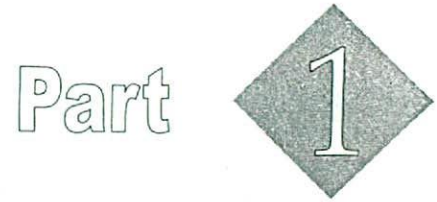

Basic Nature and Concepts

- Nature of Cost Accounting
- Cost: Concepts and Classifications

1

Nature of Cost Accounting

Modern business needs frequent cost information about business activities to plan accurately for the future, to control business results, and to make a proper appraisal of the performances of persons working in an organisation. The fulfilment of these goals requires details about the costs incurred and benefits (revenues) obtained which are provided by what is known as "cost accounting". In comparison, financial accounting does not provide management with detailed cost and revenue information relevant to its needs. Before examining the nature and contribution of cost accounting it would be appropriate to discuss the nature of financial accounting and its limitations in greater detail.

FINANCIAL ACCOUNTING

Financial accounting is concerned with providing information to external users such as shareholders (existing and potential), creditors, financial analysts, labour unions, government authorities, and the likes. Financial accounting is oriented towards the preparation of financial statements which summarise the results of operations for selected periods of time and show the financial position of the business at particular dates. The following points are important to understand the scope and nature of financial accounting:

Objectives

The basic objective of financial accounting is to provide useful information, through preparing general purpose reports, to investors, creditors and other users in making sound investment and economic decisions. These general purpose reports provide information on management performance to judge its effectiveness in utilising the resources and running the enterprise.

Contents

The end product of the financial accounting process are the financial statements that communicate useful information to decision-makers such as profit and loss account, balance sheet, statement of changes in financial position (SCFP) etc.

Accounting System

Journals, ledgers and other accounting techniques used in financial accounting depend upon the concept of the double-entry system. Financial accounting also uses generally accepted accounting principles (GAAP)* to record, classify and summarise business transactions and to prepare financial statements.

Measurement Unit

Financial accounting measures business transactions, economic resources and economic obligations and changes in them in terms of monetary units of a society in which it operates. For example, the common denominator or yardstick used for accounting measurement is the Rupee in India and dollar in the U.S.A.

Users of Financial Accounting Information

As stated earlier, financial accounting information is intended primarily to serve external users. Examples of such users are owners, creditors, potential owners, suppliers, management, tax authorities, employees, customers, financial analysts and advisers, stock exchanges, financial press and reporting agencies, trade associations, labour unions, general public.

LIMITATION OF FINANCIAL ACCOUNTING

Financial accounting is significant for managements as it helps them to direct and control the firm's activities and functions and to determine appropriate managerial policies in different areas, such as production, sales, administration and finance. However, financial accounting suffers from the following limitations which have been responsible for the emergence of cost accounting:

1. Financial accounting does not provide detailed cost information for different departments, processes, products, jobs, different services and functions.
2. Financial accounting does not set up a proper system of controlling materials and supplies which leads to losses on account of misappropriation, misutilisation, scrap, defectives, etc.
3. The recording and accounting for wages and labour is not done for different jobs, processes, products, departments. This creates problems in analysing the cost associated with different activities and rewarding workers and employees for the above-average performance.
4. It is difficult to know the behaviour of costs in financial accounting as expenses are not classified into fixed and variable, direct and indirect costs.
5. Financial accounting does not possess an adequate system of standards to evaluate the performance of departments and employees working in the departments.
6. Financial accounting contains historical cost information which is accumulated at the end of the accounting period. The historical cost is not a reliable basis for predicting future earnings, solvency, or overall managerial effectiveness.
7. Financial accounting does not provide necessary information to management in taking important decisions about expansion of business, dropping of a product line, starting a new product, alternative methods of production, improvement in product etc.

* Generally Accepted Accounting Principles (GAPP) encompass the conventions, rules and procedures necessary to define accepted accounting practice at a particular time.

8. Financial accounting does not provide cost data to determine the price of the product being manufactured or the service being rendered to the consumers.

In spite of the above limitations, Financial accounting has utility and will continue to serve management in the future also. Because of growing business requirements, the scope of financial accounting is changing and can be expected to continue to change.

COST ACCOUNTING

Cost accounting, as a tool of management, provides management with detailed records of the costs relating to products, operations or functions. Cost accounting refers to the process of determining and accumulating the cost of some particular product or activity. It also covers classification, analysis and interpretation of costs. The costs so determined and accumulated may be the estimated future costs for planning purposes, or actual (historical) costs for evaluating performance. The Institute of Cost and Management Accountants, London, defines cost accounting as "the process of accounting for cost 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 the ascertainment of the profitability of activities carried out or planned".

COST ACCOUNTANCY

Cost accounting has been differentiated from cost accountancy. The Institute of Cost and Management Accountants, London has defined cost accountancy as the "application of costing and cost accounting principles, methods and techniques to the science, art and practice of cost control and ascertainment of profitability as well as presentation of information for the purpose of managerial decision-making". According to this definition the term "cost accountancy" includes costing, cost accounting, budgetary control, cost control and cost audit. Although literature in the U.K. in the area of cost accounting tends to differentiate between cost accounting and cost accountancy, U.S. literature does not appear to point out any basic difference between these two terms.

COSTING

Cost Accounting and Costing have distinctly different meanings. The Institute of Cost and Management Accountants (ICMA), London has defined costing as the ascertainment of costs. Costing includes the 'techniques' and 'processes' of ascertaining costs. The 'technique' refers to principles and rules which are applied for ascertaining costs of products manufactured and services rendered. There are mainly two methods of costing known as job costing and process costing. The 'process' includes the day to day routine of determining costs within the method of costing (either job or process) adopted by a business enterprise. Within such a process, there could be historical costing, marginal costing, absorption costing, standard costing etc.

In practice, the three terms cost accounting, cost accountancy, and costing are most often used interchangeably although they are defined differently.

COST ACCOUNTING AND MANAGEMENT

Management requires adequate, systematic and useful cost data and reports to manage a business enterprise and to achieve business objectives. The useful information provided by cost records and reports in cost accounting assists management in performing the following important tasks:

1. Cost accounting helps in determination and analysis of cost of departments, processes, jobs, products, sales territories, sales order etc. This advantage is not available to manufacturing companies alone. In fact, the analysis of cost and income can be made in almost all type of organisation—profit or non-profit.

The example given below points out how cost accounting by products, may reveal facts and data which cannot be developed in financial accounting. Cost statements produced at regular, short intervals, which are not prepared in financial accounting, would have enabled the firm to take prompt action to overcome the problems of producing and selling Product C.

