionment of joint cost to by-products can be done by any of the four methods discussed earlier in costing of joint products. These methods are: (i) Sales value method; (ii) Physical units method; (iii) Average cost method; and (iv) Points value or survey method.

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3. Where by-products require further processing: In such situations, the share of by-product in joint-cost at the split-off point may be arrived at by subtracting the profit and the further processing cost from the realizable value of the products, *i.e.*, by using Reverse Cost Method. In case the cost of the by-products at the split-off point is small or negligible, it may be treated as per the method (a) discussed above. On the contrary, if it is of considerable amount, it is treated as per method (b) discussed above, *i.e.*, joint cost is apportioned to by-products.

Illustration 9.10: Product Z yields two by-products A and B. The joint cost of manufacture is ₹65,800. From the following information, show how would you apportion the joint cost of manufacture:

	Z	A	B
(i) Sales ₹	1,00,000	40,000	25,000
(ii) Manufacturing costs after separation ₹		5,000	4,000
(iii) Estimated selling expenses on sales		20%	20%
(iv) Estimated profit on sales		25%	30%

Solution:

Statement of Cost of By-products—A and B

	A ₹	B ₹
Sales	40,000	25,000
Less: Profit	10,000	7,500
	30,000	17,500
Less: After separation costs	5,000	4,000
Selling expenses	8,000	5,000
Share in joint cost	17,000	8,500

Statement of Cost of Product Z

		₹	₹
Total joint cost			65,800
Less: Joint cost apportioned to	A	17,000	
	B	8,500	25,500
Cost of Product Z			40,300

4. Where by-product is utilized in the undertaking itself: In those cases where by-products are used by the company itself as a raw material for some other process, such by-products may be priced at the opportunity cost. The opportunity cost is that cost which would have been incurred had the by-product been purchased from an outside firm. For example, a company is running a sugar plant as well as a paper plant. The bagasse, a by-product of sugar plant, may be

utilized in manufacture of paper as raw material. So credit for the cost of the bagasse would be given to the sugar cost at the price which the company would have otherwise paid to buy it from an outside firm for the manufacture of paper.

Decision regarding Further Processing of Joint and By-products

Apportionment of joint costs is not relevant in decision making regarding further processing of joint or by-products. Whenever management has to take a decision whether or not to further process a joint product or by-product after split-off, decision will be taken by comparing the incremental revenue after split-off point with the incremental cost after split-off point. So long as the incremental revenue is more than the incremental cost on further processing of a joint or a by-product, it is profitable to further process the product, not otherwise.

Illustration 9.11: A company produces two joint products *P* and *Q*, their cost upto separation point being ₹47,000. These products can be sold at the split-off point at ₹150 and ₹350 per unit, respectively. Alternatively, the two products can be further processed at a cost of ₹15,000 and ₹12,000, respectively. After further processing these can be sold at ₹320 and ₹500 per unit, respectively. The output of *P* is 150 units and of *Q* is 60 units.

Advise whether these products should be sold at split-off point or these should be processed further.

Solution:

Statement Showing Incremental Profit/Loss

	Product <i>P</i>	Product <i>Q</i>
Output	150 units	60 units
Incremental revenue from further processing		
<i>P</i> (₹320 – 150) × 150 units	₹25,500	
<i>Q</i> (₹500 – 350) × 60 units		₹9,000
Less: Incremental cost	15,000	12,000
Incremental Profit/loss (–)	10,500	(–) 3,000

Conclusion: Product *P* should be processed further because it gives an incremental profit of ₹10,500 whereas product *Q* should be sold at split-off point because it results in incremental loss of ₹3,000.

Check Your Progress

4. Give examples of joint costs.
5. What is the reason behind the name reverse cost method?

9.4 ANSWERS TO CHECK YOUR PROGRESS

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NOTES**QUESTIONS**

1. The finished output of the last process that is the final product is transferred to the finished goods account.
2. That amount of loss which cannot be avoided because of the nature of material or process is normal process loss. Such a loss is quite expected under normal conditions.
3. Internal process profits have the disadvantage of complicating the costing records. The complications brought into the accounts arise from the fact that inter-process profit, so introduced, remains included in the price of process stocks.
4. Some examples of joint costs are raw material, labour and overheads.
5. The reverse cost method is named so because net realizable values are calculated by working backwards from sales values.

9.5 SUMMARY

- Process costing is the most widely used method of cost ascertainment. It is used in mass production industries producing standard products, like steel, sugar and chemicals.
- In all such industries, goods produced are identical and all factory processes are standardized. Goods are produced without waiting for any instructions or orders from customers and are put into warehouse for sale.
- In industries which employ process costing, a certain amount of loss occurs at various stages of production. Such a loss may arise due to chemical reaction, evaporation, inefficiency, etc. It is, therefore, necessary to keep accurate records of both input and output. Where loss occurs at a late stage in manufacture, it is apparent that financial loss is greater.
- There are certain accounting adjustments which are peculiar to process costing: process losses and wastages, equivalent production and inter-process profits.
- In some businesses, it is a practice to charge the output of each process to the next process not at cost but at a price showing profit to the transferor process. The transfer price may be either the current market price or cost plus a fixed percentage. Thus each process is charged with its input at current price and no process obtains the benefits of saving or has to bear the losses caused by the efficiency or inefficiency of the earlier processes.
- The term joint products is used for two or more products of almost equal economic value, which are simultaneously produced from the same manufacturing process and the same raw material.

- The various methods of apportionment of joint costs are based mainly on individual opinion and tend to produce only approximate results. This is because no perfectly logical basis exists for the apportionment of joint costs to products and most of the methods are arbitrary. Therefore, while selecting a particular method it should be kept in mind that the method should be logical, appropriate and reliable and should be consistently followed.
- By-products should not be confused with waste or scrap. Waste is used to describe a material which has no value or even negative value, if it has to be disposed of at some cost. Examples of waste are gases, smoke and other unsaleable residues from the manufacturing process.

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9.6 KEY WORDS

- **Process Costing:** Process costing is the methodology used to allocate the total costs of production to homogenous units produced via a continuous process that usually involves multiple steps or departments
- **Joint Products:** Joint products are multiple products generated by a single production process at the same time.
- **By-Products:** It refers to products of relatively small value which are incidentally and unavoidably produced in the course of manufacturing the main product

9.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. State the essential characteristics of process costing.
2. How are normal and abnormal losses treated in the calculation of equivalent production?
3. State the characteristics of joint products.
4. Differentiate between joint products and by-products.
5. What is the difference between by-products, scrap and waste?
6. Write a short note on the inter process profits.

Long Answer Questions

1. Describe the different methods of accounting for joint products.
2. Explain accounting for by-products.
3. A product passes through two processes. The output of Process I becomes

the input of Process II and the output of Process II is transferred to warehouse. The quantity of raw materials introduced into Process I is 20,000 kgs at ₹10 per kg. The cost and output data for the month under review are as under:

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	<i>Process I</i>	<i>Process II</i>
Direct materials	₹60,000	₹40,000
Direct labour	₹40,000	₹30,000
Production overheads	₹39,000	₹40.250
Normal loss	8%	5%
Output	₹18,000	₹17,400
Loss realization of ¹ /unit	2.00	3.00

The company's policy is to fix the selling price of the end product in such a way as to yield a profit of 20% on selling price.

Required:

- (i) Prepare the Process Accounts
- (ii) Determine the selling price per unit of the end product.

4. A coke manufacturing company produces the following products by putting 5,000 tonnes of coal @ 25 per tonne into common process:

Coke	3,500 tonnes
Tar	1,200 tonnes
Sulphate	52 tonnes
Benzol	48 tonnes

Apportion the joint cost amongst the products on the basis of physical units method.

9.8 FURTHER READINGS

Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.

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UNIT 10 CONTRACT COSTING: TYPES AND PROCEDURE

*Contract Costing:
Types and Procedure*

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Structure

- 10.0 Introduction
- 10.1 Objectives
- 10.2 Procedure for Contract Costing
- 10.3 Types of Contract Costing
 - 10.3.1 Profit from Incomplete Contract
 - 10.3.2 Escalation Clause
 - 10.3.3 Cost-plus Costing
- 10.4 Answers to Check Your Progress Questions
- 10.5 Summary
- 10.6 Key Words
- 10.7 Self Assessment Questions and Exercises
- 10.8 Further Readings

10.0 INTRODUCTION

You have already learnt in Unit 7 that contract costing is a sub-type of job costing. Herein accounts for each and every contract is opened separately since each contract is considered to be a cost unit. This type of costing has several benefits. It helps the managers ascertain cost per contract, the total cost of contracts as well as the profit made over every contract. There is also no delay in the work being completed. The managers have a control over the performance of the contract and there are minimal chances of incurring losses. In this unit, you will learn the procedure of contract costing and will further learn about the different types of contract costing.

10.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the procedure for contract costing
- Explain special points related to contract costing
- Describe the types of contract costing

10.2 PROCEDURE FOR CONTRACT COSTING

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The basic procedure for costing of contracts is as follows:

1. **Contract account:** Each contract is allotted a distinct number and a separate account is opened for each contract.
2. **Direct costs:** Most of the costs of a contract can be allocated direct by to the contract. All such direct costs are debited to the contract account. Direct costs for contracts include: (i) Materials; (ii) Labour and supervision; (iii) Direct expenses; (iv) Depreciation of plant and machinery; (v) Sub-contract costs, etc.
3. **Indirect costs:** Contract account is also debited with overheads which tend to be small in relation to direct costs. Such costs are often absorbed on some arbitrary basis as a percentage on prime cost, or materials, or wages, etc. Overheads are normally restricted to head office and storage costs.
4. **Transfer of materials or plant:** When materials, plant or other items are transferred from the contract, the contract account is credited by that amount.
5. **Contract price:** The contract account is also credited with the contract price. However, when a contract is not complete at the end of the financial year, the contract account is credited with the value of work-in-progress as on that date.
6. **Profit or loss on contract:** The balance of contract account represents profit or loss which is transferred to Profit and Loss Account. However, when contract is not completed within the financial year, only a part of the profit arrived is taken into account and the remaining profit is kept as reserve to meet any contingent loss on the incomplete portion of the contract. This is discussed in detail later in this unit.

Special Points in Contract Costing

Some of the important points to be considered in contract costing are now discussed:

Cost of Materials

Materials include: (i) materials specifically purchased for the contract; (ii) materials issued from store against material requisition notes. The cost of both these types of materials is debited to the contract account.

Materials Returned to Store: Whenever materials are issued in excess of requirements, for instance, cement, sand, pipes and bricks, these are later returned to the store accompanied by a Material Return Note which gives the details of the materials returned. Such returned materials are credited to contract account.

Materials at Site: At the end of each accounting period, value of materials lying unused at site is credited to contract account and is carried forward for charging against the next period.

Cost of Labour

All wages of workers engaged on a particular contract are charged direct to the contract, irrespective of the type of work they perform. When several contracts are running at different locations, payroll is normally sectionalized so as to have separate payroll for each contract. Difficulties in costing may be encountered when some workers may have to move from one site to another if a number of small contracts are undertaken. In such situations, it becomes necessary to provide time sheets from which allocations can be made. In order to control labour utilization and prevent fraud in the payment of wages, surprise visits by head-office personnel will be necessary.

Plant

There are two different methods of dealing with depreciation of plant in contract account:

- (a) Contract account is debited with the cost of the plant installed. When the contract is completed or the plant is no longer required, the plant is revalued and contract account is credited with this revalued or depreciated figure. In case plant is sold on the completion of the contract, the contract account is credited with its sale proceeds. The net effect of the above debit and credit will be that the contract account will stand debited with the amount of depreciation, which is the difference between the value of plant debited and value of plant credited. The method is generally used on long contracts which extend over more than one year because depreciated value of the plant is credited to the contract account and brought down as an opening balance in the next period.
- (b) Alternatively, contract account is simply debited with the amount of depreciation. It is usual to use this method when plant is sent to contract only for a short period. For example, mobile crane or bulldozer used in a contract may be charged on this basis.

However, when a plant is hired for a contract, a charge for the hire of the plant is debited to the contract as a direct expense.

Sub-contracts

Work of specialized character, for which facilities are not internally available, is offered to a sub-contractor. For example, steel work, glass work, painting, etc., is usually carried out by the sub-contractors who are accountable to the main contractor. The cost of such work is charged to the contract account.

Payment based on Architect's Certificate

In case the contract is small, full payment is usually made on the completion of the contract. But in case of large contracts, it may take more than one year to complete. In such a case, if no payment is received until the completion of the contract, the financial resources of the contractor could surely become strained. Therefore, a system of progress payments is followed. In this system, part payments of the contract amount are paid from time to time on the basis of certificate issued by the

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architects (acting for the contractee), certifying the value of the work satisfactorily completed. Such payments received by the contractor are usually credited to the personal account of the contractee. It should be noted that such payments are not entered in the Contract Account.

Work Certified and Work Uncertified

When the contract is not completed till the end of the accounting year, the architect is required to value the work-in-progress. Such work-in-progress is classified into work certified and work uncertified.

Work Certified: This is that part of the work-in-progress which has been approved by the contractee's architect or engineer for payment. Work certified is valued at contract price (*i.e.*, selling price), and includes an element of profit.

Work Uncertified: This is that part of the work-in-progress which is not approved by the architect or engineer. This is valued at cost and thus does not include an element of profit.

Both work certified and uncertified appear on the credit side of the contract account and also on the assets side of the balance sheet.

Retention Money and Cash Ratio

It is a usual practice not to pay the full amount of work certified. The contractee may pay a fixed percentage, say 80% or 90% of the work certified, depending upon the terms of the contract. This is known as *Cash Ratio*. The balance amount not paid is known as *Retention Money*. For example, if cash ratio is 75%, the retention money will be the remaining 25%. This retention money is a type of security for any defective work which may be found in the contract later on. This also works as a deterrent for the contractor to leave the contract incomplete, if he finds the contract unprofitable. The retention money may also be adjusted against penalties that become due if the contract is not completed within the stipulated time as per the terms of the agreement.

Extra Work

Sometimes the contractor is required to do some extra work like additions or alterations in the work originally done as per agreement. The contractor will charge extra money for such extra work. The cost of such extra work is debited to the contract account and extra price realized is credited to the contract account.

Check Your Progress

1. How are direct costs treated in contract accounts?
2. What is work uncertified?

10.3 TYPES OF CONTRACT COSTING

In this section, you will study the different types of contracts and in essence types of contract costing.

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10.3.1 Profit from Incomplete Contract

Contracts which are started and finished during the same financial year create no accounting problems. But in case of those contracts which take more than one year to complete, a problem arises whether profit on such contracts should be worked out only on the completion of the contract or at the end of each financial year on the partly completed work. If profit is computed only on the completion of the contract, profit will be high in the year of completion of the contract, whereas in other years of working on contract, profit will be nil. This would result not only in distorted profit pattern but also higher tax liability because income tax at higher rates may have to be paid. Therefore, when contracts extend beyond a year, it becomes necessary to take into account the profit earned (or loss incurred) on the work performed during each year. This helps in avoiding distortion of the year-to-year profit trend of the business.

There are two aspects of profit computation:

- (a) Computation of notional profit or estimated profit.
- (b) Computation of the portion of such profit that is to be transferred to Profit and Loss Account.

Notional Profit

Notional profit is the difference between the value of work-in-progress certified and the cost of work-in-progress certified. It is computed as follows (Figures are assumed):

	₹
Value of work certified	20,00,000
Add: Cost of work not yet certified	1,50,000
	<u>21,50,000</u>
Less: Cost of work to date	19,00,000
Notional Profit	<u>2,50,000</u>

If in any year, cost of work done exceeds the value of work certified and uncertified, the result will be a notional loss.

Estimated Profit

Estimated profit represents the excess of the contract price over the estimated total cost of the contract. It is computed as follows (Figures are assumed):

	₹
Contract Price	30,00,000
Less: Total cost already incurred	21,00,000
	<u>9,00,000</u>
Less: Estimated additional costs to complete the contract	3,50,000
Estimated Profit	<u>5,50,000</u>

Portion of Notional Profit or Estimated Profit to be Transferred to Profit and Loss Account

The portion of the notional or estimated profit to be transferred to P&L Account depends upon the stage of completion of the contract, i.e., ratio of work-in-progress

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certified to total contract work. For this purpose work-in-progress uncertified is not considered. Prudence requires that the total notional profit should not be transferred to P&L Account but a portion of it should be withheld as a reserve to meet any unforeseen future expenses or contingencies.

Rules: There are no hard and fast rules in this regard. However, the following general rules may be followed in this context.

1. When work certified is less than 1/4 of the contract price, no profit is transferred to Profit and Loss Account. This is based on the principle that no profit should be taken into account unless the contract has advanced reasonably.
2. When work-in-progress certified is 1/4 or more but less than 1/2 of the contract price, then generally 1/3 of the profit is transferred to Profit and Loss Account. The balance amount is treated as reserve. Thus, profit to be transferred to Profit and Loss Account is computed by the following formula:

$$\text{Transfer to P\&L A/c} = \text{Notional Profit} \times \frac{1}{3}$$

Alternatively, a more common practice is to further reduce this amount by the cash ratio.

$$\text{Thus: Transfer to P\&L A/c} = \text{Notional profit} \times \frac{1}{3} \times \frac{\text{Cash received}}{\text{Work certified}}$$

3. When work certified is 1/2 or more but less than 9/10 of the contract price, (*i.e.* 50% to 90%), then the profit to be transferred to P & L Account is computed as follows:

$$\text{Transfer to P\&L A/c} = \text{Notional Profit} \times \frac{2}{3}$$

Here also a more common practice is to further reduce this amount by cash ratio. This is shown below:

$$\text{Transfer to P\&L A/c} = \text{Notional Profit} \times \frac{2}{3} \times \frac{\text{Cash received}}{\text{Work certified}}$$

4. When contract is near completion, then the estimated profit should be calculated on the whole contract. The proportion of estimated profit to be transferred to Profit and Loss Account is computed by any one of the following formulas:

$$(a) \text{ Estimated profit} \times \frac{\text{Work certified}}{\text{Contract price}}$$

$$(b) \text{ Estimated profit} \times \frac{\text{Work certified}}{\text{Contract price}} \times \frac{\text{Cash received}}{\text{Work certified}}$$

$$(c) \text{ Estimated profit} \times \frac{\text{Cost of work to date}}{\text{Estimated total cost of work}}$$

$$(d) \text{ Estimated profit} \times \frac{\text{Cost of work to date}}{\text{Estimated total cost of work}} \times \frac{\text{Cash received}}{\text{Work certified}}$$

5. **Loss on Uncompleted Contracts:** In the event of a loss on uncompleted contracts, this should be transferred in full to the Profit and Loss Account, whatever be the stage of completion of the contract.