The analysis (based on cost statements) points out that the contribution of firm products to total net profit (15%) vary significantly among products. Product C does not cover its prime costs, and causes a net loss to the firm of Rs 8,000 in the year; its selling and distribution costs are also particularly more compared to the other products.

The firm may decide to discontinue product C, but before deciding this, an enquiry may be made of the cost structure to find out whether or not more efficient manufacturing, selling and distribution is possible. At the same time attention must be paid to pricing policy. It should be investigated as to whether the selling price of this product can be increased to a profitable level.

Cost Statements

Particulars	*A*	*B*	*C*	*D*	*Total*
Sales	Rs 60,000	Rs 60,000	Rs 40,000	Rs 40,000	Rs 2,00,000
Materials	30,000	22,000	26,000	24,000	1,02,000
Wages	12,000	8,000	12,000	8,000	40,000
Direct Exp.	2,000	2,000	3,000	1,000	8,000
Prime Cost	44,000	32,000	41,000	33,000	1,50,000
Work Exp.	1,600	2,000	500	200	
Selling Exp.	400	1,600	2,000	400	
Distribution Exp.	1,000	400	3,500	200	
General Adm. Exp.	1,000	4,000	1,000	200	
Overhead costs	4,000	8,000	7,000	1,000	20,000
Total Cost	48,000	40,000	48,000	34,000	1,70,000
Profit	12,000	20,000	–(8000)	6,000	30,000
Percentage Profit/Loss	20%	33 1/3%	(–)20%	15%	15%

2. Cost accounting helps management in controlling cost which is probably the most important objective of every business firm. Cost accounting facilitates this task through accumulation and utilisation of cost data regarding different products, activities or functions. Each cost should be examined in the light of service or benefit obtained so that management can keep the cost at the lowest possible point.

3. One of the important uses (perhaps the most important) of cost information is in helping to make revenue decisions. Revenue decisions can be divided into the following three categories:
   (i) Pricing—Cost data are vital in pricing new products, and to make a decision as to whether to lower or raise a price.
   (ii) Product mix—Management generally has to make short term and long term product mix decisions. For short-term cost data are used to determine which product to push in the market. Similarly, in the long run the questions of increasing and decreasing capacity can be solved with the help of relevant cost information.
   (iii) Profit-volume decisions—The profit is mainly the result of a combination of three factors, viz. cost, volume, selling price. Decisions like reducing price and having additional sales, maintaining *status quo* and accepting a lower income, increasing quality of the product and having extra volume of sales, increasing selling price and improving the turnover, are significant.

   Cost data assists managements in making sound decisions in all these important areas.
4. Cost accounting helps in making special cost studies and investigations which are vital to management in formulating policies and plans directed towards profitable operations. Such special studies include pricing of a new product or new services, elimination of seasonal conditions, expansion or contraction programmes, replacement of machinery and equipment, dropping a product, changes in methods of distributing products, changes in production methods.
5. Cost accounting assists and participates in the formulation and execution of budgets and standards. Cost information for managerial decision making and planning is the most important justification of a sound cost accounting system.

OBJECTIVES OF COST ACCOUNTING

There is a direct relationship among information needs of management, cost accounting objectives, and techniques and tools used for analyses in cost accounting. Cost accounting has the following three important objectives:

1. To determine product costs.
2. To facilitate planning and control of regular business activities.
3. To supply information for short- and long-run decisions.

Product Costing

The objective of determining the cost of products is of prime importance in cost accounting. The total product cost and cost per unit of product are important in making inventory valuation, deciding price of the product, and managerial decision-making. Product costing covers the entire cycle of accumulating manufacturing and other costs and subsequently assigning them to work-in-progress and finished goods.

Planning and Control

Another important objective of cost accounting is the creation of useful cost data and information for the purposes of planning and control by management. The different alternative plans are evaluated in terms of respective cost and associated benefits.

The management control over business operations aims to establish balance between actual and budgeted performances. A properly designed cost accounting system includes the following steps in the control process:

1. Comparing actual business performances with budgets and standards.
2. Analysing the variance between budget and standards and actuals by causes, and management responsibility so that corrective action may be taken.
3. Providing managers with data and reports about their individual performances and performance of subordinates.

Information for Decisions

An important purpose of the cost accounting system is to provide data and special analyses for short- and long-run decisions of a non-recurring nature. Appropriate cost information must be accumulated to make a wide variety of short- and long-run decisions.

COST ACCOUNTING VS FINANCIAL ACCOUNTING

After studying financial accounting and cost accounting in the preceding sections of this chapter, one can understand the differences between these two accounting systems. However, to get a proper perspective, some important differences are being mentioned below:

1. *Nature* Basically, financial accounting classifies, records, presents and interprets, in terms of money, transactions and events that are of a financial character, and provides management with the facts and figures necessary for the preparation of the periodic financial statements—the balance sheet, the income statement and the statement of changes in financial position. In contrast to financial accounting, cost accounting classifies, records, presents and interprets in a significant manner the material, labour and overhead costs involved in manufacturing and selling each product, or each job or rendering a service.
2. *Primary users of information* The users of financial accounting statements are mainly external to the business enterprise such as shareholders, creditors, financial analysts, government authorities, stock exchange, labour unions, etc.

   The information generated under the cost accounting system is used by members of management at different levels. Thus, different sets of information could be developed under cost accounting and supplied to different persons responsible for activities in the organisation.
3. *Accounting system* Financial accounting follows the double-entry system for recording, classifying and summarising business transactions. Cost accounting is not based on the double-entry system. The data under cost accounting may be gathered for small or large segments or activities of an organisation and monetary as well as other measures can be used for different activities in the firm.
4. *Accounting principles* Financial accounting data is primarily meant for external users. The "generally accepted accounting principles" are important in financial accounting and are used extensively while recording, classifying, summarising, and reporting business transactions.

On the contrary, cost accounting is not bound to use the "generally accepted accounting principles". It can use any accounting technique or practice which generates useful information.

5. *Unit of measurement* All information under financial accounting is in terms of money. That is, transactions measured in terms of money have already occurred. In comparison, cost accounting applies any measurement unit that is useful in a particular situation. Besides the monetary unit, the cost accountant may find it necessary to use such measures as labour hours, machine hours and product units for the purpose of analysis and decision making.
6. *Time span* Financial accounting data and statements are developed for a definite period, usually yearly, half yearly, quarterly. It requires that financial statements be developed and presented at regular time intervals. Cost accounting reports and statements are prepared whenever needed. Reports may be prepared on a monthly, weekly or even daily basis. Frequency of reports is determined by particular planning and controlling needs, objectives of cost control and cost determination.

Inspite of the above differences, both financial and cost accounting are in agreement regarding actual cost data and product costing analyses. Closing inventory values and cost of goods manufactured and sold are the main examples. For the preparation of the income statement, financial accountant receives the necessary data from the cost accountant.

COST ACCOUNTING AND MANAGEMENT ACCOUNTING

Although over the years, the subject matter of cost accounting has broadened, it is concerned mainly with the techniques of product costing and deals with only cost and price data. It is limited to product costing procedures and related information processing. It helps management in planning and controlling costs relating to both production and distribution activities.

Management accounting may be defined as the application of accounting techniques for providing information designed to help all levels of management in planning and controlling the activities of a business enterprise and in decision making. Management accounting is not confined to the area of product costing, cost and price data. In management accounting, the objective is to have a data pool which will include any and all information that management may need. For example, if management decides to depend on long-term debt for expansion of business, it may be investigated as to what effect this decision will have upon the earnings per share? Should debt in the capital structure be too large or small? Similarly, management may be interested in knowing the adequacy of cash flow receipts to pay current obligations or the effect of inflation on business decisions and performances. Thus, management accounting helps management in the total situation.

Inspite of the differing parameters of cost accounting and management accounting, cost accounting is generally indistinguishable from what is known as management or managerial accounting. Both these accounting systems are closely linked as they use common basic data and reports to a significant degree. Much of the information used to prepare accounting statements and reports in cost accounting is also used in management accounting reports. Management accounting utilises the same (and also additional) data to prepare budgets, performance reports, control reports, data analyses for decision-making, planning and control purposes.

DIFFERENCES BETWEEN MANAGEMENT ACCOUNTING AND FINANCIAL ACCOUNTING

The differences between cost accounting and financial accounting, are also the points of difference between management accounting and financial accounting. As stated earlier, financial accounting implies the preparation of a set of financial statements, for each accounting period, in accordance with laws, rules, regulations and accounting standards and is concerned with shareholders, governmental authorities and other parties outside the business enterprise. Management accounting is not governed by any statute and is an internal function which aims to provide information to management.

Financial accounting takes an overall view of a business enterprise by totalling the results of its divisions and departments into a single summarised financial statement. Management accounting focuses attention at the lowest levels of production or any other activity in the organisation for providing help in planning, control and decisionmaking.

Financial accounting records past, historical information. However, management accounting primarily uses present and future information. The past information in management accounting acts only as a guide in predicting the future.

ROLE OF MANAGEMENT ACCOUNTANT

A Management accountant is an accountant who participates in all accounting work within the organisation, including maintaining the accounting records, preparing financial statements, preparing many specialised managerial reports and statements, generating information for different levels of management, coordinating budgeting, accounting and reporting functions. Management accountant plays a vital role in helping managers in performing management functions such as planning, organising, coordination, control, decisionmaking etc. However, the management accountant is a part of the management and not just a service arm to management. He acts as a manager and decisionmaker and exercises managerial influence and, of course, is responsible for the management of the entire accounting, reporting and budgeting functions.

ADVANTAGES OF COST ACCOUNTING

Business enterprises can derive many advantages from the cost accounting system. Some advantages are listed below:

1. The cost accounting system provides data about profitable and unprofitable products and activities. After investigating the causes of low profitability and unprofitability, management can take suitable corrective measures which may lead to higher profit.
2. All items of costs can be analysed to minimise the losses and wastage emerging from the manufacturing process and reduce the costs associated with different activities.
3. Production/manufacturing methods may be improved or changed so that costs can be controlled and profit increased.
4. Cost data can be obtained and compared with standard cost within the firm or industry.
5. Cost accounting helps management in avoiding losses arising due to many factors, such as low demand, competitive conditions, change in technology, seasonal demand for the product and the like.

6. Cost accounting also provides cost data and information to determine the price of the product. The cost of the product is perhaps the most important determinant of product pricing.
7. Negotiations with government and labour unions can easily be made with the information provided by the cost accounting system.
8. Cost accounting helps management in knowing the costs of different alternatives and selecting the most advantageous course of action. Decisions like make or buy, continue or drop a product, buy or lease, sell or process further, operate or shut down and other short-term decisions are easily solved with the help of cost accounting data.
9. More accurate and reliable financial accounts can be prepared promptly for use of management.
10. An adequate cost accounting system ensures maximum utilisation of physical and human resources, checks fraud and manipulations, and helps employees as well as the employer in their basic goals of getting higher earnings and maximising the profit of the concern.

METHODS OF COSTING

As stated earlier, the term "costing" refers to the techniques and processes of determining costs of a product manufactured or a service rendered. Different methods are applied in business enterprises to ascertain costs depending upon the nature of the product, production method and specific business conditions. For example, in a textile or steel company, raw material passes through different stages (processes) and production is done continuously. In some other industries, production is done at different customers' specific orders and each job is obviously different from the other job. In service industries like transport, hospital, banks etc., all activities and costs incurred relate mainly to performing certain services (or activities). There are two methods of costing:

(A) Job Costing
(B) Process Costing

All other methods of costing are only variants of the above two methods of costing. All possible variations of job and process costing are as follows:

(A) Job Costing
(i) Batch Costing
(ii) Contract or Terminal Costing
(iii) Multiple or Composite Costing

(B) Process Costing
(i) Unit or Single Output Costing
(ii) Operating (Service) Costing
(iii) Operation Costing

Job Costing

Job costing is used in those business concerns where production is carried out as per specific order and customers specifications. Each job (or product) is separate and distinct from the other jobs or products. The method is popular in enterprises engaged in house-building, ship-building, machinery production and repair. Job costing has the following variants:

(i) Batch Costing

Batch costing is based on the concept of contract costing. This method is used to determine the cost of a group of identical or similar products. The batch consisting of similar products is the unit and not the single item within the batch. This method can be usefully applied for the production of nuts and bolts, medicines, components and other items which are manufactured in distinct batches.

(ii) Contract or Terminal Costing

This method of costing, based on the principle of job costing is used by house builders and civil contractors. The contract becomes the cost unit for which relevant costs are accumulated.

(iii) Multiple or Composite Costing

This costing method is used in those industries where the nature of the product is complex, such as motor cars, aeroplanes, etc. In such cases costs are accumulated for different components making the final product and then totalled to ascertain the total cost of the product.