It was stated earlier also that these are not hard and fast rules. The practice may vary from firm-to-firm depending upon the nature of work involved, degree of risk in the business, extent of work completed, etc. But whatever method is adopted, it should be applied consistently from year-to-year so as not to disturb the trend of profits.

Illustration 10.1: Raja Construction Ltd took a contract in 2018 for road construction. The contract price was ₹10,00,000 and its estimated cost of completion would be ₹9,20,000. At the end of 2018, the company has received ₹3,60,000, representing 90% of the work certified. Work not yet certified had a cost of ₹10,000.

Expenditure incurred on the contract during 2018 was as follows:

Materials ₹50,000, Labour ₹3,00,000, Plant ₹20,000.

Materials costing ₹5,000 were damaged and had to be disposed of for ₹1,000. Plant is considered as having depreciated by 25 per cent.

- (i) Prepare Contract Account for 2018 in the books of Raja Construction Ltd.
- (ii) Show all possible figures that can be reasonably credited to Profit and Loss Account in respect of the contract.

Solution:

(i) Contract A/c for the year 2018			
	₹		₹
To Materials	50,000	By Materials damaged	5,000
To Labour	3,00,000	By Plant at site	15,000
To Plant	20,000	By Work-in-progress:	
To Profit (Notional)	60,000	Work certified	4,00,000*
		Work uncertified	10,000
	<u>4,30,000</u>		<u>4,30,000</u>

* Working Note: Work certified = ₹3,60,000 ÷ 90% = ₹4,00,000.

- (ii) **Amount of profit that may be taken to Profit and Loss Account:**

The contract price is ₹10,00,000

The work certified is ₹4,00,000, i.e., 40% of contract price.

Method I — 1/3 of the notional profit may be transferred to Profit and Loss Account

$$= 60,000 \times 1/3 = \text{₹20,000}$$

Method II — The amount calculated, as above, may be reduced on cash basis: i.e., Notional profit $\times 1/3 \times$ cash ratio

$$= 60,000 \times 1/3 \times 90\% = \text{₹18,000}$$

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Method III — The estimated profit is ₹80,000, i.e., ₹10,00,000 – 9,20,000

Profit to be transferred to Profit and Loss Account may be calculated on the basis of estimated profit:

$$\begin{aligned} &= \text{Estimated profit} \times \frac{\text{Work certified}}{\text{Contract price}} = 80,000 \times \frac{4,00,000}{10,00,000} \\ &= \text{₹32,000} \end{aligned}$$

Method IV — Profit calculated in method III may be further reduced by cash ratio as follows:

$$80,000 \times \frac{4,00,000}{10,00,000} \times \frac{90}{100} = \text{₹28,800}$$

10.3.2 Escalation Clause

This clause is often provided in contracts to cover any likely changes in the price or utilization of materials and labour. Thus, a contractor is entitled to suitably enhance the contract price if the cost rises beyond a given percentage. The object of this clause is to safeguard the interest of the contractor against unfavourable changes in cost. The escalation clause is of particular importance where prices of material and labour are anticipated to increase or where quantity of material and/or labour time cannot be accurately estimated.

Just as an escalation clause safeguards the interest of the contractor by upward revision of the contract price, a de-escalation clause may be inserted to look after the interest of the contractee by providing for downward revision of the contract price in the event of cost going down beyond an agreed level.

10.3.3 Cost-plus Costing

Cost-plus contract is a contract in which the price is not fixed at the time of entering into the contract. The contract price is determined by adding a specified amount or percentage of profit to the costs allowed in the contract. The contractee compensates the contractor for all allowable costs actually incurred by him. Over and above these costs the contractor is paid a fixed amount or a fixed percentage of cost as profit. The items of cost to be included for the purpose of determining contract price are broadly agreed upon in advance. The accounts of the contractor are usually subject to audit by the contractee.

Cost-plus contracts are usually entered into for executing special types of work, like construction of dam, power house, newly designed ship, etc., where accurate cost estimation is difficult. Government often prefers to give contracts on 'cost-plus' terms.

Advantages: Cost-plus contracts offer the following advantages:

To the Contractor:

1. There is no risk of loss being incurred on such contracts.
2. It protects him from the risk of fluctuations in market prices of material, labour, etc.
3. It simplifies the work of preparing tenders and quotations.

To the Contractee: The contractee can ensure a fair price of the contract by being entitled to audit the accounts of the contractor.

*Contract Costing:
Types and Procedure*

Disadvantages

The disadvantages of cost-plus contracts are:

To the Contractor:

1. The contractor is deprived of the advantages which would have accrued due to favourable market prices.
2. The contractor has to suffer for his own efficiency. This is because profit is usually based as a percentage of cost and efficient working resulting in lower cost also leads to lower profits.

To the Contractee:

1. The contractee has to pay more for the inefficiency of the contractor as the contractor has no incentive to reduce costs.
2. The price the contractee has to pay is unknown until after the completion of work.

Example: The following are the particulars relating to a contract which has begun on 1 January 2018:

	₹
Contract price	5,00,000
Machinery	30,000
Materials	1,70,600
Wages	1,48,750
Direct expenses	6,330
Outstanding wages	5,380
Uncertified work	9,000
Overheads	8,240
Materials returned	1,600
Materials on hand 31 December 2017	3,700
Machinery on hand 31 December 2017	22,000
Value of work certified	3,90,000
Cash received	3,51,000

Prepare the Contract Account for the year 2018 showing the amount of profit that may be taken to the credit of Profit and Loss A/c of the year. Also show the amount of the work-in-progress as it would appear in the balance sheet of the year.

Solution:

Contract Account for the year ending 31 December 2018

				₹
To Materials		1,70,600	By Materials returned	1,600
To Wages	1,48,750		By Materials on hand	3,700
Add: Outstanding	<u>5,380</u>	1,54,130	By Work-in-progress:	
To Direct expenses		6,330	Certified	3,90,000
To Overheads		8,240	Uncertified	<u>9,000</u>
To Depreciation on machinery		8,000		3,99,000
To Notional Profit c/d		<u>57,000</u>		<u>4,04,300</u>
		4,04,300	By Notional Profit b/d	57,000

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To P&L A/c*	34,200	
$\left(57,000 \times \frac{2}{3} \times \frac{3,51,000}{3,90,000} \right)$		
To Balance c/d (Reserve)	22,800	
	<u>57,000</u>	<u>57,000</u>

*Notes: Work certified is ₹3,90,000 which is 78% of contract price of ₹5,00,000. Thus transfer to P&L A/c is by the following formula:

$$\text{Notional profit} \times \frac{2}{3} \times \frac{\text{Cash received}}{\text{Work certified}}$$

Balance Sheet as on 31 December 2018

Liabilities	₹	Assets	₹
Outstanding wages	5,380	Materials on hand	3,700
		Machinery on hand	22,000
		Work-in-progress:	
		Work certified	3,90,000
		Work uncertified	9,000
			<u>3,99,000</u>
		Less: Cash received	3,51,000
			<u>48,000</u>
		Less: Profit in reserve	<u>22,800</u>
			25,200

Target Costing

Cost is an important justification for determining the selling price. In a traditional 'cost-plus' price method, the selling price of a product is set on the basis of total cost plus desired profit. This sounds logical because a company must cover all costs and earn a profit. But it must be accepted that in a competitive market, a company has little influence over the selling price of its product. Thus a cost plus price may not be acceptable in the market and if it is so then cost-plus pricing approach will prove a recipe for market failure. This view is based on the ground that it is not for the customer to ensure a profit to the manufacturer. In the words of Peter E Drucker, 'Customers do not see it as their job to ensure manufacturer a profit. The only sound way to price is to start out with what the market is willing to pay.'

In fact, the price of a product has to be on the basis of what the market is willing to pay. **Target costing** is a method of determining the cost of a product or service on the basis of competitive price prevailing in the market. In this technique, it is the market price that determines, the cost of a product and not the cost that determines the selling price. Target costing is defined as 'a cost management tool for determining and realizing a total cost at which a proposed product with specified functionality must be produced to generate the desired profitability at its anticipated selling price in the future.' It is important that the cost and the price are for the specified product functionality which can be understood from the needs for the customer and his willingness to pay for each function.

Target cost is an allowable cost for the product or service, given a competitive price, so that the company can earn the desired profit margin.

Thus:

Target cost = Competitive market price – Required profit

In simple words, target costing involves setting a target cost by subtracting the desired profit margin from the competitive market price. For example, if a manufacturer has target a profit of ₹25,000 on a new product by producing and selling 50,000 units at a price of ₹4 per unit,

Sales 50,000 units @ ₹4	₹2,00,000
Desired profit	₹25,000
Target cost	₹1,75,000

The target cost is determined by working from the market price of product to the cost that will allow a company to earn a target profit.

In order to reduce cost to a target cost level, companies have to:

- (a) redesign the product or service
- (b) use advanced cost management techniques to seek higher productivity
- (c) use new and advanced technology in the manufacture of goods and services.

Target Costing Process

The basic steps in target costing are: define, set, achieve and maintain:

1. **Define the product, i.e.,** to analyse the product and its functions, identify the customers, study competitive position, etc.
2. **Set the target, i.e.,** to study how much the customer will pay and what should be the cost of the product.
3. **Achieve the target** to make value analysis and cost analysis to achieve the target cost.
4. **Maintain competitive cost i.e.,** not only to achieve the target cost but to stay ahead of competitors by using cost reduction methodology on a continuous basis.

Check Your Progress

3. How is the loss on uncompleted contracts treated?
4. State the object of the escalation clause.

10.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Direct costs are debited to the contract account.
2. Work uncertified is that part of the work-in-progress which is not approved by the architect or engineer. This is valued at cost and thus does not include an element of profit.

Contract Costing:
Types and Procedure

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3. In the event of a loss on uncompleted contracts, this should be transferred in full to the Profit and Loss Account, whatever be the stage of completion of the contract.
4. The object of the escalation clause is to safeguard the interest of the contractor against unfavourable changes in cost

10.5 SUMMARY

- Contract costing also known as terminal costing is a variant of job costing in which each contract is a cost unit and an account is opened for each contract in the books of the contractor to ascertain profit/loss thereon.
- The Contract costing procedure includes: preparation of a contract account, allocation of direct and indirect costs, transfer of materials or plant, crediting of the contract price and the determination of profit or loss on contract.
- Materials of contracting costing in contract costing can be either materials returned to store or materials at site.
- Progress payments are part payments of the contract amount which are paid from time to time on the basis of certificate issued by the architects, certifying the value of the work satisfactorily completed.
- When contracts extend beyond a year, it becomes necessary to take into account the profits earned (or loss incurred) on the work performed during each year. This helps in avoiding distortion of the year-to-year profit trend of the business.
- Escalation clause is a clause often provided in contracts to cover any likely changes in the price or utilization of materials and labour.
- Cost-plus contract is a contract in which the price is not fixed at the time of entering into the contract.

10.6 KEY WORDS

- **Contract costing:** It is a variant of job costing in which each contract is a cost unit and an account is opened for each contract in the books of the contractor to ascertain profit/loss thereon
- **Escalation clause:** It is a clause which is often provided in contracts to cover any likely changes in the price or utilization of materials and labour
- **Cost-plus contract:** It refers to a contract in which the price is not fixed at the time of entering into the contract

10.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

*Contract Costing:
Types and Procedure*

Short Answer Questions

1. How are direct and indirect costs treated in the contract costing procedure?
2. Briefly state the methods of ascertaining profit on the following contracts:
 - (a) When contract is completed
 - (b) When contract is not completed
 - (c) When the contract is nearing completion

Long Answer Questions

1. Distinguish between job costing and contract costing. State the special features of contract costing.
2. What is a cost-plus contract? Discuss this from the point of view of (a) the manufacturer, (b) the buyer.
3. Explain how the profits are determined in the case of uncompleted contracts.
4. Thekedar accepted a contract for the construction of a building for ₹10,00,000; the contractee agreeing to pay 90% of work certified as complete by the architect.

During the first year, the amounts spent were:

Material	₹1,20,000	Machinery	₹30,000
Labour	₹1,50,000	Other expenses	₹90,000

At the end of the year, the machinery was considered to be of ₹20,000, and materials at site were of the value of ₹5000. Work certified during the year totalled ₹4,00,000. In addition, work-in-progress but not certified at the end of year had cost ₹15,000. Prepare Contract Account in the books of Thekedar. Also show the various figures of profit that can be transferred reasonably to the Profit and Loss Account

NOTES

10.8 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
- Arora, M.N. 2010. *Cost Accounting: Principles and Practice*, Eleventh edition. New Delhi: Vikas Publishing House.
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UNIT 11 OPERATING COSTING

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Structure

- 11.0 Introduction
- 11.1 Objectives
- 11.2 Meaning and Features of Operating Costing
 - 11.2.1 Cost Unit
- 11.3 Transport Costing and Operating Cost Sheet
- 11.4 Answers to Check Your Progress Questions
- 11.5 Summary
- 11.6 Key Words
- 11.7 Self Assessment Questions and Exercises
- 11.8 Further Readings

11.0 INTRODUCTION

Not all organization are involved in the process of manufacturing tangible products, many undertake the delivery of services. For such organizations, operating costing is used. It measures the cost per unit of service rendered. Since this is not a tangible product or item, technical and statistical expertise is required in this type of costing. Operating costing has several benefits including assistance in setting of, control and management of costs, prevention of unnecessary costs, comparison of costs, check of probability between different service centres, etc. In this unit, you will learn about the meaning and features of operating costing, the concept of cost unit and the procedure related to transport costing.

11.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the meaning and features of operating costing
- Explain the concept of cost unit
- Describe the features and procedure of transport costing
- Explain the preparation of operating cost sheet

11.2 MEANING AND FEATURES OF OPERATING COSTING

Operating costing is a method of cost ascertainment used in those undertakings which are engaged in providing services, such as transport, electricity, etc. These undertakings do not manufacture tangible products.

The cost of providing a service is termed as 'operating cost'. In many manufacturing companies, operating costing is used in certain departments which render services, within the organization, e.g., internal transport and personnel department. Operating costing is also known as service costing.

According to CIMA London, *Operating costing is that form of operation costing which applies where standardized services are rendered either by an under-taking or by a service cost centre within an undertaking.*

Operating costing should not be confused with operation costing. While operating costing is applied to determine the cost of providing a service, operation costing is a refinement and more detailed application of process costing.

Operating Costing is applicable in:

- Road transport companies
- Railways
- Airways
- Shipping companies
- Electricity companies
- Water supply companies
- Gas supply companies
- Hospitals and nursing homes
- Cinemas
- Canteens and hotels
- Computer Centres
- Schools and colleges
- Local Authority
- Power house in a factory

Features

The following characteristics are usually found in industries where operating costing is used:

- (a) Services rendered to customers are of unique and standardized type.
- (b) A large proportion of the total capital is invested in fixed assets and comparatively less working capital is required.
- (c) The distinction between fixed cost and variable cost is of particular importance. This is because the economics and scale of operations considerably affect the cost per unit of service rendered. For example, fixed cost like insurance per passenger will be lower if buses in transport company run capacity packed.

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11.2.1 Cost Unit

The selection of a suitable cost unit (unit of service) is very important. The cost units may be of the following two types:

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(1) **Simple cost unit:** A few examples are given below:

<i>Undertaking</i>	<i>Cost unit</i>
1. Transport	Per kilometre or per mile
2. Water works	Per 1,000 litres
3. Municipality	Per km of road maintained
4. Canteen	Per meal or per dish

(2) **Composite cost unit:** In service undertakings, generally a composite cost unit is used. In this type, two units are rolled into one. For example, in a transport company, weight of goods as well as distance covered should be taken into account in evolving a cost unit, *i.e.*, a tonne-kilometre, which means 1 tonne of goods transported to 1 km. Other examples are:

<i>Undertaking</i>	<i>Cost unit</i>
1. Transport	Per passenger-km or Per tonne-km
2. Hospital	Per bed per day
3. Hotel	Per room per day
4. Cinema	Per seat per show (or per man show)
5. Electricity	Per kilowatt hour (kWh)

11.3 TRANSPORT COSTING AND OPERATING COST SHEET

There are various undertakings in which operating costing is used. For instance, transport costing, canteen costing, boiler house and power house costing, etc. In this section, you will only study the transport costing, its procedure and the preparation of operating sheet.

Objectives: The main objectives of transport costing are:

1. To fix the rates of carriage of goods or passengers on the basis of operating costs.
2. To decide the hire charges where vehicles are given on hire.
3. To determine what should be charged to departments or others using the service.
4. To compare the cost of using own motor vehicles and that of using alternate forms of transport.

5. To compare the cost of maintaining one vehicle with another or one group of vehicles with another group.

Operating Costing

Determination of Number of Cost Units

The cost unit in passenger transport is usually a passenger kilometre and in goods transport it is a tonne-kilometre.