Process Costing

This costing method is used in those industries where production is done continuously, such as chemicals, oil, gas, paper, etc. It is difficult to trace the costs to specific units and the total cost is averaged for the number of units manufactured. Sometimes, total cost and per unit cost is calculated at each stage of production for control purposes. Process costing has the following variants:

(i) Unit or Single Output Costing

This method is used where a single item is produced and the final production is composed of homogeneous units. The per unit cost is obtained by dividing the total cost by the total number of units manufactured.

(ii) Operating (Service) Costing

Operating costing method is used by those organisations which render services and do not manufacture any physical item, such as transport, power house, hospital. The cost units differ among these service organisations depending upon the nature of service being rendered. But usually the units are passenger-mile, tonne-mile, a bed in hospital, per student in a college.

(iii) Operation Costing

This costing method aims at ascertaining the costs of each operation in place of each process. In this method the assumption is that output is achieved through a number of different operations.

Besides the above variations of job costing and process costing, the different techniques or types of costing (discussed below) can be found in these two methods of costing and can be used to determine costs therein.

TECHNIQUES (TYPES) OF COSTING

The terms 'techniques' or 'types' refer to the manner of ascertaining costs of a product, job or activity. But these terms (techniques or types) also necessarily indicate what types of costs are being ascertained such as historical cost, standard cost, absorption (full) cost, marginal cost etc. It is clear that the term 'Methods of Costing' itself signifies only the method(s), job costing or process costing, that is being used to determine costs without indicating the types of costs (historical, standard, full or marginal) which are ascertained under the two methods of costing (Job or Process Costing). The following are generally the techniques of costing:

(1) Historical Costing

Historical costing is system of costing under which costs are determined after they have been incurred.

(2) Standard Costing

Under standard costing, standard costs are determined and used, and then compared with the actual costs to determine the extent of variances so that remedial action can be taken. Standard costs are the predetermined costs in conformity with the most efficient operation and use of the resources within the film.

(3) Absorption or Full Costing

Under this costing method, all manufacturing costs, fixed and variable, are changed to products, jobs, processes, etc. and are included in total cost.

(4) Variable or Marginal Costing

Variable costing method charges only variable production costs to products or jobs, and thus the cost of the products or jobs consists of only variable production and not fixed production costs. The fixed production, administration, selling and distribution costs are written off against profits in the periods in which they arise.

(5) Uniform Costing

Truly speaking, uniform costing is not a technique of costing, but is an attempt by several undertakings and organisations to use similar costing principles and/or practices.

COSTING SYSTEM

The term 'costing system' refers to an accounting system followed to accumulate costs, to ascertain costs of products or jobs, to prepare cost information using some procedures and principles for recording of cost data. Since there are two basic methods of costing—Job Costing and Process Costing, to ascertain costs, the costing system followed by business enterprises are also divided into two categories:

1. Job Order Costing System
2. Process Costing System

It should be understood that within these two costing systems, further, business enterprises may follow different techniques of costing such as historical cost, standard cost, full cost, marginal cost etc., which have been discussed earlier.

INSTALLATION OF A COST ACCOUNTING SYSTEM

A cost accounting system is a system that accumulates costs, assigns them to cost objects, i.e. products, jobs, processes, etc. and reports cost information. In addition to this, a proper cost accounting system assists management in the planning and control of business operations, in analysing product profitability, and in accomplishing business objectives through optimum utilisation of available resources. The underlying principles, procedures and objects of all costing system are the same, but the application of these principles and methods may vary with the circumstances. Basically, two main questions are involved in installing a cost accounting system: (i) factors influencing cost accounting system, and (ii) features of cost accounting systems.

Factors Influencing the Cost Accounting System

The following factors should be considered before designing the cost accounting system:

1. *Size of the firm* The complexity and outline of the cost accounting system depends on the size of the business enterprise and management requirements. As the size of the firm and business grows, management requirements for cost data and information increase. A large firm has to develop a large volume of cost data regarding the activities of various departments of the business enterprise.
2. *Manufacturing process or methods* The manufacturing process includes production layout and arrangement, production scheduling, production control methods, plant and equipment capacities, inspection and testing of materials, degree of complexity in the production procedure and factory layout of the particular business firm for which it is designed. Methods of wage payment (piece-rate, time-rate, incentive schemes), methods of collecting hours worked, inventory system, overhead recovery, and other problems related with the factory are the factors vital in designing a cost accounting system.
3. *Nature and number of products* If a single product is manufactured, all costs of direct material, direct labour and other factory expenses can be directly allocated to that product. But in the case of more than one product being produced, some costs of production relating to two or more products are to be equitably apportioned among them. In this situation, the process of developing cost data is more complex, which, in turn, influences the designing of the cost system.
4. *Management control needs* The designing of the cost accounting system in a business firm is guided by the management control requirement. The costing system should supply data to persons at different levels in the organisation to take suitable action in their respective areas.
5. *Raw materials* The nature of raw materials and the degree of waste therein influences the designing of the cost accounting system in a manufacturing concern. There are some materials which have a high degree of spoilage. The issuing of materials, methods of pricing and control over spoilage are accordingly adopted as to suit the specific type of materials.
6. *Staff efficiency* The working and formulation of the cost accounting system depends, to a great extent, on the efficiency of personnel and staff engaged in it.
7. *Comparability* A business enterprise follows cost accounting systems prevailing in other business firms within the same industry. This is necessary to facilitate comparison of its own cost data with data produced for the industry.
8. *Organisational structure* The cost accounting system must correspond to the organisational division or authority so that individual foremen, supervisors, department heads, or executives can be held accountable for the costs incurred in their respective departments.
9. *External factors* The adoption of a costing system depends mainly on internal factors and situations within the firm. However, external factors may influence scope of the costing system to be applied by a business firm. For example, Cost Accounting Rules are applicable to manufacturing companies in India which require certain cost information to be developed and submitted to government authorities.

FEATURES OF COST ACCOUNTING SYSTEM

The cost accounting system may be used by all types of business organisations—manufacturing and non-manufacturing. The cost accounting system should be practical, i.e. it must be helpful to the

business. There must be no attempt to make the business suit the system. The following are the essential features of a cost accounting system:

1. *Basis for accumulating costs* A fundamental feature of any system is the method of accumulating manufacturing costs. Costs may be accumulated by individual jobs (job order cost system) or by manufacturing departments or processes (process cost system).

   A job order cost system has the unique feature of accumulating manufacturing costs separately for each batch or job. Within a process cost system, costs are accumulated by process or department. Cost of production reports are prepared for each process in the factory. A process cost system is best suited for standard products that are manufactured continuously for mass production.
2. *Relationship with financial accounting* Most cost accounting system are complementary/supplemental in their relation to financial accounting. In this role, cost accounting systems imply physical inventory counts to determine quantities of materials, work-in-process and finished goods. Inventory quantities must be counted and unit costs determined before periodic financial statements can be prepared. An integrated system removes the need of coordination between financial accounting and cost accounting. Integrated systems are comparatively more sophisticated, more costly and more conducive to cost control than supplemental system.
3. *Basis of product costs* In many cost accounting systems, cost estimates are desirable in addition to actual or historical costs. Actual costs incurred for a period are used to compute product costs. A system using actual material cost, actual labour cost and estimated overhead rate is called a normal cost system. In contrast, standard costs may be developed for the purpose of product costing. Standard costs are carefully predetermined estimates of what material, labour and overhead costs should be on a per unit basis, given product specifications and desired operating efficiency.
4. *Full (absorption) costing or marginal (variable) costing* Another important question relating to the cost accounting system is whether all manufacturing costs are to be accumulated and attached to products. The traditional opinion is that all manufacturing costs—variable and fixed—should be charged to products. This method is known as full costing or absorption costing, because fixed manufacturing costs are absorbed by units produced. An alternative viewpoint is that only variable manufacturing costs should be attached to products. In this method, fixed manufacturing costs are recorded as expenses of the accounting period.

DIFFICULTIES IN INSTALLATION OF A COSTING SYSTEM

The installation of costing system in business organisations is not an easy task. There are many difficulties, as listed below, which are faced by organisations while setting up costing system.

(1) Opposition from the Existing Staff

The existing staff is likely to oppose the introduction of costing system, may resent the additional work and may not provide cooperation which is necessary for the success of cost accounting system.

(2) Shortage of Trained Manpower

Installation of cost accounting system requires trained staff to operate the system effectively which organisations may not have, thus affecting adversely the better application of the system.

(3) Error in Measuring Requirements

The organisations, big and small, have varying requirements as to the costing system. Organisations may not know their specific requirements accurately. Consequently, the installation of costing system will either not meet their requirements or will provide unnecessary sophistication and dose of accounting procedures.

(4) Non-cooperation from Management

Resistance is noticed not only from the lower and middle staff but also from the members of top management. Managers may not support the Managing Director in his efforts to minimise costs and control activities as these might be looked upon as an interference in their managerial authorities.

ARGUMENTS AGAINST COST ACCOUNTING

Cost accounting undoubtedly helps managements in managing the affairs of business efficiently and in accomplishing business goals. However, some organisations do not look with favour the installation of cost accounting system. Some arguments which are advanced against adopting cost accounting are as follows:

(1) The system of cost accounting may prove costly and small organisations may not find it profitable. The collection, analysis, allocation and maintenance of cost data is a time-consuming and difficult task which requires efficient manpower.

(2) All business organisations are required to prepare financial accounts to determine profit and financial position. Installation of cost accounting system along with financial accounting system increases work load.

(3) Cost accounting system itself is not an end but only a means to achieve certain objectives. The system itself will not improve efficiency, control costs and avoid wastage. Sometimes management personnel become inactive with the mere installation of the cost accounting system.

However, all the above arguments are not valid. Keeping in view the advantages and contributions of cost accounting to management, as explained earlier, it can be rightly said that cost accounting is a necessity for all business organisations. For manufacturing firms, cost accounting is vital necessity to reduce cost, to avoid waste, to improve efficiency and to provide cost data to management for planning, control and decision making.

COST CENTRES

The Institute of Cost and Management Accountants, London defines cost centres as "a location, person, or item of equipment (or a group of these) for which costs may be ascertained and used for the purposes of cost control." A cost centre is an organisational segment or area of activity considered to accumulate costs. The following are the types of cost centres usually found in a manufacturing company.

Impersonal Cost Centre

A cost centre which consists of a location or item of equipment (or a group of these).

Personal Cost Centre

A cost centre which consists of a person or group of persons.

Operation Cost Centre

A cost centre which consists of the machines and/or persons carrying out similar operations.

Process Cost Centre

A cost centre which consists of a specific process or a continuous sequence of operations.

COST UNITS

The Institute of Cost and Management Accountants, London has defined a cost unit as follows: "A unit of quantity of product, service or time (or a combination of these), in relation to which cost may be ascertained or expressed."

In the job costing method, cost unit is a single specific order; in batch costing it consists of a group of similar articles; and in contract costing, it consists of a single product (contract). The cost units used in different industries cannot be uniform. The cost units and centres should be those which suit the business and which are readily understood and accepted by all concerned.

The following Table gives examples of cost units (i.e. unit of cost activity) and method of costing used in different industries.

Cost Unit and Method of Costing

	Industry/ Enterprise	*Cost unit*	*Method of costing*
1.	Building	House or square foot of area	Job Costing
2.	Chemical	Tonne, pound or kilogram	Process Costing
3.	Cement	Tonne	Process Costing
4.	Automobile	Number	Process Costing
5.	Steel	Tonne	Process Costing
6.	Transport	Tonne kilometre, Passenger kilometre	Operating Costing
7.	Cable	Metre	Process Costing
8.	Gas	Cubic foot or cubic metre	Process Costing
9.	Nuts and bolts	Gross or some measure of standard weight	Job Costing
10.	Power	Kilowatt hour	Process Costing
11.	Paper	Ream	Process Costing
12.	Timber	Cubic foot	Process Costing
13.	Brewery	Per dozen bottles or per gallon of draught brew	Process Costing

	Industry/ Enterprise	*Cost unit*	*Method of costing*
14.	Biscuits	Per (WT)	Process Costing
15.	Hospital	Per bed occupied/out-patient visit	Operating Costing
16.	Case-making	Per case	Job Costing
17.	Road contractors	Per mile	Job Costing
18.	Ice cream	Per gallon	Process Costing
19.	Knitted textiles	Per pound/kg of fabric	Process Costing
20.	Canned fruit	Per dozen cans or per gross cans	Process Costing
21.	Soft drinks	Cases of 24 bottles each	Process Costing
22.	Oil extraction, petrochemicals	Gallons, litres, tonnes	Process Costing
23.	Pharmaceuticals	1000 nos. tablets, ampulses	Process Costing
24.	Machine building	Numbers	Job Costing
25.	Readymade garments	Numbers	Batch Costing
26.	Aircraft	Numbers	Job Costing
27.	Sugar	Tonnes, kilograms	Process Costing
28.	Furnishing	Each article by numbers	Job Costing
29.	Confectionary	Per kg	Process Costing
30.	Clothing (automatic process)	Per dozen articles	Process Costing
31.	Bicycle manufacturing	Number	Multiple Costing
32.	Textiles	Metres, yards	Process Costing
33.	Flour	Tonnes	Process Costing
34.	Parts manufacturing	Nos. of articles in tens, hundreds, thousands	Job Costing