Absolute tonne-km and Commercial tonne-km

In transport costing, composite cost units may be computed in two ways:

- (a) Absolute tonne-km
- (b) Commercial tonne-km

In absolute tonne-km, cost units between each two stations is calculated separately in tonne-kms and then totalled up. But in commercial tonne-km, the trip is considered as a whole and it is arrived at by multiplying the total distance in kms by average load quantity.

Illustration 11.1: A truck starts with a load of 10 tonnes of goods from station *P*. It unloads 4 tonnes at station *Q* and rest of the goods at station *R*. It reaches back directly to station *P* after getting reloaded with 8 tonnes of goods at station *R*. The distances between *P* to *Q*, *Q* to *R* and then from *R* to *P* are 40 kms, 60 kms and 80 kms, respectively. Compute absolute tonne-kms and commercial tonne-kms.
(CA Inter)

Solution:

$$\begin{aligned}\text{Absolute tonne-km} &= (40 \text{ kms} \times 10 \text{ tonnes}) + (60 \text{ kms} \times 6 \text{ tonnes}) \\ &\quad + (80 \text{ kms} \times 8 \text{ tonnes}) \\ &= 400 + 360 + 640 = \mathbf{1,400 \text{ tonne-kms}}\end{aligned}$$

$$\begin{aligned}\text{Commercial tonne-km} &= \text{Average load} \times \text{total km} \\ &= \left(\frac{10+6+8}{3} \right) \text{ tonnes} \times 180 \text{ kms} \\ &= 8 \text{ tonnes} \times 180 \text{ km} = \mathbf{1,440 \text{ tonne-kms}}\end{aligned}$$

Log Sheet or Operating Cost Sheet

Most of the details required for transport costing are obtained from log sheet. A log sheet is maintained for each vehicle to record details of trips, running time, capacity, mileage, etc., on daily basis. These details also enable the management to avoid idleness of vehicles, to prevent waste of capacity and to guard against unnecessary duplication of trips. A specimen of a log sheet is given in Fig. 11.1.

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DAILY LOG SHEET									
Vehicle No.					Route No.				
Date of purchase					Driver				
Make and specification					Time left				
.....					Time returned				
Particulars of Trips									
Trip No.	From	To	Tonnes or Packages		Kms	Time			Remarks
			Out	Collection en-route		Out	In	Hrs taken	
Supplies			Worker's time			Abnormal Supplies			
Petrol/Diesel			Driver			Loading/Unloading			
Oil			Conductor			Traffic delays			
Grease			Cleaner			Accidents			

Fig. 11.1 Daily Log Sheet

Transport Costing Procedure

Costs are classified and accumulated under the following heads:

1. **Standing or fixed charges:** These are constant costs and are incurred irrespective of the mileage run. Such costs, therefore, should not be allocated to specific journeys on the basis of mileage. Some of these are direct or traceable fixed costs and can be allocated to specific vehicles, other such costs are suitably apportioned to each vehicle. Opinions differ as to whether depreciation is to be regarded as a fixed cost or a variable cost. It is thus sometimes regarded as a variable cost and sometimes as a fixed cost. Interest on capital may also be included in fixed charges.

2. **Running or variable charges:** These costs are those which vary in direct proportion to mileage run and so variable cost per unit may be computed straightaway. Wages of drivers, conductors and cleaners are sometimes regarded as variable costs if payment is made according to distance or trips.

These two types of costs are compiled periodically in an operating cost sheet.

Illustration 11.2: From the following data relating to two different vehicles *A* and *B*, compute the cost per running mile:

	<i>Vehicle A</i>	<i>Vehicle B</i>
Mileage run (annual)	₹15,000	₹6,000
Cost of vehicle	₹25,000	₹15,000

Road licence (annual)	₹750	₹750
Insurance (annual)	₹700	₹400
Garage rent (annual)	₹600	₹500
Supervision and salaries	₹1,200	₹1,200
Driver's wages per hour	₹3	₹3
Cost of fuel per gallon	₹3	₹3
Miles run per gallon	20 miles	15 miles
Repairs and maintenance per mile	₹1.65	₹2.00
Tyre allocation per mile	₹0.80	₹0.60
Estimated life of vehicles	1,00,000 miles	75,000 miles

Operating Costing

NOTES

Charge interest at 5% per annum on cost of vehicles. The vehicles run 20 miles per hour on an average. (ICWA Inter)

Solution:

Operating Cost Sheet for the year ending.....

No. of cost units A: 15,000
B: 6,000

Cost unit: One mile

Particulars	Vehicle A ₹	Vehicle B ₹
Fixed cost per annum:		
Road licence	750	750
Insurance	700	400
Garage rent	600	500
Supervisory salaries	1,200	1,200
Interest 5% on cost of vehicle	1,250	750
Total	4,500	3,600
Fixed cost per mile (A)	0.30	0.60
Variable cost per mile:		
Driver's wages (₹3 per hour for 20 miles)	0.15	0.15
Fuel cost per mile	0.15	0.20
Repairs and maintenance	1.65	2.00
Tyre allocation	0.80	0.60
Depreciation (cost ÷ estimated life)	0.25	0.20
Variable cost per mile (B)	3.00	3.15
Total Cost Per Running Mile (A + B)	3.30	3.75

Price Quotations

Transport companies may have to quote prices for specific trips on contract basis or mileage basis. The method of preparing price quotations is similar to that as explained in earlier unit on Output or Unit Costing, i.e., price quotation is usually based on cost plus desired profit. A Statement of Quotation is thus prepared to determine the Quotation Price as shown in the following Illustration.

NOTES

Illustration 11.3: Union Transport Company supplies the following details in respect of a truck of 5-tonne capacity:

Cost of truck	₹90,000
Estimated life	10 years
Diesel, oil, grease	₹15 per trip each way
Repairs and maintenance	₹500 per month
Cleaner's wages	₹250 per month
Driver's wages	₹500 per month
Insurance	₹4,800 per year
Tax	₹2,400 per year
General supervision charges	₹4,800 per year

The truck carries goods to and from city covering a distance of 50 miles each way.

While going to the city, freight is available to the extent of full capacity and on return 20% of capacity.

Assuming that the truck runs on an average 25 days a month, work out:

- Operating cost per tonne-mile, and
- Rate per trip that the company should charge if profit of 50% on freightage is to be earned.

Solution:

(i)

Operating Cost Statement*for the month ending.....*

Tonne-miles = 7,500*

		<i>Per month</i>	<i>Per tonne-mile</i>
		₹	₹
1. Fixed Costs			
Driver's wage	500		
Cleaner's wage	250		
Insurance	400		
Taxes	200		
General supervision	<u>400</u>	1,750	0.233
2. Running (or Variable) Costs			
Diesel, oil, etc. (15 × 2 × 25)	750		
Repairs and maintenance	500		
Depreciation $\left(90,000 \times \frac{1}{10} \times \frac{1}{12}\right)$	<u>750</u>	<u>2,000</u>	<u>0.267</u>
Total		3,750	0.500

*Note: Tonne-miles are computed as under:

$$[(50 \times 5) + (50 \times 1)] \times 25 \text{ days} = 7,500 \text{ tonne-miles}$$

(ii) Calculation of Freight Rate and Quotation

Cost per tonne-mile	₹0.50
Profit per tonne-mile (50% on freightage is 100% on cost)	₹0.50

Freight rate per tonne-mile

₹1.00

Operating Costing

Freight rate per trip both ways = ₹1 × 300 tonne-miles = ₹300.

Note: In one trip (both ways) there are 300 tonne-miles, i.e., $(50 \times 5) + (50 \times 1) = 300$.

Check Your Progress

1. State the difference between operating and operation costing.
2. Give examples of composite cost unit.
3. Name the way of computing composite cost unit in which the trip is considered as a whole and is arrived at by multiplying the total distance in kms by average load quantity.

NOTES

11.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Operating costing should not be confused with operation costing. While operating costing is applied to determine the cost of providing a service, operation costing is a refinement and more detailed application of process costing.
2. Examples of composite cost unit includes: per passenger-km, per bed per day, per seat per show, per kilowatt hour, etc.
3. It is in commercial tonne-km in which the trip is considered as a whole and it is arrived at by multiplying the total distance in kms by average load quantity.

11.5 SUMMARY

- Operating costing is a method of cost ascertainment used in those undertaking which are engaged in providing services, such as transport, electricity, etc.
- The cost of providing a service is termed as 'operating cost'. In many manufacturing companies, operating costing is used in certain departments which render services, within the organizations, e.g., internal transport and personnel department. Operating costing is also known as service costing.
- Operating costing is applicable in: road transport companies, railways, airways, gas supply companies, cinemas, canteens and hotels, etc.
- The selection of a suitable cost unit is very important. The cost units may be of the following types: (i) simple cost unit and (ii) composite cost unit.
- The cost unit in passenger transport is usually a passenger kilometer and in goods transport it is a tonne-kilometre.

NOTES

- In transport costing, composite cost units may be computed in two ways: (a) Absolute tonne-km and (b) Commercial tonne-km.
- Most of the details required for transport costing are obtained from log sheet. A log sheet is maintained for each vehicle to record details of trips, running time, capacity, mileage, etc., on daily basis.

11.6 KEY WORDS

- **Operating Costing:** It is a method of cost ascertainment used in those undertaking which are engaged in providing services, such as transport, electricity, etc.
- **Log Sheet:** In transport costing, a log sheet is maintained for each vehicle to record details of trips, running time, capacity, mileage, etc., on daily basis.

11.7 SELF ASSESSMENT QUESTIONS AND EXERCISES**Short Answer Questions**

1. List some of the industries in which operating costing is applicable.
2. What are the features of operating costing?
3. Write a short note on cost unit.
4. What are the objectives of transport costing?
5. Briefly explain the preparation of log sheet.

Long Answer Questions

1. Explain the transport costing procedure with an example.
2. During one week, a lorry carries a load of 29 tonnes and the distance covered is 409 kilometres as below:

	<i>Kilometres</i>	<i>Tonnes carried</i>
Monday	85	6
Tuesday	70	5
Wednesday	80	5
Thursday	64	6
Friday	76	4
Saturday	34	3
	409	29

Assuming your own figures, calculate the cost per tonne-kilometre

11.8 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
- Arora, M.N. 2010. *Cost Accounting: Principles and Practice*, Eleventh edition. New Delhi: Vikas Publishing House.
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Operating Costing

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BLOCK - IV

BATCH, STANDARD COSTING AND RECONCILIATION OF COST

UNIT 12 BATCH COSTING

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- 12.2 Meaning and Applicability of Batch Costing
 - 12.2.1 Economic Batch Quantity (EBQ)
- 12.3 Answers to Check Your Progress Questions
- 12.4 Summary
- 12.5 Key Words
- 12.6 Self Assessment Questions and Exercises
- 12.7 Further Readings

12.0 INTRODUCTION

Batch costing is a sub-type of job costing. It is used in industries where homogeneous products are manufactured in large quantities. As the name suggests, batch costing is related to the cost ascertainment of a batch of goods. These are products whose cost per units cannot be ascertained in isolation. Examples of such products include cakes, biscuits, nuts, bolts, screws, etc. There are several factors which are used for such cost accumulation and ascertainment including the flow of work, operation factors, capacity of machines, treatment of work-in-progress, etc. The production planning through economic batch quantity helps in ascertaining the optimum batch quantity to be produced. In this unit, you will study the meaning and applicability of batch costing, the batch costing procedure and the concept of economic batch quantity.

12.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the meaning of batch costing
- List the industries in which batch costing is used
- Explain the batch costing procedure
- Describe the concept of economic batch quantity

12.2 MEANING AND APPLICABILITY OF BATCH COSTING

Batch costing is a variation of job costing. While job costing is concerned with costing of jobs that are made to a customer's particular requirements, batch costing is used when production consists of limited repetitive work and a definite number of articles are manufactured in each batch to be held in stock for sale to customers generally. Thus, a batch is a cost unit consisting of a group of identical items.

Application of Batch Costing

Batch costing is applied in the manufacture of shoes, toys, readymade garments, component parts of say, cars, radios, watches, etc. In shoe industry, for example, it is just not economical to manufacture a pair of shoes to meet the requirements of one customer. On the other hand, batches of say 500 to 5,000 shoes of each size, style, colour, etc., are economically made and held in stock for sale on demand.

- Shoe manufacture
- Toys
- Readymade garments
- Tyres and tubes
- Component parts, etc.

Batch Costing Procedure

Each batch is given a batch number in exactly the same way as a job is given a job number. Direct materials, direct labour and direct expenses which can be identified with the batch are recorded on the Batch Cost Card. The costing of materials requisitions and time sheets follows normal job costing principles. Overheads are absorbed on one of the bases already explained as is done in job costing. When a batch is completed, the total cost of the batch is divided by the quantity produced in the batch to arrive at the cost per unit or per dozen etc., as required.

Often, a major cost in producing a batch is the cost of setting up jigs and tools. This is of the nature of fixed cost and is spread over the total number of articles in the batch. So the larger the batch size, the lower is the setting up cost per article.

Illustration 12.1: Component 89-X is made entirely in cost centre 75. 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 ₹ 1.50. The setting up of the machine to produce component 89-X takes 2 hours 20 minutes.

On the basis of this information, prepare a comparative cost sheet showing the production and setting up cost, both in total and per component assuming a batch of (a) 10 components, (b) 100 components and (c) 1,000 components, is produced.

(CA Inter)

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Solution:

Comparative Cost Sheet
Component 89-X

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Particulars	Batch size in components		
	10	100	1,000
	₹	₹	₹
Setting-up Cost			
Labour—2 hrs 20 mts at 72 paise per hour	1.68		
Overheads—2 hrs 20 mts at ₹1.50 per machine hour	3.50	5.18	5.18
Production Cost			
Material cost @ 6 paise per component	0.60	6.00	60.00
Wages @ 72 paise per hour			
For 10 components 1 hr 40 mts	1.20		
For 100 components 16 hrs 40 mts		12.00	
For 1,000 components 166 hrs 40 mts			120.00
Overheads @ ₹1.50 per machine hour			
For 10 components 1 hr 40 mts	2.50		
For 100 components 16 hrs 40 mts		25.00	
For 1,000 components 166 hrs 40 mts			250.00
Total Cost	9.48	48.18	435.18
Cost per component (Total cost ÷ No. of Components)	0.94	0.48	0.44

12.2.1 Economic Batch Quantity (EBQ)

In the above Illustration 12.1, it was seen that when batch size increases, the total cost per component decreases. It is due to the fixed nature of setting up cost which remains unchanged with the increase or decrease in the batch size. Thus larger the number of units in a batch, lower is the setting up cost per unit. In industries where batch costing is employed, an important point is the determination of the optimum quantity in a batch at which cost per unit is minimum. This is known as a *Economic Batch Quantity*. While determining economic batch quantity, two type of costs are considered:

- (a) **Setting-up costs:** This is the cost of setting the machine and the tools for production of a particular batch. This is of a fixed nature. Therefore, when the size of the batch is large, setting-up cost per article in the batch is lower.
- (b) **Carrying cost:** This includes the cost of storage, interest on capital invested, etc. Larger size of a batch leads to higher carrying costs.

In determining the economic batch quantity, there are five main considerations:

- (a) The cost and time taken in setting up the tools on the machines
- (b) The cost and time taken in manufacturing the parts
- (c) The interest on capital invested in the parts
- (d) The cost of storage
- (e) The rate of consumption or sale of the parts

As the concept of economic batch quantity is similar to economic order quantity (See the unit on Material Cost), the former can also be determined with the help of tables, mathematical formulae and graphs. A simple formula for determining the economic batch quantity is given below:

$$EBQ = \sqrt{\frac{2 \cdot U \cdot S}{C}}$$

where EBQ = Economic Batch Quantity

U = No. of units to be produced in a year

S = Set-up costs per batch

C = Carrying cost per unit of production.

Example: U = Production per year = 12,000 units

S = Set-up costs per batch = ₹150

C = Carrying cost per unit = ₹0.20

$$EBQ = \sqrt{\frac{2 \times 12,000 \times 150}{0.20}} = 4,243 \text{ units}$$

Illustration 12.2: A contractor has to supply 10,000 paper cones per day to a textile mill. He finds that when he starts a production run, he can produce 25,000 paper cones per day. The cost of holding a paper cone in stock for one year is 2 paise and the setting-up cost of a production run is ₹18. How frequently should production runs be made? (ICWA Inter)

Solution:

$$\text{Economic Batch Quantity (EBQ)} = \sqrt{\frac{2 \cdot U \cdot S}{C}}$$

where U = Units to be produced = 10,000 × 365 days = 36,50,000

S = Setting-up cost per production run or batch = ₹18

C = Carrying cost per unit for one year = ₹0.02

$$EQB = \sqrt{\frac{2 \times 36,50,000 \times 18}{0.02}} = 81,056 \text{ units}$$

Production per batch = 81,056 units

$$\text{Frequency of production runs} = \frac{81,056 \text{ units}}{10,000 \text{ units per day}} = 8 \text{ (Approx.)}$$

Thus, a production run should be made after every 8 days.

Example 1: Leo Limited undertakes to supply 1,000 units of a component per month for the months of January, February and March 2010. Every month a batch order is opened against which materials and labour cost are booked at

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actuals. Overheads are levied at a rate per labour hour. The selling price is contracted at ₹15 per unit.

From the following data, present the profit per unit of each batch order and the overall position of the order for the 3,000 units.