COST ACCOUNTING DEPARTMENT

The organisation of business enterprises differ widely in their nature and structure. Also, the accounting information is required to be provided to various persons within the organisation for decision-making. These factors greatly influence the designing of an organisational structure and the cost accounting department. In a typical manufacturing company, the Chief Accounting Officer is the controller or head of the accounting division (Fig. 1.1). The controller performs other functions besides determining the cost of product, such as budgeting, general (financial) accounting, systems and procedures, data processing, taxes and reports, internal auditing. Figure 1.2 depicts the different functions of the accounting department within the purview of the Chief Accounting Officer.

The cost accounting department discharges many important functions in a manufacturing concern. It keeps full records about material, labour and overhead. After accumulating all different costs, it analyses them so that they can be used by management for planning, control and decision-making.

The cost accounting department, further, divides its responsibilities into different components to get prompt and timely reports. Coordination is needed among these functions (or departments) within the cost accounting department. Generally, these functional units are under the supervision of the Chief Accounts Officer (Fig. 1.2).

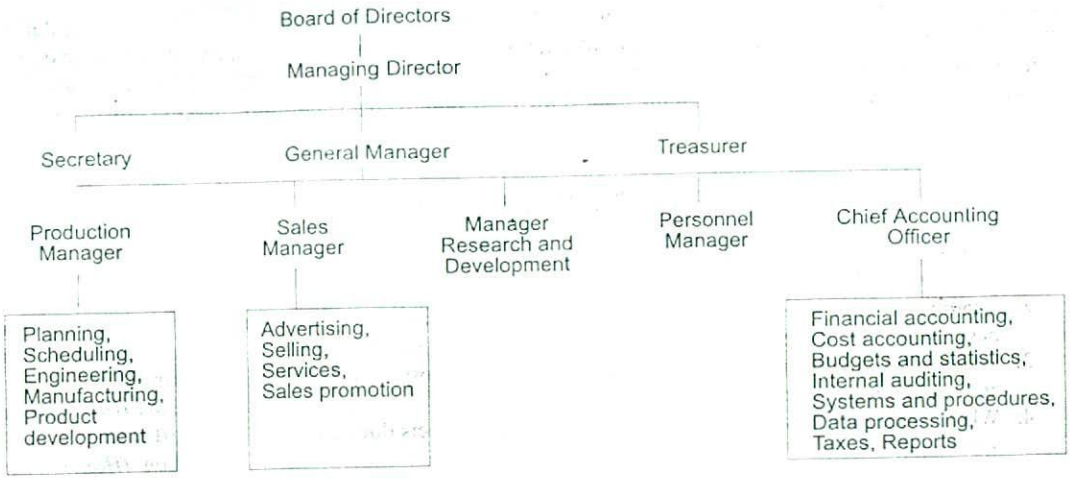

Fig. 1.1 Organisation Chart of a Manufacturing Company

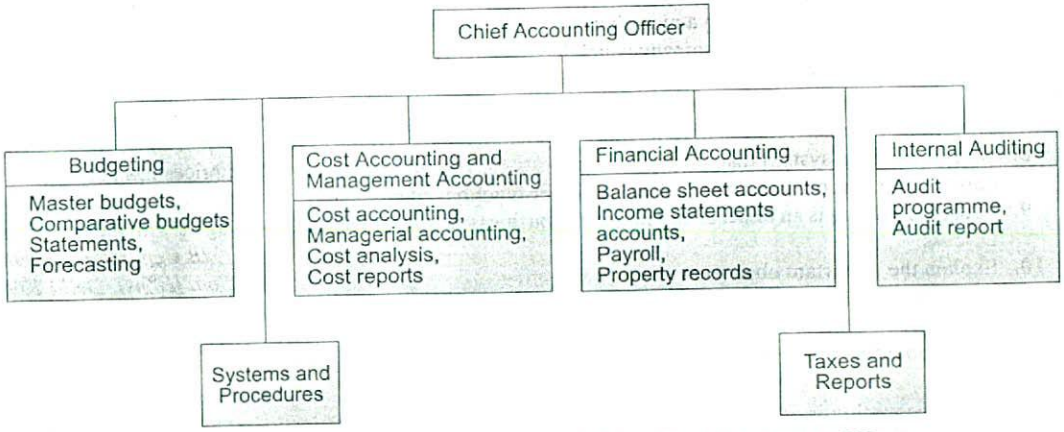

Fig. 1.2 Organisation of the Department of the Chief Accounting Officer

The cost accounting department and its activities are closely connected with other departments and their activities in the organisation. For example, the production department is responsible for designing, planning and producing products upto the finished product stage. The research and development department develops cost estimates for each element of cost, i.e. material, labour and overhead. Costs are measured at different stages of production and activities to evaluate the efficiency of the department or persons associated with the specific activity. The personnel department is mainly engaged in keeping efficient employees, establishing wage rates and methods or remuneration which are beneficial to employees as well as to the firm. The marketing department requires a good product at a competitive price for dealing with customers. The sales department determines sales policies in terms of product cost data which helps the department to know which are profitable and unprofitable products. The finance depart-

ment, which is responsible for arrangement of funds is greatly assisted by the cost accounting department which gives vital information on accounting, budgeting and cash flow. The cost accounting department helps the law department in working as per the legal requirements. Wages laws, bonus laws, labour agreements, taxes are some of the important areas where cost accounting and the law department both have to cooperate.