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<i>Month</i>	<i>Batch Output (Numbers)</i>	<i>Material Cost ₹</i>	<i>Labour Cost ₹</i>
January 2010	1,250	6,250	2,500
February 2010	1,500	9,000	3,000
March 2010	1,000	5,000	2,000

Labour is paid at the rate of ₹2 per hour. The other details are:

<i>Month</i>	<i>Overheads ₹</i>	<i>Total Labour Hours</i>
January 2010	12,000	4,000
February 2010	9,000	4,500
March 2010	15,000	5,000

(CA Inter)

Solution:**Statement of Cost and Profit Per Unit of Each Batch**

	<i>Jan. 2010</i>	<i>Feb. 2010</i>	<i>March 2010</i>	<i>Total</i>
(a) Batch Output (Nos.)	1,250	1,500	1,000	3,750
(b) Sales Value (@ ₹15 per unit)	₹ 18,750	₹ 22,500	₹ 15,000	₹ 56,250
Cost				
Material	6,250	9,000	5,000	20,250
Wages	2,500	3,000	2,000	7,500
Overheads (See working notes)	3,750	3,000	3,000	9,750
(c) Total	12,500	15,000	10,000	37,500
(d) Profit per batch (b) – (c)	6,250	7,500	5,000	18,750
(e) Cost per unit (c) ÷ (a)	10	10	10	
(f) Profit per unit (d) ÷ (a)	5	5	5	

Overall Position of the Order for 3,000 Units

	<i>₹</i>
Sales value (3,000 units × ₹15)	45,000
Less: Total cost (3,000 units × ₹10)	30,000
Profit	15,000

Working Notes: Overheads are charged on labour hour basis as under:

	<i>Jan. 2010</i>	<i>Feb. 2010</i>	<i>March 2010</i>
(i) Labour hours:			
Labour cost	₹2,500	₹3,000	₹2,000
Labour rates per hour =	2	2	2
	= 1,250	= 1,500	= 1,000

(ii) Overheads per hour:

$\frac{\text{Total overheads}}{\text{Total labour hours}} =$	$\frac{₹12,000}{4,000}$	$\frac{₹9,000}{4,500}$	$\frac{₹15,000}{5,000}$
	= ₹3	= ₹2	= ₹3

(iii) **Overheads for batch (i) × (ii)** **₹3,750** **₹3,000** **₹3,000**

Batch Costing

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Check Your Progress

1. What is implied about the setting up cost with a larger batch size in batch costing?
2. Give some examples of carrying costs.

12.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. In batch costing, the larger the batch size, the lower is the setting up cost per article.
2. Some examples of carrying costs include the cost of storage, interest on capital invested, etc.

12.4 SUMMARY

- Batch costing is a variation of job costing. While job costing is concerned with costing of jobs that are made to a customer's particular requirements, batch costing is used when production consists of limited repetitive work and a definite number of articles are manufactured in each batch to be held in stock for sale to customers generally.
- Batch costing is applied in the manufacture of shoes, toys, readymade garments, component parts of say, cars, radios, watches, etc.
- For ascertaining the cost of each batch, a batch cost sheet is prepared for which a batch number is assigned to each batch of production.
- In industries where batch costing is employed, an optimum quantity in a batch is determined at which cost per unit is minimum. This is known as a economic batch quantity (EBQ). The concept of EBQ is similar to economic order quantity (EOQ) as discussed in the chapter on material cost.

12.5 KEY WORDS

- **Batch:** It is a cost unit consisting of a group of identical items
- **Economic Batch Quantity:** It refers to the optimum quantity in a batch at which cost per unit is minimum

12.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

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Short Answer Questions

1. What is the difference between job and batch costing?
2. Write a short note on the applicability of batch costing.
3. How are jigs and tools treated under batch costing?

Long Answer Questions

1. Explain the preparation of comparative cost sheet with an example.
2. Describe the concept of Economic Batch Quantity.

12.7 FURTHER READINGS

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UNIT 13 STANDARD COSTING

Structure

- 13.0 Introduction
- 13.1 Objectives
- 13.2 Standard Costing: Definition, Application, Advantages and Limitations
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- 13.4 Answers to Check Your Progress Questions
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13.0 INTRODUCTION

In historical costing only actual costs are ascertained. Historical costs are the actual costs which have been incurred in the past. Such costs are ascertained only after these have been incurred. In the initial stages of development of cost accounting, historical costing was the only system available for ascertaining costs.

A system of historical costing suffers from the following limitations:

1. **No basis for cost control:** Historical costs cannot be used for the purpose of cost control as the cost has already been incurred before the cost figures can become available to management.
2. **No yardstick for measuring efficiency:** Historical costs do not provide any yardstick against which efficiency can be measured. It only indicates the actual cost which is of little value in measuring performance efficiency.
3. **Delay in availability of information:** Cost data under historical costing is obtained too late and is not of much use in price quotations and production planning.
4. **Expensive system:** Historical costing is comparatively an expensive system of costing as it involves the maintenance of a larger volume of records.

The above given limitations of Historical costing encouraged the development of a more satisfactory standard costing approach based on predetermined costs. Standard costing is not an alternative system to job order or process costing. It is a special technique to control costs and can be used in conjunction with any other system like job costing, process costing or marginal costing.

In this unit, you will study the concept of standard costing and variance analysis.

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13.1 OBJECTIVES

After going through this unit, you will be able to:

- Describe the meaning and applicability of standard costing
- Discuss the advantages and limitations of standard costing
- Explain the different types of variances
- Discuss the treatment of different cost variances

13.2 STANDARD COSTING: DEFINITION, APPLICATION, ADVANTAGES AND LIMITATIONS

The word standard means ‘a norm’ or a criterion. Standard cost is thus a criterion cost which may be used as a yardstick to measure the efficiency with which actual cost has been incurred. In other words, standard costs are predetermined costs or target costs that should be incurred under efficient operating conditions.

According to Chartered Institute of Management Accountants (CIMA), London, ‘*Standard cost is the predetermined cost based on technical estimates for materials, labour and overhead for a selected period of time for a prescribed set of working conditions*’.

In the words of Brown and Howard, ‘*the standard cost is a predetermined cost which determines what each product or service should cost under given circumstances*’. Thus standard costs are planned costs that should be attained under a given set of operating conditions. The main object of standard cost is to look forward and assess what the cost ‘*should be*’ as distinct from what the cost has been in the past.

Definition

Standard costing is simply the name given to a technique whereby standard costs are computed and subsequently compared with the actual costs to find out the differences between the two. These differences (known as variances) are then analysed to know the causes thereof so as to provide a basis of control. The CIMA, London has defined standard costing as ‘*the preparation of standard costs and applying them to measure the variations from actual costs and analysing the courses of variations with a view to maintain maximum efficiency in production.*’ Brown and Howard have defined it, ‘*as a technique of cost accounting which compares the standard cost of each product or service with the actual costs, to determine the efficiency of the operations so that any remedial action may be taken immediately.*’

Steps: Standard costing system involves the following steps:

1. The setting of standard costs for different elements of cost, *i.e.*, material, labour and overheads.
2. Ascertaining actual costs.
3. Comparing standard with actual costs to determine the differences between the two, known as 'variances'.
4. Analysing variances for ascertaining reasons thereof.
5. Reporting of these variances and analysis thereof to management for appropriate action, where necessary.

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Application

The application of standard costing requires certain conditions to be fulfilled. These are:

- (a) A sufficient volume of standard products or components should be produced.
- (b) Methods, operations and processes should be capable of being standardized.
- (c) A sufficient number of costs should be capable of being controlled.

Industries producing standardized products which are repetitive in nature, *i.e.*, industries using process costing method, fulfil all the above conditions and thus the system can be used to the best advantage in such industries. Examples are fertilizers, cement, steel and sugar.

In jobbing industries, it is not worthwhile to develop and employ a full system of standard costing. This is because in such industries each job undertaken may be different from another and setting standards for each job may prove difficult and expensive. In such industries, therefore, a partial system may be adopted in appropriate circumstances. For example, certain processes and operations performed may be of a repetitive nature and thus the principles of standard costing may be applied by setting standard for each such process or operation.

Advantages of Standard Costing

The advantages to be derived from a system of standard costing will vary from one business to another. Much depends upon the degree of sophistication achieved and the acceptance by the management of utility of the system. Possible advantages are as follows:

1. **Effective cost control:** The most important advantage of standard costing is that it facilitates the control of costs. Control is exercised by comparing actual performance with standards and taking action on the basis of variances so revealed.
2. **Helps in planning:** Establishing standards is a very useful exercise in business planning which instils in management a habit of thinking in advance.

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3. **Provides incentives:** Standards provide incentives and motivation to work with greater effort. Schemes may be formulated to reward those who achieve or surpass the standard. This increases efficiency and productivity.
4. **Fixing prices and formulating policies:** Standard costs are a valuable aid to management in determining prices and formulating production policies. For example, prices may be fixed by adding a standard margin of profit to standard cost. Similarly, standard costing furnishes cost estimates while planning production of new products.
5. **Facilitates delegation of authority:** In order that responsibility for off-standard performance may be identified directly with the persons concerned, an organization chart is prepared which shows delegated authority and establishes responsibility of each executive.
6. **Facilitates coordination:** While establishing standards, the performance of different departments, such as production, sales and purchases, is taken into account. Thus through the working of standard cost system, coordination of various functions is achieved.
7. **Eliminates wastes:** By fixing standard, certain wastes, such as material wastage, idle time and lost machine hours, are reduced.
8. **Valuation of stocks:** Standard costing simplifies the valuation of stock because the stock is valued at standard cost. The difference between standard and actual cost is transferred to a variance account. This ensures uniform pricing of stocks in the form of raw materials, work-in-progress and finished goods.
9. **Management by exception:** Reporting of variances is based on the principle of management by exception. Only variances beyond a predetermined limit may be considered by the management for corrective action. This also reduces the cost of preparing reports.
10. **Economical and simple:** Standard costing is an economical and simple means of cost accounting and generally results in savings in the cost of costing system. It results in reduction in paperwork in accounting and needs fewer number of forms and records. This leads to considerable saving in clerical labour.

Limitations of Standard Costing

Standard costing system may suffer from certain disadvantages. This may be because of lack of education and communication and resultant misunderstanding on the part of managerial staff. Possible disadvantages are:

1. The system may not be appropriate to the business.
2. The staff may not be capable of operating the system.

3. A business may not be able to keep standards up-to-date. In other words, a business may not revise standards to keep pace with the frequent changes in manufacturing conditions. Firms may avoid revising standards as it is a costly affair.
4. Inaccurate and unreliable standards cause misleading results and thus may not enjoy the confidence of the users of the system.
5. Operation of the standard costing system is a costly affair and small firms cannot afford it.
6. Standard costing is expensive and unsuitable in job order industries which are manufacturing non-standardized products.

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Preliminaries in Establishing a System of Standard Costing

In establishing a system of standard costing, there are a number of preliminaries to be considered. These are as follows:

1. Establishment of Cost Centres

2. Classification of Accounts

3. Types of Standards

Standards may be divided into the following two main classes—basic and current.

Basic standards: These are the standards which are established for an indefinite period of time. They are similar to an index number against which all later results are measured. Variances from basic standards show trends of deviation of the actual cost. However, basic standards are of no practical utility from the point of view of cost control.

Current Standards: Such standards remain in operation for a limited period and are related to current conditions. These standards are revised at regular intervals. Current standards are of three types: (i) Ideal standards; (ii) Expected standards; and (iii) Normal standards.

4. Setting Standard Costs

The success of a standard costing system depends on the reliability, accuracy and acceptance of the standards. Extreme care, therefore, must be taken to ensure that all factors have been considered in the establishment of standards.

Standard costs are set for each element of cost, *i.e.*, direct materials, direct labour and overheads. These are described below:

Setting standards for direct materials: Two standards are developed for material costs:

- (a) Material price standard
- (b) Material usage (or quantity) standard

(a) **Material price standard:** This is a forecast of the average prices of materials during the future period. This standard is quite difficult to establish because prices

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are regulated more by the external factors than by the company management. The purchasing department notifies the standard prices after considering factors like:

- (i) Purchase prices of recent orders
- (ii) Prices specified in the long-term contracts
- (iii) Forecasts of the commodity price trends

Provision should be made for discounts, packing and delivery charges.

(b) Material quantity (or usage) standard: While setting quantity standard, the quality and size of material items to be consumed should be standardized. The standard is usually developed from material specifications prepared by the department of engineering of product design.

Setting standards for direct labour: The following two standards are usually established for direct labour costs:

- (a) Labour rate standard
- (b) Labour time standard

(a) Labour rate standard: This standard is determined having regard to the current rates of pay and any anticipated variations. Sometimes an agreement between trade unions and employer covers a number of future months or years. In such cases, the agreed rate should be adopted as the standard rate for the period.

Where workers are paid on time basis, it is necessary to establish:

- (i) the labour time standard for each operation
- (ii) the wage rate of each grade of labour
- (iii) the grades of labour to be employed

The type of operation will determine the grade of labour to be employed—male or female, skilled, unskilled or semi-skilled.

Where workers are paid on piece basis, the standard cost will be a fixed rate per piece.

(b) Labour time (or efficiency) standard: Standard time for labour should be scientifically determined by time and motion studies, carried out in conjunction with a study to determine the most efficient method of working. Due allowance should be made for normal loss of labour time, like fatigue, idle time, tool setting, etc.

Setting Standards for Direct Expenses: Direct expenses are not very common, but if there are any direct expenses relating to the cost unit, standards for these too must be set. Setting these standards is usually quite simple, as these may be based on past records, adjusted according to anticipated changes therein.

Setting Standards for Overheads: Setting standards for overheads is more complex than the development of material and labour standards. Developing this standard involves the following two distinct calculations:

- (a) Determination of the standard overhead costs; and
- (b) Determination of the estimates of production, *i.e.*, standard level of activity reduced to a common base, such as direct labour hours, units of production or machine hours.

A standard overheads absorption rate is computed with the use of these two figures by the following formula:

$$\text{Standard overhead rate (per hour)} = \frac{\text{Standard overhead cost for the period}}{\text{Standard hours for the period}}$$

or

$$\text{Standard overhead rate (per unit)} = \frac{\text{Standard overhead cost for the period}}{\text{Standard production (in units) for the period}}$$

Thus this rate may be per unit of production when base is in units of production and it will be per hour, if base is the number of hours.

An overall blanket rate of overheads absorption is rarely accurate in any costing system. Thus a separate rate should be computed for each cost centre (or department) created for this purpose.

Overhead standards will be more useful to management if they are divided to show fixed and variable components. Separate overheads absorption rates should be computed for these two types of overheads, *i.e.*, fixed overheads and variable overheads.

Standard Hour

Production may be expressed in diverse type of units such as kilograms, tonnes, litres, gallons, numbers, etc. When a company is manufacturing different types of products, it is almost impossible to aggregate the production, which cannot be expressed in the same unit. Therefore, it is essential to have a common unit in which the production, which is measured in different type of units, can be expressed. As time factor is common to all operations, a common practice is to express the various units in terms of time, known as *standard hour*. The standard hour is the quantity of output or amount of work which should be performed in one hour. In the words of CIMA, London, a standard hour is '*a hypothetical hour which represents the amount of work which should be performed in one hour under stated conditions.*' Time and motion studies may indicate what the output of each process in one hour should be. For example, if 10 units of product should be produced in one hour, then an output of 200 units would represent 20 standard hours.

Standard Cost Card (Standard Cost Sheet)

Once the standard costs have been established, these are recorded on a standard cost card. A standard cost card is thus a record of the standard material, labour and overhead costs. Such a card is maintained for each product or service. The

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card will normally show the quantity and price of each material item to be consumed, the time and rate of labour required, the overheads to be absorbed and the total cost. Costs shown in the card should be approved by the person who will be responsible for the operations concerned, otherwise he may not cooperate with much enthusiasm in attaining the standards.

Check Your Progress

1. Why is it not worthwhile to develop and employ a full system of standard costing in jobbing industries?
2. Name the three types of current standards.
3. What does the transfer of variance between standard cost and actual cost to a variance account ensure?

13.3 VARIANCE ANALYSIS

Cost Variance: Cost variance is the *difference between a standard cost and the comparable actual cost incurred during a period*. CIMA, London.

Variance analysis is the process of analysing variances by sub-dividing the total variance in such a way that management can assign responsibility for any off standard performance. According to CIMA, London, Terminology, variance analysis is *the process of computing the amount of variance and isolating the causes of variance between actual and standard*. An important aspect of variance analysis is the need to separate controllable from uncontrollable variances. A detailed analysis of controllable variances will help the management to identify the persons responsible for its occurrence so that corrective action can be taken.

Favourable and Unfavorable Variances

Where the actual cost is less than standard cost, it is known as *favourable* or *credit* variance. On the other hand, where the actual cost is more than standard cost, the difference is referred to as *unfavourable*, *adverse* or *debit* variance.

In simple words, any variance that has a favourable effect on profit is favourable variance and any variance which has an adverse or unfavourable effect on profit is unfavourable variance.

Many students experience difficulty in ascertaining whether a variance is favourable or adverse. In the formulae given in this book, positive (+) variance will indicate favourable variance and negative (−) variance will indicate adverse variance. Favourable variances will be designated by (*F*) and Adverse by (*A*).

Controllable and Uncontrollable Variances

If a variance can be regarded as the responsibility of a particular person, with the result that his degree of efficiency can be reflected in its size, then it is said to be a

controllable variance. For example, excess usage of material is usually the responsibility of the foreman concerned. However, if the excessive usage is due to material being defective, the responsibility may rest with the Inspection Department for non-detection of the defects.

If a variance arises due to certain factors beyond the control of management, it is known as uncontrollable variance. For example, change in the market prices of materials, general increase in the labour rates, increase in the rates of power or insurance premium, etc., are not within the control of the management of the company. Responsibility for uncontrollable variances cannot be assigned to any person or department.

The division of variances into controllable and uncontrollable is extremely important. The management should place more emphasis on controllable variance as it is these variances which require investigation and possibly corrective action. The uncontrollable variances, on the other hand, may be ignored. This follows the well known *principle of exception* whereby those matters which are going right are ignored and any deviations from efficient performance are investigated.

Methods Variance

While setting standards, specific methods of production are kept in view. If, for some reason or the other, a different method of production is adopted, it will give rise to a different amount of cost, thereby resulting in a variance. Such a variance is known as methods variance. Thus a methods variance arises due to the use of methods other than those specified. According to CIMA, London Terminology, methods variance is '*the difference between the standard cost of a product or operation, produced or performed by the normal method and the standard cost of a product or operation, produced or performed by the alternative method actually employed.*'

Revision Variance

After setting standards, sometimes standard cost has to be revised on account of unavoidable changes in prices of various factors like wages, materials, etc. The standard costs once set are not disturbed every now and then to account for these uncontrollable factors. Rather a revision variance is created and the basic standard cost is allowed to stand. This revision variance is the difference between the standard cost originally set and the revised standard cost.

Thus:

$$\text{Revision variance} = \text{Original standard cost of actual output} - \text{Revised standard cost of actual output}$$

Creation of revision variance is only an interim adjustment which allows the standard costing system to operate usefully even when there are changes in standard costs.

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Variances for each Element of Cost

The total cost variance is divided into Material, Labour and Overheads variances.

Material Variances

The different material variances are as follows:

Direct Material Cost Variance

This is the difference between the standard cost of direct materials specified for the output achieved and the actual cost of direct materials used. It is calculated as:

$$\text{Material Cost Variance} = \text{Standard cost of actual output} - \text{Actual cost}$$

$$MCV = SC - AC$$

or Material Cost Variance =

$$\left[\begin{array}{c} \text{Standard quantity} \\ \text{for actual output} \end{array} \times \begin{array}{c} \text{Standard} \\ \text{price} \end{array} \right] - \left[\begin{array}{c} \text{Actual} \\ \text{quantity} \end{array} \times \begin{array}{c} \text{Actual} \\ \text{price} \end{array} \right]$$

$$MCV = (SQ \times SP) - (AQ \times AP)$$

The material cost variance may be further divided into price variance and usage variance.

Material Price Variance

This is 'that portion of the material cost variance which is due to the difference between the standard price specified and the actual price paid'. It is calculated by the following formula:

$$\text{Material Price Variance} = (\text{Standard price} - \text{Actual price}) \times \text{Actual quantity}$$

$$MPV = (SP - AP) \times AQ$$

Thus, this is the difference between standard price and actual price multiplied by actual quantity.

Reasons for Material Price Variance: This variance usually arises due to the following reasons:

1. Change in the market prices of materials
2. Failure to purchase the specified quality, thereby resulting in a different price being paid
3. Change in the quantity of materials, thereby leading to lower/higher quantity discount
4. Not availing cash discounts, when standards set took into account such discounts.
5. Inefficient purchasing
6. Change in the delivery costs
7. Rush purchases
8. Purchase of a substitute material on account of non-availability of the material specified

9. Change in the rates of excise duty, purchase tax, etc.
10. Off-season purchasing for certain seasonal products, like jute, cotton, etc.

Material Usage (or Quantity) Variance

This is 'that portion of the material cost variance which is due to the difference between the standard quantity specified and the actual quantity used'. Its formula is:

$$\text{Material Usage Variance} = \left(\frac{\text{Standard quantity for actual output} - \text{Actual quantity}}{\text{Standard price}} \right) \times \text{Standard price}$$

$$MUV = (SQ - AQ) \times SP$$

Thus, this is the difference between standard quantity and actual quantity multiplied by the standard price.

Example: Continuing example given above, material usage variance will be calculated as under:

$$\begin{aligned} MUV &= (SQ - AQ) \times SP \\ &= (4,000 - 4,300) \times 5 \\ &= ₹1,500 \text{ (A)} \end{aligned}$$

Reasons for Material Usage Variance: The material usage variance may be caused by some or all of the following reasons:

1. Use of defective or sub-standard materials
2. Carelessness in the use of materials
3. Pilferage
4. Poor workmanship
5. Defect in plant and machinery
6. Change in the design or specification of the product
7. Change in the quality of materials
8. Use of substitute materials
9. Use of non-standard material mixture
10. Yield from materials in excess of or less than standard yield

Classification of Material Usage Variance

Material usage variance is further sub-divided into:

- (a) Material mix variance
- (b) Material yield variance (Or Material sub-usage variance)

(a) **Material Mix Variance:** This is sub-variance of material usage variance. It arises only where more than one type of material is used for producing the finished product. A company may be using a mixture of materials which does not comply with the predetermined standard mixture. This gives rise to material mix variance.

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The material mix variance is defined as *that portion of the material usage variance which is due to the difference between standard and actual composition of materials*. It may arise in industries like chemicals, rubber, etc., where a number of raw materials are mixed to produce a final product. Change from the standard mix may be due to non-availability of one or more components of the mix or due to non-purchase of materials at proper time. Increase in the proportion of cheaper materials results in favourable mix variance and vice versa, the use of more expensive materials in larger proportion results in adverse variance.

This variance is calculated with the help of the following formula:

$$\text{Material mix variance} = \left(\frac{\text{Revised standard quantity}}{\text{Actual quantity}} - \frac{\text{Actual quantity}}{\text{Standard quantity}} \right) \times \text{Standard price}$$

$$MMV = (RSQ - AQ) \times SP$$

The revised standard quantity is nothing but the standard proportion of total of actual quantities of all the materials. This is calculated as under:

$$RSQ = \frac{\text{Standard quantity of one material}}{\text{Total of standard quantities of all materials}} \times \frac{\text{Total of actual quantities}}{\text{of all materials}}$$

(b) Material Sub-usage (or Material Revised Usage) Variance: This is a sub-variance of the material usage variance and represents that portion of the material usage variance which is attributed to reasons other than those which give rise to material mix variance. Thus the algebraic sum of this revised usage variance and material mix variance is equal to material usage variance. Its formula is:

$$\text{Material revised usage variance} = \left(\frac{\text{Standard quantity}}{\text{Revised standard quantity}} - \frac{\text{Revised standard quantity}}{\text{Standard quantity}} \right) \times \text{Standard price}$$

$$MRUV = (SQ - RSQ) \times SP$$

Material Yield Variance: This is also a sub-variance of material usage variance. It arises in process industries, like chemicals, where loss of materials in production is inevitable. While setting standards, the normal or standard loss is taken into account. But actual loss may differ from normal or standard loss. This results in actual yield or output being different from standard yield.

Thus material yield variance is that portion of the material usage variance which is due to the difference between standard yield specified and actual yield obtained. The standard yield is the output expected to be obtained from the actual usage of raw materials. It should be noted that yield variance as used in standard costing is the same thing as abnormal loss or abnormal gain in the other costing systems.

One important feature of yield variance which differentiates it from other material variances (price, usage and mix variances) is that yield variance is an *output variance*, while others are *input variances*. In other words, yield variance represents a gain or loss on output in terms of finished production, while other

variances represent a gain or loss on the cost of material input. Its formula is given on the following page:

Standard Costing

$$\text{Material Yield Variance} = \left(\text{Actual yield} - \text{Standard yield} \right) \times \text{Standard Output Price}$$

$$MYV = (AY - SY) \times SOP$$

Standard output price (SOP) is the standard material cost per unit of output.

Note: Material revised usage variance and Material yield variance are two different methods of calculating the same thing and are hence clubbed together.

Illustration 13.1: The standard mix to produce one unit of product is as follows:

Material A	60 units @ ₹15 per unit	=	900
Material B	80 units @ ₹20 per unit	=	1,600
Material C	100 units @ ₹25 per unit	=	2,500
	240 units		5,000

During the month of April, 10 units were actually produced and consumption was as follows:

Material A	640 units @ ₹17.50 per unit	=	11,200
Material B	950 units @ ₹18.00 per unit	=	17,100
Material C	870 units @ ₹27.50 per unit	=	23,925
	2,460 units		52,225

Calculate all material variances.

Solution:

Material	Standard for 10 units			Actual for 10 units		
	Qty units	Rate ₹	Amt ₹	Qty Units	Rate ₹	Amt ₹
A	600	15	9,000	640	17.50	11,200
B	800	20	16,000	950	18.00	17,100
C	1,000	25	25,000	870	27.50	23,925
Total	2,400		50,000	2,460		52,225

1. **Material Cost Variance** = Standard cost – Actual cost

$$= ₹50,000 - ₹52,225 \text{ (A)}$$

$$MCV = ₹2,225 \text{ (A)}$$

2. **Material Price Variance** = (Std Price – Actual Price) × Actual Qty

$$\text{Material A} = (15 - 17.50) \times 640 = ₹1,600 \text{ (A)}$$

$$\text{Material B} = (20 - 18) \times 950 = ₹1,900 \text{ (F)}$$

$$\text{Material C} = (25 - 27.50) \times 870 = ₹2,175 \text{ (A)}$$

$$MPV = ₹1,875 \text{ (A)}$$

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3. **Material Usage Variance** = (Std Qty – Actual Qty) × Std Price

$$\text{Material } A = (600 - 640) \times 15 = ₹600 \text{ (A)}$$

$$\text{Material } B = (800 - 950) \times 20 = ₹3,000 \text{ (A)}$$

$$\text{Material } C = (1,000 - 870) \times 25 = ₹3,250 \text{ (F)}$$

$$MUV = ₹350 \text{ (A)}$$

Check:

$$MCV = MPV + MUV$$

$$₹2,225 \text{ (A)} = ₹1,875 \text{ (A)} + ₹350 \text{ (A)}$$

4. **Material Mix Variance** = (Revised Std Qty – Actual Qty) × Std Price

$$\text{Material } A = (615^* - 640) \times 15 = ₹375 \text{ (A)}$$

$$\text{Material } B = (820^* - 950) \times 20 = ₹2,600 \text{ (A)}$$

$$\text{Material } C = (1,025^* - 870) \times 25 = ₹3,875 \text{ (F)}$$

$$MMV = ₹900 \text{ (F)}$$

*Revised Standard Quantity (RSQ) is calculated as follows:

$$\text{Material } A = \frac{2,460}{2,400} \times 600 = 615 \text{ units}$$

$$\text{Material } B = \frac{2,460}{2,400} \times 800 = 820 \text{ units}$$

$$\text{Material } C = \frac{2,460}{2,400} \times 1,000 = 1,025 \text{ units}$$

5. **Material Yield Variance**

For yield variance, certain basic calculations have to be made as follows:

$$\text{Standard yield} = \frac{\text{Actual usage of materials}}{\text{Standard usage per unit of output}} = \frac{2,460}{240} = 10.25 \text{ units}$$

$$SOP \text{ (Std material cost per unit of output)} = ₹50,000 \div 10 \text{ units} = ₹5,000$$

$$\text{Material Yield Variance} = (AY - SY) \times SOP$$

$$MYV = (10 - 10.25) \times 5,000 = ₹1,250 \text{ (A)}$$

Material Revised Usage (or Sub-usage) Variance (MRUV)

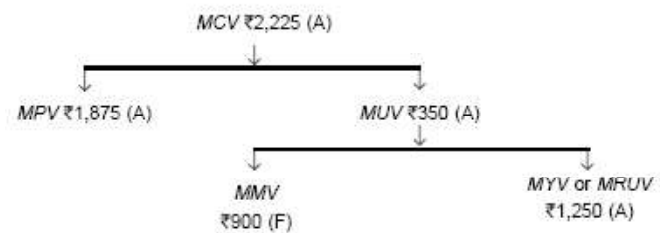
$$= (\text{Standard Quantity} - \text{Revised Standard Quantity}) \times \text{Standard Price}$$

$$\text{Material } A = (600 - 615) \times 15 = ₹225 \text{ (A)}$$

$$\text{Material } B = (800 - 820) \times 20 = ₹400 \text{ (A)}$$

$$\text{Material } C = (1,000 - 1,025) \times 25 = ₹625 \text{ (A)}$$

$$MRUV = ₹1,250 \text{ (A)}$$

Note: Either MMV or MRUV is calculated. These two are always equal.**Check:**

Labour Variances

Standard Costing

The analysis and computation of labour variances is quite similar to material variances.

Labour Cost Variance

This is the difference between the standard direct labour cost specified for the activity achieved and the actual direct labour cost incurred. It is calculated as under:

$$\text{Labour Cost Variance} = \frac{\text{Std labour cost of actual output}}{\text{Actual labour cost}}$$

$$LCV = SC - AC$$

Or, Labour Cost Variance =

$$\left(\frac{\text{Std hours for actual output}}{\text{Std rate per hour}} \right) - \left(\frac{\text{Actual hours}}{\text{Actual rate per hour}} \right)$$
$$LCV = (SH \times SR) - (AH \times AR)$$

Classification of Labour Cost Variance

Labour cost variance is further divided into rate variance and efficiency variance.

Labour Rate Variance: This is that portion of the labour cost variance which is due to the difference between the standard rate of labour specified and the actual rate paid. Its formula is:

$$\text{Labour Rate Variance} = (\text{Standard rate} - \text{Actual rate}) \times \text{Actual hours}$$

$$LRV = (SR - AR) \times AH$$

Thus, this is the difference between standard and actual rates of wages, multiplied by actual hours.

Reasons for labour rate variance: Usual reasons are:

1. Change in the basic wage rates
2. Use of a different method of wage payment
3. Employing workers of grades different from the standard grades specified
4. Unscheduled overtime
5. New workers not being paid at full rates

Often, labour rate variance will be an uncontrollable variance as labour rates are usually determined by demand and supply conditions in the labour market, backed by negotiable strength of the trade union. Where this variance is due to the use of a grade of labour other than that specified, there may well be such acceptable explanations as non-availability of the labour grade specified. But when a foreman carelessly employs a wrong grade of labour on a job, he may be held responsible.

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Labour Time (or Efficiency) Variance: This is that portion of the labour cost variance which is due to the difference between labour hours specified for actual output and the actual labour hours expended. This variance is calculated as follows:

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$$\text{Labour Efficiency Variance} = \left(\frac{\text{Std hours for actual output}}{\text{Actual hours}} - 1 \right) \times \text{Standard rate}$$

$$LEV = (SH - AH) \times SR$$

Thus, this variance is the difference between standard and actual time valued at standard rate.

Reasons for labour efficiency variance: This variance is usually caused by one or more of the following reasons:

1. Poor working conditions, *e.g.*, inadequate lighting and ventilation, excessive heating, etc.
2. Defective tools and plant and machinery
3. Inefficient workers
4. Incompetent supervision
5. Use of defective or non-standard materials
6. Time wasted by factors, like waiting for materials, tools or machine break-down
7. Insufficient training of workers
8. Change in the method of operation
9. Non-standard grade of workers

Classification of Labour Efficiency Variance

Labour efficiency variance is further divided into the following sub-variances:

- (a) Idle time variance
- (b) Labour mix variance
- (c) Labour yield variance (or Labour revised efficiency variance)

(a) Idle Time Variance: This variance represents that portion of the labour efficiency variance which is due to abnormal idle time, such as time lost due to machine break-down, power failure, strike, etc. It is calculated by valuing idle hours at standard rate. Thus:

$$\text{Idle Time Variance} = \text{Idle hours} \times \text{Standard rate}$$

$$ITV = IH \times SR$$

As idle hours represent a loss, idle time variance is always unfavourable.

Some accountants do not treat Idle Time Variance as a part of labour efficiency variance but treat it as a part of labour cost variance.

(b) Labour Mix Variance (Gang Composition Variance): This variance is similar to material mix variance. It arises only when more than one grade of workers are employed and the composition of actual grade of workers differs from those specified. It is calculated with the help of following formula:

$$\text{Labour Mix Variance} = \left(\frac{\text{Revised standard}}{\text{hours}} - \frac{\text{Actual}}{\text{hours}} \right) \times \text{Standard rate}$$

$$LMV = (RSH - AH) \times SR$$

(c) Labour Revised Efficiency Variance (Or Labour Sub-efficiency Variance): This is similar to Material Revised Usage Variance and is a sub-variance of labour efficiency variance. It arises due to factors other than those which give rise to idle time variance and labour mix variance. Thus, this is a residue of labour efficiency variance left after idle time and mix variance have been separated. Its formula is:

$$\text{Labour Revised Efficiency Variance} = \left(\frac{\text{Std hours for}}{\text{actual output}} - \frac{\text{Revised}}{\text{std hours}} \right) \times \text{Std rate}$$

$$LREV = (SH - RSH) \times SH$$

Labour Yield Variance: This is quite similar to Material Yield Variance. This variance reveals the effect on labour cost of actual output or yield being more or less than the standard yield. Its formula is:

$$\text{Labour Yield Variance} = \left(\frac{\text{Actual}}{\text{yield}} - \frac{\text{Std yield}}{\text{from actual input}} \right) \times \frac{\text{Std labour cost}}{\text{per unit of output}}$$

Note: Labour revised efficiency variance and Labour yield variance are two methods of calculating the same thing, and are hence clubbed together.