THEORY QUESTIONS

1. "Financial accounting procedures are generally designed to ascertain the periodic profit or loss, but there are important limitations and deficiencies in the system." Discuss. *(B Com (Hons), Delhi)*
2. Examine critically the drawbacks of conventional financial accounting. Do you think that these limitations have been overcome by the introduction of cost accounting in business? *(CA Inter)*
3. What is cost accounting? What are its objectives? How do cost accounting records help in the planning and control of operations of a business enterprise? *(B Com (Hons), Delhi)*
4. What is meant by cost accounting? In what essential respects does cost accounting differ from financial accounting? *(B Com (Hons), Delhi)*
5. Explain fully the concept of cost. How does cost accounting contribute to the effective and efficient management of an industrial establishment? *(B Com (Hons), Delhi)*
6. What is the function of a costing department in a manufacturing concern? How is the costing department useful to other departments in a manufacturing concern?
7. SV Ltd. is a manufacturing company which has a sound system of financial accounting. The management of the company, therefore, feels that there is no need for the installation of a cost accounting system. Prepare a report for management, bringing out the distinction between cost and financial accounting systems and the need for the introduction of a sound cost accounting system. *(CA Inter, MFC, Delhi)*
8. "A cost keeping system that simply records costs for the purpose of fixing sale prices has accomplished only a small part of its mission." What are other functions of costing? *(ICWA, Inter)*
9. "Cost accounting is an unnecessary luxury for business establishments." Do you agree with the statement? Discuss. *(B Com (Hons), Delhi)*
10. Explain the important objectives of cost accounting. *(B Com (Hons), Delhi 1997)*
11. What is cost accounting? Discuss briefly its important functions in a business firm. *(B Com (Hons), Delhi 1998)*
12. Cost accounting has come to be an essential tool of the management." Comment. *(B Com (Hons), Delhi, 2000)*
13. "Cost accounting is a system of foresight and not a postmortem examination, it turns losses into profits, speedsup activities and eliminates waste." Discuss. *(ICWA; B Com (Hosn), Delhi)*
14. State the primary objectives of installation of a costing system. Apart from technical costing problems, what practical difficulties would you meet and how would you overcome them? *(B Com (Hons), Delhi)*
15. (a) State and explain the main differences between financial accounting and cost accounting.
    (b) What is a cost centre and how does it differ from a department of a factory? *(B Com (Hons), Delhi)*
16. How far is cost information helpful for the following purposes:
    (a) Fixation of selling prices
    (b) Control of costs
    (c) Management decisions

17. List *A* gives you different methods of costing which can be used in one or more industries or organisations given in List *B*. Mention the correct costing method of the industries in List *B*.

List A Process, operating, single output, job, contract, multiple

List B
(i) Chemical works
(ii) Road transport company
(iii) Coal
(iv) Nursing home
(v) Paint
(vi) Construction industries
(vii) Cement manufacturing
(viii) Soap manufacturing
(ix) Railways
(x) Ship builders
(xi) Bicycle manufacturing
(xii) Readymade garments
(xiii) Telephone
(xiv) Cotton textiles
(xv) Aluminium
(xvi) Paper mill
(xvii) Furniture manufacture
(xviii) Meat packing
(xix) Sugar
(xx) Steel
(xxi) Paper boxes
(xxii) Air conditioners
(xxiii) Locomotive
(xxiv) Tyres and tubes
(xxv) Leather
(xxvi) Pianos
(xxvii) Toys and novelties
(xxviii) Oil refinery
(xxix) Baby food
(xxx) Radio receivers

Ans. (i) Process (ii) Operating (iii) Single (iv) Operating (v) Process (vi) Contract (vii) Process (viii) Process (ix) Operating (x) Contract (xi) Multiple (xii) Batch (xiii) Operating (xiv) Process (xv) Process (xvi) Process (xvii) Job (xviii) Process (xix) Process (xx) Process (xxi) Process (xxii) Multiple (xxiii) Multiple (xxiv) Process (xxv) Process (xxvi) Batch (xxvii) Batch (xxviii) Process (xxix) Batch (xxx) Multiple

18. Indicate whether the following statements are True or False:
(i) The rental of a car which includes a fixed daily rate pusle an extra fee for each kilometer driven is an example of a step cost.
(ii) Assuming inflation, if a company wants to maximise net income, it would select FIFO as the method of pricing raw materials.
(iii) Overtime premium paid to all factory workers is usually considered direct labour.
(iv) Period costs are invariable and are expensed out as and when the inventory is sold.
(v) Idle facility and idle time are the same. *(B. Com (Hons), Delhi 1999)*

Ans: (i) False (ii) True (iii) False (iv) True (v) False

2

Cost: Concepts and Classifications

The three important areas in cost accounting are cost ascertainment, cost analysis and cost control. For cost accounting to be useful in these areas, costs must be accumulated, classified and grouped in such a manner that (i) total costs and units costs can be determined; (ii) trends in costs behaviour can be observed; (iii) cost can be controlled; and (iv) useful analysis can be made based on past as well as future costs for planning, control and decision-making. These requirements call for an understanding of the concept of cost and of its appropriate classifications. The purpose of this chapter is to explain the concept of cost and different cost classifications.

COST

Cost is the amount of expenditure, actual (incurred) or notional (attributable), relating to a specific thing or activity. The specific thing or activity may be a product, job, service, process or any other activity.

Cost is the amount of resources given up in exchange for some goods or services. The resources given up are generally in terms of money or, if not in terms of money, they are always expressed in monetary terms. The term 'cost' itself is without any significant meaning and, therefore, it is always advisable to use it with an adjective or phrase that will convey the meaning intended, such as prime, direct, indirect, fixed, variable, controllable, opportunity, imputed, sunk, differential, marginal, replacement and the like. Each such adjective or description implies a certain attribute or characteristic which is important in computing, measuring and analyzing the cost.

Basically, when a cost is incurred, it could be in the form of deferred cost (asset) or expired cost (expense). Deferred costs are unexpired costs, capitalised costs, which provide benefits in the future periods and known as assets and hence appear on the balance sheet. Examples of deffered or unexpired costs are plant, equipment, building, inventory, prepaid rent and insurance. When these deferred costs (assets) are used up, to the extent used, they become expenses and appear on the income statement and are deducted from revenues. Expired costs are costs which have been used up totally in generating revenue. They are not capitalised but only shown as expenses on income statement.

EXPENSES

Expenses are expired costs, incurred and totally used up in generation of revenue. Examples of expired costs are costs of goods sold expense, selling and administrative expenses. Expenses need not necessar-

ily have to be paid in cash immediately, even a promise to pay could be made for the benefits obtained. The manufacturing costs are capitalised in the form of finished goods inventory and when a sale is made, they expire (becoming expenses). The cost of unsold inventory which was an asset earlier, now becomes expenses (costs of goods sold) as it has contributed to the generation of revenue.