Illustration 13.2: The standard labour employment and the actual labour engaged in a week for a job are as under:

	<i>Skilled workers</i>	<i>Semi-skilled workers</i>	<i>Unskilled workers</i>
Standard no. of workers in the gang	32	12	6
Actual no. of workers employed	28	18	4
Standard wage rate per hour	3	2	1
Actual wage rate per hour	4	3	2

During the 40 hours working week, the gang produced 1,800 standard labour hours of work. Calculate:

- | | |
|--------------------------------|--------------------------|
| (a) Labour Cost Variance | (b) Labour Rate Variance |
| (c) Labour Efficiency Variance | (d) Labour Mix Variance |
| (e) Labour Yield Variance | |

(CA Inter)

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Solution:**NOTES**

Category of workers	Standard			Actual		
	Hrs*	Rate ₹	Amount ₹	Hrs*	Rate ₹	Amount ₹
Skilled	1,280	3	3,840	1,120	4	4,480
Semi-skilled	480	2	960	720	3	2,160
Unskilled	240	1	240	160	2	320
	2,000		5,040	2,000		6,960

*Hrs = No. of workers × 40 hours.

$$\text{Std cost of actual output} = \frac{₹5,040}{2,000 \text{ hrs}} \times 1,800 \text{ hrs} = ₹4,536$$

Labour Cost Variance = Std cost of actual output – Actual cost

$$LCV = ₹4,536 - 6,960 = ₹2,424 \text{ (A)}$$

Labour Rate Variance = $(SR - AR) \times AH$

$$\text{Skilled} = (3 - 4) \times 1,120 = ₹1,120 \text{ (A)}$$

$$\text{Semi-skilled} = (2 - 3) \times 720 = ₹720 \text{ (A)}$$

$$\text{unskilled} = (1 - 2) \times 160 = ₹160 \text{ (A)}$$

$$LRV = ₹2,000 \text{ (A)}$$

Labour Efficiency Variance = $(*SH \text{ for actual output} - AH) \times SR$

$$\text{Skilled} = (1,152 - 1,120) \times 3 = ₹96 \text{ (F)}$$

$$\text{Semi-skilled} = (432 - 720) \times 2 = ₹576 \text{ (A)}$$

$$\text{Unskilled} = (216 - 260) \times 1 = ₹56 \text{ (F)}$$

$$LEV = ₹424 \text{ (A)}$$

*Std hrs for actual output are calculated as follows:

$$\text{Skilled} = \frac{1,800}{2,000} \times 1,280 = 1,152 \text{ hrs}$$

$$\text{Semi-skilled} = \frac{1,800}{2,000} \times 480 = 432 \text{ hrs}$$

$$\text{Unskilled} = \frac{1,800}{2,000} \times 240 = 216 \text{ hrs}$$

Labour Mix Variance = $(\text{Revised std hrs} - AH) \times SR$

$$\text{Skilled} = (1,280 - 1,120) \times 3 = ₹480 \text{ (F)}$$

$$\text{Semi-skilled} = (480 - 720) \times 2 = ₹480 \text{ (A)}$$

$$\text{Unskilled} = (240 - 160) \times 1 = ₹80 \text{ (F)}$$

$$LMV = ₹80 \text{ (F)}$$

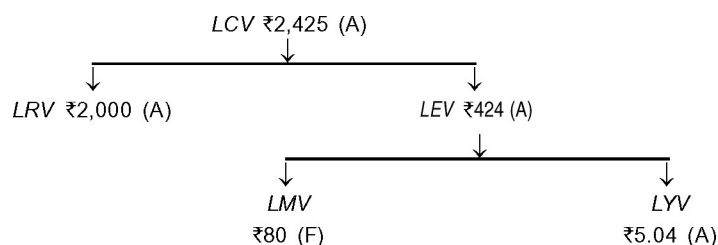
Labour Yield Variance =

Standard Costing

$$\left(\frac{\text{Actual output}}{\text{Actual hours}} - \frac{\text{Std output for actual hours}}{\text{Std hours}} \right) \times \text{Std rate per hour of work}$$

$$LYV = (1,800 - 2,000) \times \frac{5,040}{2,000} = \text{₹}504 \text{ (A)}$$

Check:



NOTES

Overheads Variances

Overhead cost is the aggregate of indirect materials, indirect labour and indirect expenses. Analysis of overheads variances is different from that of direct material and direct labour variances and is considered to be a difficult part of variance analysis. There are mainly two reasons for this difficulty. *Firstly*, standard overhead rate for fixed overheads is difficult to establish because changes in the volume of output will distort this rate, even though there is no change in the amount of fixed overhead cost. Generally fixed overheads absorption rate is determined on the basis of normal volume of output. *Secondly*, there is conflicting terminology and different ways of computing overheads variances. Overheads variances may be separately computed for fixed overheads and variable overheads. Then there are two variance, three variance and four variance methods of analysing overheads variances. Moreover, overhead rate may be per hour or per unit of output. All these lead to confusion in overheads variance analysis.

In this book, overheads variances have been classified into fixed and variable overheads variances and then further analysed according to causes.

It is important to understand at the outset that overheads variance is nothing but under or over-absorption of overheads. Certain basic terms used in connection with overheads variances are explained first of all.

Standard Overhead Rate: This standard overheads absorption rate may be computed per hour or per unit, depending upon the method of absorption. This is calculated as follows:

$$\text{Standard overhead rate (per hour)} = \frac{\text{Budgeted overheads}}{\text{Budgeted hours}}$$

Or

$$\text{Standard overhead rate (per unit)} = \frac{\text{Budgeted overheads}}{\text{Budgeted output (in units)}}$$

Where overheads variances are separately computed for fixed and variable overheads, separate overhead rates are to be computed for fixed overheads and variable overheads.

NOTES***When Overhead Rate per Hour is Used***

The following basic calculations should be made before computing variances:

- (a) ***Standard hours for actual output (SHAO)***: It is required to be calculated when overheads are absorbed on the basis of overhead rate per hour. It is calculated as under:

$$SHAO = \frac{\text{Budgeted hours}}{\text{Budgeted output}} \times \text{Actual output}$$

- (b) Absorbed (or Recovered) overheads =

$$\frac{\text{Std hrs for actual output}}{\text{Std hrs for actual output}} \times \frac{\text{Std overhead rate per hour}}{\text{Std overhead rate per hour}}$$

- (c) Standard overheads = $\frac{\text{Actual hours}}{\text{Actual hours}} \times \frac{\text{Std overhead rate per hour}}{\text{Std overhead rate per hour}}$

- (d) Budgeted overheads = $\frac{\text{Budgeted hours}}{\text{Budgeted hours}} \times \frac{\text{Std overhead rate per hour}}{\text{Std overhead rate per hour}}$

- (e) Actual overheads = $\frac{\text{Actual hours}}{\text{Actual hours}} \times \frac{\text{Actual overhead rate per hour}}{\text{Actual overhead rate per hour}}$

When Overhead Rate per Unit is used

The following basic calculations should be made:

- (a) ***Standard output for actual hours (SOAH)***: It is required to be calculated when overheads are absorbed on the basis of overhead rate per unit. It is calculated as follows:

$$SOAH = \frac{\text{Budgeted output (in units)}}{\text{Budgeted hours}} \times \text{Actual hours}$$

- (b) Absorbed overheads = $\frac{\text{Actual output}}{\text{Actual output}} \times \frac{\text{Std overhead rate per unit}}{\text{Std overhead rate per unit}}$

- (c) Standard overheads = $\frac{\text{Std output for actual time}}{\text{Std output for actual time}} \times \frac{\text{Std overhead rate per unit}}{\text{Std overhead rate per unit}}$

- (d) Budgeted overheads = $\frac{\text{Budgeted output}}{\text{Budgeted output}} \times \frac{\text{Std overhead rate per unit}}{\text{Std overhead rate per unit}}$

- (e) Actual overheads = $\frac{\text{Actual output}}{\text{Actual output}} \times \frac{\text{Actual overhead rate per unit}}{\text{Actual overhead rate per unit}}$

Overhead Cost Variance

This is the total overheads variance and can be described as the difference between total standard overheads absorbed and total actual overheads incurred. CIMA, London has defined it as '*the difference between the standard cost of overheads*

absorbed in the output achieved and the actual overhead cost.’ Thus, this variance arises due to the actual overhead incurred differing from the standard overheads absorbed and is simply under or over-absorption of overheads. Its formula is:

$$\text{Overhead Cost Variance} = \text{Absorbed overheads} - \text{Actual overheads}$$

$$\text{OCV} = \left(\frac{\text{Std hours for actual output}}{\text{Std overheads absorption rate}} \right) - \text{Actual overheads}$$

Variable overheads (V.O.) Variances

Variable Overhead Cost Variance: It may be defined as the difference between absorbed variable overheads and actual variable overheads. Its formula is:

$$\text{Variable Overhead Cost Variance} = \left(\frac{\text{Std hours for actual output}}{\text{Std variable ohds rate}} \right) - \text{Actual overhead cost}$$

$$\text{VOCV} = (\text{Absorbed V.O.} - \text{Actual V.O.})$$

This variance is sub-divided into the following two variances:

(a) **Variable Overheads Expenditure Variance:** This is also known as Spending Variance or Budget Variance. This variance arises due to the difference between standard variable overheads allowed and actual variable overheads incurred. Its formula is:

$$\begin{aligned} \text{V.O. Expenditure Variance} &= \left(\frac{\text{Std variable overhead rate}}{\text{Actual hours}} \right) - \text{Actual overhead cost} \\ &= (\text{Standard V.O.} - \text{Actual V.O.}) \end{aligned}$$

(b) **Variable Overhead Efficiency Variance:** This variance arises due to the difference between standard hours allowed for actual output and actual hours. The reasons for this variance are the same which give rise to labour efficiency variance. Its formula is as follows:

$$\begin{aligned} \text{V.O. Cost Variance} &= \left(\frac{\text{Std variable overhead rate}}{\text{Actual hours}} \right) - \text{Std variable overhead rate} \\ &= (\text{Absorbed V.O.} - \text{Standard V.O.}) \end{aligned}$$

Check:

$$\text{V.O. Cost Variance} = \text{V.O. Expenditure Variance} + \text{V.O. Efficiency Variance}$$

Illustration 13.3: Calculate variable overheads variances from the following:

	Budgeted	Actual
Output (units)	20,000	19,000
Hours	5,000	4,500
Overheads – Fixed	₹10,000	10,500
Variable	₹ 5,000	4,800

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NOTES**Solution:****Basic calculations:**

$$(a) \text{ Std variable overhead rate} = \frac{\text{Budgeted overheads}}{\text{Budgeted hours}} = \frac{\text{₹5,000}}{5,000 \text{ hours}} = \text{₹1 per hour}$$

$$(b) \text{ Std hours for actual output} =$$

$$\frac{\text{Budgeted hours}}{\text{Budgeted output}} \times \text{Actual output} = \frac{5,000}{20,000} \times 19,000$$

$$= 4,750 \text{ hours}$$

$$\text{Absorbed fixed overheads} = \text{Std hrs for actual output} \times \text{Std rate} = 4,750 \times 1 = \text{₹4,750}$$

$$\text{Standard fixed overheads} = \text{Actual hrs} \times \text{Std rate} = 4,500 \times 1 = 4,500$$

Calculation of Variances:**(a) Variable Overhead Cost Variance**

$$= \text{Absorbed ohds} - \text{Actual variable ohds}$$

$$= 4,750 - 4,800 = \text{₹50 (A)}$$

(b) Expenditure Variance = Std overheads – Actual variable overheads

$$= 4,500 - 4,800 = \text{₹300 (A)}$$

(c) Efficiency Variance = Absorbed overheads – Std overheads

$$= 4,750 - 4,500 = \text{₹250 (F)}$$

Check:

$$\text{V.O. Cost Variance}$$

$$= \text{Expenditure Variance} + \text{Efficiency Variance}$$

$$50 \text{ (A)} = 300 \text{ (A)} + 250 \text{ (F)}.$$

Fixed Overheads (F.O.) Variances

Fixed Overhead Cost Variance: It is the difference between standard fixed overhead cost for actual output (or absorbed overheads) and actual fixed overheads. Its formula is:

$$\text{F.O. Cost Variance} = \left(\text{Std hours for actual output} \times \text{Std F.O. rate} \right) - \text{Actual fixed overheads}$$

$$= \text{Absorbed overheads} - \text{Actual overheads}$$

Fixed overhead cost variance is sub-divided into the following two variances:

(a) Fixed Overhead Expenditure Variance: This is also known as Spending Variance or Budget Variance. It arises due to the difference between budgeted fixed overheads and actual fixed overheads. Its formula is:

$$\text{F.O. Expenditure Variance} = \left(\text{Budgeted fixed overheads} - \text{Actual fixed overheads} \right)$$

(b) **Fixed Overheads Volume Variance:** This variance arises due to the difference between standard output and actual output. It is defined as that portion of overheads variance which arises due to the difference between standard cost of overheads absorbed by actual production and the standard allowance for that output.

$$\begin{aligned}\text{F.O. Volume Variance} &= \left(\text{Std hours for actual output} - \text{Budgeted hours} \right) \times \text{Std rate} \\ &= \text{Absorbed Overheads} - \text{Budgeted Overheads}\end{aligned}$$

Example: Calculate fixed overheads variances for the data given in Illustration 13.3.

Solution:

Basic calculations:

$$(a) \text{ Std fixed overhead rate} = \frac{\text{Budgeted fixed overheads}}{\text{Budgeted hours}} = \frac{\text{₹}10,000}{5,000 \text{ hrs}} = \text{₹}2$$

$$\begin{aligned}(b) \text{ Std hours for actual output} &= \frac{\text{Budgeted hrs}}{\text{Budgeted output}} \times \text{Actual output} \\ &= \frac{5,000}{20,000} \times 19,000 = 4,750 \text{ hrs}\end{aligned}$$

$$\begin{aligned}(c) \text{ Absorbed fixed overheads} &= \text{Std hrs for actual output} \times \text{Std rate} \\ &= 4,750 \text{ hrs} \times \text{₹}2 = \text{₹}9,500\end{aligned}$$

Calculation of Variances:

(a) **Fixed Overhead Cost Variance**

$$\begin{aligned}&= \text{Absorbed fixed overheads} - \text{Actual fixed overheads} \\ &= 9,500 - 10,500 = \text{₹}1,000 \text{ (A)}\end{aligned}$$

(b) **Fixed Overhead Expenditure Variance**

$$\begin{aligned}&= \text{Budgeted overheads} - \text{Actual overheads} \\ &= 10,000 - 10,500 = \text{₹}500 \text{ (A)}\end{aligned}$$

(c) **Fixed Overheads Volume Variance**

$$\begin{aligned}&= \text{Absorbed fixed ohds} - \text{Budgeted overheads} \\ &= 9,500 - 10,000 = \text{₹}500 \text{ (A)}\end{aligned}$$

Check:

$$\begin{aligned}\text{F.O. Cost Variance} &= \text{Expenditure Variance} + \text{Volume Variance} \\ 1,000 \text{ (A)} &= 500 \text{ (A)} + \text{₹}500 \text{ (A)}\end{aligned}$$

(B) When Overhead Rate per Unit is Used

Whether standard overhead rate used is per hour or per unit, the results will be the same. Thus the variances calculated by both the methods would be identical. In fact, these are two different ways of looking at the same thing.

NOTES

NOTES**Basic calculations:**

- (i) Std fixed overhead rate $= \frac{₹12,500}{12,500 \text{ units}} = ₹1 \text{ per unit}$
- (ii) Std variable overhead rate $= \frac{₹50,000}{12,500 \text{ units}} = ₹4 \text{ per unit}$
- (iii) Std output for actual hours $= \frac{\text{Budgeted output}}{\text{Budgeted hrs}} \times \text{Actual hours}$
 $= \frac{12,500 \text{ units}}{6,250 \text{ hrs}} \times 5,750 \text{ hrs} = 11,500 \text{ units}$

Calculation of Variances:**Variable Overheads Variances:**

(a) **Variable Overhead Cost Variance** = Absorbed overheads – Actual overheads

$$= (\text{Actual output} \times \text{Std rate}) - \text{Actual overheads}$$

$$= (11,000 \times 4) - 45,000 = ₹1,000 \text{ (A)}$$

(b) **Variable Overheads Budget Variance**

$$= (\text{Standard overheads}) - (\text{Actual overheads})$$

$$= \text{Actual output} - \frac{\text{Std output}}{\text{for actual hrs}} \times \text{Standard rate}$$

$$= (11,500 \times 4) - 45,000 = ₹1,000 \text{ (F)}$$

(c) **Variable Overheads Efficiency Variance** = Absorbed overheads – Std overheads

$$= \left(\text{Actual output} - \frac{\text{Std output}}{\text{for actual hrs}} \right) \times \text{Standard rate}$$

$$= (11,000 - 11,500) \times ₹4 = ₹2,000 \text{ (A)}$$

Fixed Overheads Variances:

(a) **Fixed Overhead Cost Variance** = Absorbed overheads – Actual overheads

$$= \left(\text{Actual output} - \text{Std rate} \right) - \text{Actual overheads}$$

$$= (11,000 \times 1) - 13,000 = ₹2,000 \text{ (A)}$$

(b) **Fixed Overheads Budget Variance**

$$= \text{Budgeted overheads} - \text{Actual overheads}$$

$$= 12,500 - 13,000 = ₹500 \text{ (A)}$$

(c) **Fixed Overheads Volume Variance** = Absorbed overheads – Budgeted overheads

$$= \left(\text{Actual output} - \frac{\text{Budgeted output}}{\text{output}} \right) - \text{Std rate}$$

$$= (11,000 - 12,500) \times ₹1 = ₹1,500 \text{ (A)}$$

Sub-division of Overheads Volume Variance

Standard Costing

Volume variance is further sub-divided into the following variances:

1. Efficiency Variance
2. Capacity Variance
3. Calendar Variance

1. **Fixed Overheads Efficiency Variance:** This is defined as ‘*that portion of volume variance which reflects the increased or reduced output arising from efficiency above or below the standard which is expected.*’ This variance thus shows that the actual quantity produced is different from standard quantity because of higher or lower efficiency of workers engaged in production. Its formula is:

$$\begin{aligned}\text{Efficiency Variance} &= \frac{\text{Absorbed fixed overheads}}{\text{overheads}} - \frac{\text{Standard fixed overheads}}{\text{overheads}} \\ &= \left(\frac{\text{Std hrs for actual output}}{\text{actual output}} - \frac{\text{Actual hours}}{\text{hours}} \right) \times \text{Std rate}\end{aligned}$$

2. **Fixed Overheads Capacity Variance:** This is ‘*that portion of the volume variance which is due to working at higher or lower capacity usage than the standard.*’ Thus this variance arises when plant capacity actually utilized is more or less than the capacity planned to be utilized due to factors like idle time, under or over customer demand, strikes, power failure, etc. Its formula is:

$$\begin{aligned}\text{Capacity Variance} &= \left(\frac{\text{Standard fixed overheads}}{\text{overheads}} - \frac{\text{Budgeted overheads}}{\text{overheads}} \right) \\ \text{Or} \quad &= \left(\frac{\text{Actual hrs worked}}{\text{worked}} - \frac{\text{Budgeted hours}}{\text{hours}} \right) \times \text{Std rate}\end{aligned}$$

3. **Calendar Variance:** It may be defined as ‘*that portion of the volume variance which is due to the difference between the number of working days in the budget period and the number of actual working days in the period to which the budget is applied.*’ Calendar variance is actually volume variance arising due to a particular cause, i.e., actual number of working days being different from those budgeted, due to extra holiday being declared on the death of a national leader or any other reason. Calendar variance arises only in exceptional circumstances because normal holidays are taken into account while laying down the standards.

When calendar variance is calculated, the calculation of capacity variance has to be modified so as to induct this additional variance into the analysis. Calendar variance is calculated by the following formula:

$$\begin{aligned}\text{Calendar Variance} &= \left(\frac{\text{Actual no. of working days}}{\text{working days}} - \frac{\text{Std no. of working days}}{\text{working days}} \right) \times \text{Std rate per day} \\ \text{Or} \quad &= \left(\frac{\text{Revised budgeted hours}}{\text{hours}} - \frac{\text{Budgeted hours}}{\text{hours}} \right) \times \text{Std rate per hour}\end{aligned}$$

NOTES

Generally, this variance is adverse because of extra holidays, but if there are extra working days (because of less holidays), then this variance will be favourable.

Example: The following information is given:

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Std fixed overhead rate (per hour)	₹5
Budgeted hours	12,500
Std no. of working days	25
Actual hours	11,500
Actual no. of working days	22

Calculate Calendar Variance.

Solution:

$$\text{Std no. of hrs per day} = 12,500 \div 25 \text{ days} = 500$$

$$\begin{aligned} \text{Revised budgeted hours} &= \text{Std hours per day} \times \text{Actual no. of days} \\ &= 500 \times 22 = \mathbf{11,000} \end{aligned}$$

$$\begin{aligned} \text{Calendar Variance} &= (11,000 - 12,500) \times ₹5 \\ &= \mathbf{₹7,500 (A)} \end{aligned}$$

Alternative Method

$$\begin{aligned} \text{Std overhead rate per day} &= \text{Std hrs per day} \times \text{Std rate per hr} \\ &= 500 \text{ hrs} \times ₹5 = ₹2,500 \end{aligned}$$

$$\text{Calendar Variance} =$$

$$\begin{aligned} &\left(\text{Actual no. of working days} - \text{Std no. of working days} \right) \times \text{Std rate per day} \\ &= (22 - 25) \times 2,500 = \mathbf{₹7,500 (A)} \end{aligned}$$

Revised Capacity Variance

When calendar variance is to be calculated, the method of calculating capacity variance has to be modified. The new formula in that case is as follows.

$$\text{Revised Capacity Variance} = \left(\text{Actual hours} - \text{Revised budgeted hours} \right) \times \text{Std rate per hr}$$

In the example given above, capacity variance will be calculated as follows:

$$\text{Revised Capacity Variance} = (11,500 - 11,000) \times ₹5 = \mathbf{₹2,500 (F)}$$

Reporting of Variances

In order that a standard costing system may be of maximum value to management, it is essential that reports exhibiting variances from standards for each element of cost of each department and operation should be quickly and effectively presented to management. Furthermore, it is essential that management should act speedily to investigate variances and, where possible, make decisions to prevent recurrence of adverse variances.

Illustration 13.4: The standard cost card for product ‘Simco’ reveals:

Standard Costing

Standard materials —	₹
2 kgs of A @ ₹2 per kg	4.00
1 kgs of B @ ₹6 per kg	6.00
Direct labour (3 hours @ ₹6 per hour)	18.00
Variable overheads (3 hours @ ₹4 per direct labour hour)	<u>12.00</u>
Total standard cost per unit	<u>40.00</u>

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It is proposed to produce 10,000 units of ‘Simco’ in the month of March and budgeted costs on the information contained in the standard costs card are as follows:

Direct materials —	
A 20,000 kgs @ ₹2 per kg	40,000
B 10,000 kgs @ ₹6 per kg	60,000
Direct labour (30,000 hours @ ₹6 per hour)	1,80,000
Variable overheads (30,000 hours @ ₹4 per direct labour hr)	<u>1,20,000</u>
	<u>4,00,000</u>

The actual results are:

Direct materials —	
A 19,000 kgs @ ₹2.20 per kg	41,800
B 10,100 kgs @ ₹5.60 per kg	56,560
Direct labour (28,500 hours @ ₹6.40 per hour)	1,82,400
Variable overheads	<u>1,04,400</u>
	<u>3,84,760</u>

Actual production was 9,000 units.

From the above information, calculate the following variances and prepare a Variance Report showing reconciliation of standard cost and actual cost.

- Material price and usage
- Labour wages rate and labour efficiency
- Variable overheads
 - Total variable overheads variance
 - Overheads expenditure variance
 - Overheads efficiency variance

Solution:

(a) Material Variances

- Material Price Variance = $(SP - AP) \times AQ$
 $A = (2 - 2.20) \times 19,000 = ₹3,800 (A)$
 $B = (6 - 5.60) \times 10,100 = ₹4,040 (F)$
 $MPV = ₹240 (F)$

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$$(ii) \text{ Material Usage Variance} = (SQ - AQ) \times SP$$

$$A = (18,000 - 19,000) \times 2 = ₹2,000 \text{ (A)}$$

$$B = (9,000 - 10,100) \times 6 = ₹6,600 \text{ (A)}$$

$$MUV = ₹8,600 \text{ (A)}$$

$$(iii) \text{ Material Cost Variance} = MPV + PUV$$

$$= ₹240 \text{ (F)} + ₹8,600 \text{ (A)} = ₹8,360 \text{ (A)}$$

(b) Labour Variances

*9,000 units @ 3 hours per unit = 27,000 standard hours for actual production (SH)

$$(i) \text{ Labour Rate Variance} = (SR - AR) \times AH$$

$$= (6 - 6.40) \times 28,500 = ₹11,400 \text{ (A)}$$

$$(ii) \text{ Labour Efficiency Variance} = (SH - AH) \times SR$$

$$= (27,000 - 28,500) \times 6 = ₹9,000 \text{ (A)}$$

$$(iii) \text{ Labour Cost Variance} = LRV + LEV$$

$$= 11,400 \text{ (A)} + 9,000 \text{ (A)} = ₹20,400 \text{ (A)}$$

(c) Variable Overheads Variances**Total Variable Overheads Variance**

= (Std hrs for actual production × Std overhead rate) – Actual variable overheads

$$= (27,000 \times 4) - 1,04,000 = ₹4,000 \text{ (F)}$$

(i) Overheads Expenditure Variance

= (Budgeted overheads – Actual variable overheads)

$$= (28,500 \times 4) - 1,04,000 = ₹10,000 \text{ (F)}$$

(ii) Overheads Efficiency Variance

= (Standard hours for actual production – Actual hours) × Standard overheads rate

$$= (27,000 - 28,500) \times 4 = ₹6,000 \text{ (A)}$$

Total Cost Variance = Total Std Cost – Total Actual Cost

$$= (9,000 \text{ units} \times ₹40) - ₹3,84,760 = ₹24,760 \text{ (A)}$$

Variance Report

(Reconciliation of Standard Cost and Actual Cost)

	Variances		Amount
	Favourable (F) ₹	Adverse (A) ₹	₹
Total Standard Cost (9,000 units @ ₹40)	–	–	3,60,000
Material Price Variance	240	–	
Material Usage Variance	–	8,600	
Labour Rate Variance	–	11,400	
Labour Efficiency Variance	–	9,000	
Overheads Expenditure Variance	10,000	–	
Overheads Efficiency Variance	–	6,000	
Total	10,240	35,000	24,760 (A)
Total Actual Cost			3,84,760

Disposition of Variances

When standard costs are not entered in the books of accounts and are used only as a statistical information, no adjustments are required at the end of the period for the variances. However, when standard costs are incorporated into the accounting system through journals and ledgers, there arises a question of adjustment and disposition of variances at the end of the accounting period.

There is no uniformity of opinion as to the proper disposition of variances. Therefore, no hard and fast rules can be laid down in this regard.

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Check Your Progress

4. State the accounting principle which is used when dealing with controllable and uncontrollable variances.
5. Mention the formula for material usage variance.
6. When does labour mix variance arises?
7. Which variance is also known as spending variance or budget variance?

13.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. In jobbing industries, it is not worthwhile to develop and employ a full system of standard costing because in such industries each job undertaken may be different from another and setting standards for each job may prove difficult and expensive.
2. The three types of current standards are: ideal standards, expected and normal standards.
3. The transfer of variance between standard cost and actual cost to a variance account ensures uniform pricing of stocks in the form of raw materials, work-in-progress and finished goods.
4. The accounting principle which is used when dealing with controllable and uncontrollable variances is the principle of exception whereby those matters which are going right are ignored and any deviations from efficient performance are investigated.
5. The following is formula for material usage variance:

$$\text{Material Usage Variance} = (\text{Standard quantity for actual output} - \text{Actual quantity}) \times \text{Standard Price}$$
6. Labour mix variance arises only when more than one grade of workers are employed and the composition of actual grade of workers differs from those specified.

7. Fixed overhead expenditure variance is also known as Spending variance or Budget Variance.

NOTES

13.5 SUMMARY

- Standard costing is a specialized technique of cost management to control the cost.
- The limitations of historical costing encouraged the development of a more satisfactory standard costing approach based on predetermined costs.
- Standard costing is not an alternative system to job order or process costing. It is a special technique to control costs and can be used in conjunction with any other system like job costing, process costing or marginal costing.
- Standard costing system may suffer from certain disadvantages. This may be because of lack of education and communication and resultant misunderstanding on the part of managerial staff.
- Establishing a system of standard costing: establishment of cost centres, classification of accounts, types of standards, and setting of standard costs.
- Cost variance is the difference between a standard cost and the comparable actual cost incurred during a period. These variances can be favourable or unfavourable and controllable and uncontrollable variances.
- While setting standards, specific methods of production are kept in view. If, for some reason or the other, a different method of production is adopted, it will give rise to a different method of production is adopted, it will give rise to a different amount of cost, thereby resulting in a variance. Such a variance is known as methods variance.
- The total cost variance is divided into material, labour and overheads variances.
- The material cost variance is further divided into material price and material usage variances.
- The labour cost variance is divided into labour rate variance and labour efficiency variance.

13.6 KEY WORDS

- **Historical costing:** It is a cost accounting concept in which the assets and liabilities are reported at their historical costs, which does not account for changes in the item's value.
- **Standard costs:** These are predetermined costs or target costs that should be incurred under efficient operating conditions.

- **Standard hour:** It refers to the quantity of output or amount of work which should be performed in one hour.
- **Cost variance:** It refers to the difference between a standard cost and the comparable actual cost incurred during a period.

Standard Costing

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13.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Define standard and budgeted costs.
2. Write a short note on the applicability of standard costing.
3. List the limitation of standard costing.
4. What are the different types of variances?

Long Answer Questions

1. Explain the steps involved in the establishment of standard costing.
2. Describe the process of setting standard costs.
3. Discuss the different material and labour variances.
4. From the particulars given below, compute: Material Price Variance, Material Usage Variance, Labour Rate Variance, Idle Time Variance and Labour Efficiency Variance, with full working details.

One tonne of materials input yields a standard output of 1,00,000 units. The standard price of material is ₹ 20 per kg. Number of employees engaged is 200. The standard wage rate per employee per day is ₹6. The standard daily output per employee is 100 units. The actual quantity of material used is 10 tonnes and the actual price paid is ₹ 21 per kg. Actual output obtained is 9,00,000 units. Actual number of days worked is 50 and actual rate of wages paid is ₹ 6.50 per day. Idle time paid for and included in above time is 1/2 day.

5. From the following prepare variance analysis of a particular department for a month:

Variable Overheads items:	Actual ₹
Material handling	8,325
Idle Time	850
Rework	825
Overtime premium	250
Supplies	4,000
	14,250

NOTES**Fixed Overheads Items:**

Supervision	1,700
Depreciation of plant	2,000
Depreciation of equipment	5,000
Rates	1,150
Insurance	350
	10,200

Normal capacity 10,000 standard hours, budgeted rate ₹ 1.70 per standard hour for variable overheads and ₹ 1 per standard hour for fixed overheads. Actual level is 8,000 standard hours.

13.8 FURTHER READINGS

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UNIT 14 RECONCILIATION OF ACCOUNTS, COST CONTROL AND REDUCTION

*Reconciliation of
Accounts, Cost Control
and Reduction*

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Structure

- 14.0 Introduction
- 14.1 Objectives
- 14.2 Reconciliation of Cost and Final Accounts
 - 14.2.1 Procedure
- 14.3 Cost Control and Cost Reduction
 - 14.3.1 Distinction between Cost Control and Cost Reduction
 - 14.3.2 Scope and Areas of Cost Reduction
 - 14.3.3 Tools and Techniques of Cost Reduction and Cost Control and their Advantages
 - 14.3.4 Essentials for the Success of Cost Control and Cost Reduction
 - 14.3.5 Advantages of Cost Reduction
- 14.4 Answers to Check Your Progress Questions
- 14.5 Summary
- 14.6 Key Words
- 14.7 Self Assessment Questions and Exercises
- 14.8 Further Readings

14.0 INTRODUCTION

When cost accounts and financial accounts are maintained separately in two different sets of books, two profit and loss accounts will be prepared—one for costing books and the other for financial books. The profit or loss shown by costing books may not agree with that shown by financial books. Therefore, it becomes necessary that profit or loss shown by the two sets of accounts is reconciled.

It is important to note that the question of reconciliation of cost financial accounts arises only under non-integral system. However, under the integral accounts, since cost and financial accounts are integrated into one set of books and only one Profit and Loss Account is prepared, the problem of reconciliation does not arise.

In this unit, you will learn the important aspects of reconciliation of cost and final accounts.

Now-a-days businesses are operating in a globally competitive environment, where in order to increase profits, increase in selling prices of products/services may not be possible because of fears of shrinkage in volumes. Thus in order to

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improve profit performance, businesses have to be extremely cost conscious and improve their performance in cost. In other words, in this age of competition, in order to survive and improve profitability, managers have to make continuous efforts to find out ways and means to control and reduce costs.

In this unit, you will also learn the important aspects of cost control and cost reduction.

14.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the concept of reconciliation of cost and financial accounts
- Describe the procedure of reconciliation of cost and financial accounts
- Explain the meaning and essentials of cost control and cost reduction
- Recall the tools and techniques of cost control and cost reduction and their advantages
- Differentiate between cost control and cost reduction
- Explain the areas of cost reduction and control

14.2 RECONCILIATION OF COST AND FINAL ACCOUNTS

The need for reconciliation arises due to the following reasons:

1. Reconciliation reveals the reasons for difference in profit or loss between cost and financial accounts.
2. It also helps in checking the arithmetic accuracy of the costing data. In other words, reconciliation enables to test the reliability of cost accounts.
3. It promotes coordination and cooperation between cost accounting and financial accounting departments.

Reasons for Disagreement in Profit/Loss

Difference in profit or loss between cost and financial accounts may arise due to the following reasons:

1. **Items shown only in financial accounts:** There are a number of items which appear in financial accounts and not in cost accounts. While reconciling, any items under this category must be considered. These items are classified into three categories as under:

(a) **Purely financial charges**—Examples:

- (i) Loss on the sale of capital assets
- (ii) Discount on bonds, debentures, etc.

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- (iii) Losses on investments
- (iv) Expenses of company's transfer office
- (v) Interest on bank loans and mortgages
- (vi) Fines and penalties
- (vii) Provision for bad and doubtful debts
- (viii) Damages payable at law
- (ix) Amounts written off, goodwill, discount on debentures, preliminary expenses
- (x) Loss due to theft, pilferage, etc.
- (b) **Purely financial incomes**—Examples:
 - (i) Profit arising from the sale of capital assets
 - (ii) Rent receivable
 - (iii) Dividend and interest received on investments
 - (iv) Interest received on bank deposits
 - (v) Transfer fees received
 - (vi) Income tax refund
- (c) **Appropriations of profit**—Examples:
 - (i) Dividends paid
 - (ii) Transfer to reserves
 - (iii) Charitable donations
 - (iv) Income-tax
 - (v) Any other items which appears in Profit and Loss Appropriation Account

2. Items shown only in cost accounts: There are a few items which are included in cost accounts and not in financial accounts. Examples:

- (a) Notional rent, *i.e.*, charge in lieu of rent when premises are owned and no rent is payable
- (b) Interest on capital employed but not actually paid, *i.e.*, the notional cost of employing capital
- (c) Notional salaries
- (d) Depreciation on fully depreciated assets still in use

3. Under-absorption or over-absorption of overheads: In cost accounts, overheads are recovered at a predetermined rate whereas in financial accounts these are recorded at actual cost. This may give rise to a difference between overheads absorbed in cost and actual overhead cost incurred. Such differences should be written off to Costing Profit and Loss Account.

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However, when under or over-absorbed overheads are not written off to Costing Profit and Loss Account, it results in the amount recovered in cost accounts being different from the actual amount shown in financial accounts. In such a case, it becomes necessary to take into account this under/over-absorption while reconciling the two accounts.

4. Different bases of stock valuation: In cost accounts stocks are valued according to the method adopted in stores accounts, *e.g.* FIFO, LIFO, etc. On the other hand, valuation of stock in financial accounts is invariably based on the principle of cost or market price, whichever is less. Different stock values result in some difference in profit or loss as shown by the two sets of account books.

5. Different charges for depreciation: The rates and methods of charging depreciation may be different in cost and financial accounts. The financial accounts may follow straight line or diminishing balance method, etc., whereas in cost accounts machine hour rate, production unit method, etc., may be adopted. This will also cause a difference in the profit/loss figures.

14.2.1 Procedure

The cost and financial accounts are reconciled by preparing a Reconciliation Statement or a Memorandum Reconciliation Account. The following procedure is recommended for preparing a Reconciliation Statement:

1. Ascertain the points of difference between cost accounts and financial accounts.
2. Start with the profit as per cost accounts.
3. (a) *Regarding items of expenses and losses:*

Add: Items over-charged in cost accounts

Deduct: Items under-charged in cost accounts

For example, depreciation in cost accounts is ₹2,500 and that in financial accounts is ₹2,700. This has the effect of increasing costing profit by ₹200 as compared to financial profit. Then in order to reconcile, ₹200 will be deducted from costing profit.

- (b) *Regarding items of incomes and gains:*

Add: Items under-recorded or not recorded in cost accounts

Deduct: Items over-recorded in cost accounts

For example, interest on investments received amounting to ₹1,500 is not recorded in cost accounts. This will have the effect of reducing profit as per cost books. Thus, in order to reconcile, this amount of ₹1,500 for interest should be added in the costing profit.

(c) Regarding valuation of stock:

(i) Opening Stock— *Add:* Amount of over-valuation in cost accounts
Deduct: Amount of under-valuation in cost accounts

(ii) Closing Stock— *Add:* Amount of under-valuation in cost accounts
Deduct: Amount of over-valuation in cost accounts

4. After making all the above additions and deductions in costing profit, the resulting figure shall be the profit as per financial books.
5. The above treatment of items will be reversed when the starting point in the Reconciliation Statement is the profit as per financial accounts or loss as per cost accounts.

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Pro forma of Reconciliation Statement

Profit as per cost accounts		₹	₹
<i>Add:</i>	1. Over-absorption of overheads		
	2. Financial incomes not recorded in cost books		
	3. Items charged only in cost accounts (Notional rent and interest on capital, etc.)		
	4. Over-valuation of opening stocks in cost books		
	5. Under-valuation of closing stock in cost books		
<i>Less:</i>	1. Under-absorption of overheads		
	2. Purely financial charges		
	3. Under-valuation of opening stock in cost books		
	4. Over-valuation of closing stock in cost books		
Profit as per financial accounts			

Memorandum Reconciliation Account

This is an alternative to Reconciliation Statement. The only difference is that the information shown above in the pro forma reconciliation statement is shown in the form of an account. The profit as per cost accounts is the starting point and is shown on the credit side of this account. All items which are added to costing profit for reconciliation are also shown on credit side. The items to be 'deducted' from costing profit for reconciliation are shown on the debit side. The balance figure is the profit as per financial accounts.

It is only a memorandum account and does not form part of the double entry books of account.

Pro forma of Memorandum Reconciliation Account

₹		₹	
To (Item to be deducted)	—	By Profit as per cost accounts	—
To (Item to be deducted)	—	By (Item to be added)	—
To (Item to be deducted)	—	By (Item to be added)	—
To (Item to be deducted)	—	By (Item to be added)	—
To (Item to be deducted)	—	By (Item to be added)	—
To Profit as per financial accounts (balancing figure)	—	By (Item to be added)	—

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Example 1: From the following figures, prepare a Reconciliation Statement:

	₹
Net profit as per financial books	63,780
Net profit as per costing books	66,760
Factory overheads under-recovered in costing	5,700
Administration overheads recovered in excess	4,250
Depreciation charged in financial books	3,660
Depreciation recovered in costing	3,950
Interest received but not included in costing	450
Income-tax provided in financial books	600
Bank interest credited in financial books	230
Stores adjustment (credited in financial books)	420
Depreciation of stock charged in financial accounts	860
Dividends appropriate in financial accounts	1,200
Loss due to theft and pilferage provided only in financial books	260

Solution:

Reconciliation Statement

	₹	₹
Profit as per costing books		66,760
<i>Add:</i> 1. Adm. overheads recovered in excess	4,250	
2. Depreciation overcharged in cost books (3,950 – 3,660)	290	
3. Interest received but not included in costing	450	
4. Bank interest credited in financial books only	230	
5. Stores adjustment credited in financial books	<u>420</u>	<u>5,640</u>
		72,400
<i>Less:</i> 1. Factory overheads under-recovered	5,700	
2. Income tax provided in financial books	600	
3. Dividends appropriated	1,200	
4. Depreciation of stock in financial books	860	
5. Loss due to theft and pilferage not shown in cost books	<u>260</u>	<u>8,620</u>
Profit as per financial books		63,780

Check Your Progress

1. Give some examples of purely financial incomes.
2. What are the ways in which depreciation is charged in financial and cost accounts?
3. What is the alternative to reconciliation statement?

14.3 COST CONTROL AND COST REDUCTION

Cost control is an essential component of any system of cost accounting. It is exercised through comparing actual costs with predetermined standard costs so that the difference between the two can be measured and then analysed according to reasons for taking corrective action. CIMA, London has defined cost control as, ‘the regulation by executive action of the cost of operating an undertaking

particularly where action is guided by cost accounting'. Cost control is thus simply the utilization of the available resources economically and prevention of the wastage within the existing environment. It is the function of keeping costs within the prescribed limits.

Steps in Cost Control: In designing a system of cost control, the following steps are taken:

1. Establishing norms: The first step in cost control is to set norms or standards which may serve as yardsticks for measuring performance. These standards or norms are set on the basis of past performance, adjusted for changes in future and on the basis of studies conducted.
2. Comparison with actual: The actual costs incurred are compared with established standard costs to know the level of achievement. The variations are analysed so as to arrive at the causes which are controllable and uncontrollable.
3. Corrective action: Remedial or corrective measures are taken to avoid the recurrence of variations in future and for revision of standards, wherever necessary.

Amongst the techniques used for cost control, the two most popular are budgetary control and standard costing.

Cost Reduction

Cost reduction is often confused with cost control. Cost reduction is much wider in scope and consists of effecting savings in cost by continuous research for improvement in products, methods, procedures and organizational practices. Cost reduction is defined by CIMA, London as 'the achievement of real and permanent reduction in the unit cost of goods manufactured or services rendered without impairing their suitability for use intended.' This definition reveals the following characteristics of cost reduction:

- (i) Cost reduction must be real—say, through increase in productivity, change in product design and improvement in technology, etc.
- (ii) Cost reduction must be permanent—temporary reductions in cost due to windfalls, change in tax rates and changes in market prices, do not come in the purview of cost reduction.
- (iii) Cost reduction must not impair the suitability of products or services for the intended use. In other words, cost reduction should not be at the cost of essential characteristics of the products or services.

The cost reduction is, therefore, the term used for planned and positive approach to the improvement of efficiency. It can be viewed in many ways, such as increasing productivity, elimination of waste, improvement in product design, better technology and techniques, incentive schemes, new layouts and better

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methods, etc. If the cost reductions are not based on sound reasons, like improved methods, then very quickly the costs will grow back to their original size.

14.3.1 Distinction between Cost Control and Cost Reduction

Cost control and cost reduction are two effective tools of cost management to improve efficiency. Cost control and cost reduction are two separate phases of cost improvement. Cost reduction begins where cost control ends. The main points of distinction between the two are as follows:

Cost control	Cost Reduction
1. Cost control is the achievement of predetermined targets of costs.	Cost reduction is the achievement of the real and permanent reduction in costs.
2. Cost control tends to assume a static state of affairs and that standards once set are not challenged.	Cost reduction assumes the existence of concealed potential savings in the standards or pre-determined costs set for cost control and that these standards are always subject to challenge.
3. Cost control is concerned with predetermining costs, comparing it with actual costs, analyzing the variances and taking corrective action.	Cost reduction is not concerned with maintenance of performance according to predetermined targets. It is rather concerned with finding out new product designs, methods, etc.
4. Cost control is a preventive function as it aims to prevent the costs from exceeding the predetermined targets.	Cost reduction is a corrective function because it challenges the predetermined targets and seeks to improve performance by correcting the targets.
5. Cost control is a part of cost accounting function.	Cost reduction may be achieved even when no cost accounting system is in operation.
6. Cost control lacks dynamic approach to cost improvement.	Cost reduction is a more dynamic approach to cost improvement and elimination of waste.

14.3.2 Scope and Areas of Cost Reduction

The scope of cost reduction is so wide that it is not practicable to develop fully the areas in which cost reduction may be applied. Wherever costs are incurred, there is scope for their reduction and the management should not feel that there is no room for cost reduction in any particular area. Effort should, therefore, be made to reduce costs right from the top level to the shop floor level. However, in the following areas, scope of cost reduction is the largest:

1. **Product design:** The design of the product provides the greatest scope for cost reduction. Product design being the first step in production, if cost reduction can be made at design stage, then it is likely that the benefits can be availed to the maximum.

There are two basic points that should be kept in mind while effecting cost reduction in product design:

- (a) The product should perform all the functions for which it is intended; and

- (b) The product should retain its 'esteem' or 'aesthetic' value. This is in the case of many products which have the shape or other characteristic which pleases the eye.

Improvement in product design may result in cost reduction as illustrated below:

- (i) **Material cost:** Change in design of the product may result in saving in material cost. Economical substitution for existing material may also be considered. For example, in manufacturing kitchen utensils, brass may be substituted by cheaper alloys. In curtain rings, metal may be substituted by plastic.
 - (ii) **Labour cost:** Improvement in design may result in reduced operating time.
 - (iii) **Factory overheads:** Reduced operating time not only helps in saving in labour cost but also in factory overheads.
 - (iv) **Packing and transportation:** Compact design of a product results in reduced cost of packing and transportation.
 - (v) **Cost of tools, jigs and fixtures** can be reduced through design improvement.
2. **Organization:** Cost reduction may also be achieved by improving factory organization in the form of clear-cut lines of authority and responsibility, well-defined channels of communications, co-ordination and co-operation between various executives, etc.
 3. **Production:** A cost reduction programme should make a study of sequence of operations to find out the best one, to use the most suitable machines for the work, to use jigs and fixtures to reduce operating time, to reduce idle time, to reduce scrap by the use of better quality tools, to provide better working conditions conducive to efficiency, etc.
 4. **Administration:** Items under this head include savings effected by modifying the range of cash discounts to customers, introducing mechanical and electronic aids to office routine, modifying internal and external communication system, etc.
 5. **Marketing:** In this function, costs can be reduced by revising the methods of remuneration of salesmen, re-arranging territorial responsibilities of sales representatives, modifying current methods of advertising, improving product design and production quality so as to reduce after sales service, economizing channels of distribution, improving packing, etc.
 6. **Finance:** A cost reduction programme should aim at securing capital at economical cost, employing capital to give maximum return and eliminating over and under capitalization and wasteful use of capital, etc.

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14.3.3 Tools and Techniques of Cost Reduction and Cost Control and their Advantages

Various tools and technique used for cost reduction include the following:

1. Standard costing
2. Budgetary control
3. Inventory control
4. Production planning and control
5. Standardization and simplification
6. Operational research and statistical techniques
7. Value analysis
8. Automation
9. Design improvement
10. Market research
11. Job evaluation and merit rating
12. Work study
13. Organization and methods study
14. Quality control.

14.3.4 Essentials for the Success of Cost Control and Cost Reduction

The following are the essentials which must be considered for the successful operation of a cost control and cost reduction programme:

- The cost reduction programme must align with the type and nature of organization. It should be suitable to its set objectives and available resources.
- It must be remembered, planned and operated as a continuous and not a one-time activity. There must be continuous corrective action in place and newer innovative approaches.
- The cost reduction programme must initiate permanent and real cost cutting and not arbitrary cost slashing.
- Cost reduction programme is heavily dependent on the cooperation of the different teams and members. It should be made acceptable keeping the employees in mind. Examples could be set by initiation from the top executives.
- Innovation in cost reduction must be bred and encouraged. Consequently, employees leading with innovative approaches must be rewarded suitably.
- The cost reduction programme must not be narrow in approach at the risk of only accounting for costs. It must also keep in consideration the social and legal consequences of the implementation of the programme.

- The principle behind a cost reduction programme must be that there is always scope for cost reduction in all organizations.
- It must be ensured that there is no overlapping of cost reduction measures to make sure that there is no double counting.

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14.3.5 Advantages of Cost Reduction

The following are the advantages of cost reduction programmes:

- It will increase profits and thereby increase the basis for more dividends, bonuses, retention of profit, etc.
- It will encourage the prospects of company expansion.
- It will ensure increased productivity even in cases of limited resources.
- It will assist in meeting competitions in a better manner.
- It will increase government's revenue by the way of taxation.
- It will make goods and services available to consumers at cheaper rates.
- It will help firm think about long term benefits and also improve their image and goodwill.

Check Your Progress

4. What is known as the function of keeping costs within prescribed limits?
5. Which of the two is a corrective function: cost control or cost reduction?
6. List the items included in cost reduction in the area of administration.

14.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Some examples of purely financial incomes are profit arising from the sale of capital assets, rent receivable, dividend and interest received on investments, interest received on bank deposits, transfer fees received, and income tax refund.
2. The financial accounts may follow straight line or diminishing balance method, etc., of charging depreciation, whereas in cost accounts machine hour rate, production unit method, etc., may be adopted.
3. Memorandum reconciliation account is the alternative to reconciliation statement.
4. Cost control is known as the function of keeping costs within prescribed limits.
5. Cost reduction is a corrective function.

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6. Items under the administration head for cost reduction include savings effected by modifying the range of cash discounts to customers, introducing mechanical and electronic aids to office routine, modifying internal and external communication system, etc.

14.5 SUMMARY

- When cost accounts and financial accounts are separately maintained in two different sets of books, two profit and loss accounts will be prepared—one for costing books and the other for financial books.
- It is important to note that the question of reconciliation of cost financial accounts arises only under non-integral system.
- However, under the integral accounts, since cost and financial accounts are integrated into one set of books and only one Profit and Loss Account is prepared, the problem of reconciliation does not arise.
- There are a number of items which appear in financial accounts and not in cost accounts. While reconciling, any items under this category must be considered.
- In cost accounts overheads are recovered at a predetermined rate whereas in financial accounts these are recorded at actual cost. This may give rise to a difference between overheads absorbed in cost and actual overhead cost incurred. Such differences should be written off to Costing Profit and Loss Account.
- In cost accounts stocks are valued according to the method adopted in stores accounts, e.g. FIFO, LIFO etc. On the other hand, valuation of stock in financial accounts is invariably based on the principle of cost or market price, whichever is less.
- The cost and financial accounts are reconciled by preparing a Reconciliation Statement or a Memorandum Reconciliation Account.
- Cost control is exercised by comparing actual costs with pre-determined standard costs so that the difference between the two can be measured and then analysed according to reasons for taking corrective action. Cost control is thus simply the function of keeping costs within the prescribed limits.
- Cost reduction is the achievement of real and permanent reduction in the per unit cost of goods manufactured or services rendered without impairing their suitability for use intended, say, through increase in productivity, change in product design, improvement in technology, etc. Product design provides the greatest scope for cost reduction.
- Various tools and technique used for cost reduction include the following:
 - o Standard costing
 - o Budgetary control

- o Inventory control
- o Production planning and control
- o Standardization and simplification
- o Operational research and statistical techniques
- o Value analysis
- o Automation
- o Design improvement
- o Market research
- o Job evaluation and merit rating
- o Work study
- o Organization and methods study
- o Quality control.

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14.6 KEY WORDS

- **Financial Accounts:** This refers to the type of accounting in which actual transactions of a company are recorded to show the financial position
- **Costing Accounts:** This refers to the type of accounting in which actual transactions as well as estimation of costs of a company are recorded of accurate decision making
- **Cost Control:** It refers to the method of regulation by executive action of the cost of operating an undertaking particularly where action is guided by cost accounting
- **Cost Reduction:** It is the achievement of real and permanent reduction in the unit cost of goods manufactured or services rendered without impairing their suitability for use intended

14.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What do you understand by reconciliation of cost and financial accounts?
2. List out 10 items, either debit or credit, which appear in financial accounts but do not appear in cost accounts.
3. What is Memorandum Reconciliation Account?
4. What is cost reduction? Give examples.
5. Distinguish between cost control and cost reduction.

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6. What are the different techniques and tools of cost control and cost reduction?
7. Write a short note on the essentials for success of cost control and cost reduction.
8. What are the advantages of cost reduction programmes?

Long Answer Questions

1. Indicate the reasons why it is necessary for the cost and financial accounts of an organization to be reconciled and explain the main reasons of difference which enter into such accounts.
2. The profit disclosed by company's cost accounts for the year was ₹ 30,114 whilst the net profit shown by the financial accounts amounted to ₹ 19,760. On reconciling the figures the following differences are brought to light:
 - (a) Overheads in the cost accounts were estimated at ₹ 7,500. The charge for the year shown by the financial accounts was ₹ 6,932.
 - (b) Director's fees not charged in the cost accounts amounted to ₹ 750.
 - (c) The company has allocated ₹ 600 to general provision for bad debts.
 - (d) Work was commenced during the year on a new factory and expenditure of ₹ 12,000 was incurred. Depreciation of 5% was provided for in the financial accounts.
 - (e) Transfer fees received amounted to ₹ 28.
 - (f) The amount charged for Income Tax ₹ 9,000.

Prepare a statement reconciling the figure shown by cost and financial accounts.

14.8 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
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