Factory (or manufacturing) overhead is treated as cost (an asset) because this is included in the cost of finished goods inventory which is an asset unless sale is made. Selling and administrative expenses, when not included in the cost of finished goods inventory, are treated only as expenses and not cost (asset). Factory overheads are assets because they are supposed to add utility to the goods manufactured. For example, depreciation of a factory machine increases the utility of the goods manufactured which are therefore included in work-in-progress and finished goods inventory. But selling and distribution overheads do not add to the utility of goods manufactured and are treated merely as expenses and are deducted from revenues whenever incurred. Similarly, depreciation of a factory building is a cost, but depreciation of an office building is an expense.

LOSS

Loss is lost cost. The term 'loss' is used to describe mainly two accounting events. In traditional financial accounting it is used to denote a situation where expenses exceed revenues for an accounting period, that is, the opposite of net income (earnings) for the accounting period. Secondly, a loss arises due to the cost of an asset being more than the sale proceeds when the asset is sold. This unfavourable event does not arise from a normal business activity but from non-operating transactions or events. This definition of loss is used to identify the opposite of gain. That is, if no benefit is received from the cost incurred or it becomes definite that no benefit will accrue, the cost becomes a lost cost, i.e. loss.

Loss is unrelated to revenue generation and is only offset against revenue of the period in which the loss occurred. Examples of loss are, loss on sale of fixed asset, loss of a stock due to fire.

CLASSIFICATION OF COSTS

The achievement of the objectives of cost accounting requires that cost should be ascertained, classified and grouped. Cost classification may be defined as the process of grouping costs according to their common characteristics. There are many objectives of cost classifications depending on the requirements of management. However, the following objectives are considered very useful and significant:

(i) Determining product costs for stock valuation and profit measurement
(ii) Planning
(iii) Decision Making
(iv) Control

The different cost classifications are as follows:

1. Natural classifications of costs
   (i) Direct material
   (ii) Direct labour
   (iii) Direct expenses
   (iv) Factory overhead
   (v) Selling and distribution and administrative overheads

2. Cost behaviour (In relation to changes in output, activity or volume)
   (i) fixed cost
   (ii) Variable cost
   (iii) Mixed cost (Semi-variable and Semi-fixed cost)
3. Degree of Traceability to the Product
   (i) Direct cost
   (ii) Indirect cost
4. Degree of Association with the Product
   (i) Product cost
   (ii) Period cost
5. Functional Classification of Costs
   (i) Manufacturing cost
   (ii) Selling and distribution cost
   (iii) Administrative cost
6. Relationship with the Accounting Period
   (i) Capital cost
   (ii) Revenue cost
7. Costs for Decision Making and Planning
   (i) Opportunity cost
   (ii) Sunk cost
   (iii) Relevant cost
   (iv) Differential cost
   (v) Imputed cost
   (vi) Out-of-pocket cost
   (vii) Fixed, variable and mixed cost
   (viii) Shutdown cost
8. Costs for Control
   (i) Controllable and uncontrollable cost
   (ii) Standard cost
   (iii) Fixed, variable and mixed cost
9. Other Costs
   (i) Joint cost
   (ii) Common cost

NATURAL CLASSIFICATION OF COSTS

The term "natural classification" refers to the basic physical characteristics of the cost. In a manufacturing concern, generally, the following costs are incurred:

1. *Direct material* Direct materials refers to the cost of materials which are conveniently and economically traceable to specific units of output. The term "direct materials" is denoted by certain other names also, such as process material, prime cost material, production material, stores material, construction materials. Some examples of direct materials are: raw cotton in textiles, crude oil to make diesel, steel to make automobile bodies. The following group of materials fall within the definition of direct materials:

(a) All materials specially purchased for a particular job, order, process or product.
(b) All materials (including primary materials and raw materials) acquired and subsequently requisitioned from the stores for production.
(c) Components or parts purchased or produced and requisitioned from the storeroom.
(d) Material passing from one process to another process.
(e) Primary packing materials, e.g., wrappings, cardboard boxes, etc.

Items, such as import duties, dock charges, transport cost of materials, storing of materials, cost of purchasing and receiving materials are properly added to their invoiced price and thus, the materials are charged out at this increased cost.

Chapters 3 and 4 discuss in detail direct materials and materials cost.

2. *Direct labour* Direct labour is defined as the labour of those workers who are engaged in the production process. It is the labour expended directly upon the materials comprising the finished product. Other terms for the direct labour are: process labour, productive labour, operating labour. Examples are the labour of machine operators and assemblers. However, a worker may be performing direct labour for a certain number of hours but be an indirect worker for the balance of the day. For example, manufacturing concerns frequently have workers who may be working on an assembly line or operating a machine as direct workers for three or four hours but later in the day may help in repairing machinery or in doing other work as indirect workers.

Chapter 5 explains direct labour and accounting and control of direct labour cost in detail.

3. *Direct expenses (Chargeable expenses)* These include any expenditure other than direct material and direct labour directly incurred on a specific product or job. Such special necessary expenses can be identified with product or job and are charged directly to the product as part of the prime cost. Examples of direct expenses are:

(a) Cost of hiring special machinery or plant.
(b) Cost of special moulds, designs and patterns.
(c) Experimental costs and expenditure on model and pilot schemes.
(d) Fees paid to architects, surveyors and other consultants.
(e) Cost of transport and conveyance to the site of job or operations.
(f) Inward carriage and freight charges on special materials.
(g) Cost of patents and royalties.
(h) Cost of defective work, e.g. where several trials are necessary before an appropriate one is obtained. The cost of such trials is taken as direct expense.
(i) Licence fees.
(J) Hire charges for plants and equipments for a specific product or job.
(k) Components and parts processed for a special job.
(l) Insurance charges on special materials chargeable to a job.

Other things remaining the same, the term 'direct expenses' (chargeable expenses), whenever used in costing, refers to a specific product or job. That is, whether some expenses are direct or not, is decided in terms of specific job or product as product or job is considered the cost unit. However, some expenses which cannot be directly indentified with product or job (and hence are not direct expenses), can sometimes be identified with a department, function, territory, customer, division etc. For example, salary of branch office manager, depreciation of plant, rent and rates, heating and lighting, insurance expenses etc. are direct in relation to some department or activity but become indirect with regard to a product or job because these expenses are incurred for more than one product or job.

The total of the above three elements of costs (i) direct materials, (ii) direct labour and (iii) direct expenses, are prime cost. According to Official Terminology of Chartered Institute of Management Accountants (London), prime cost is the total cost of direct material and direct labour. Thus, direct expenses is not included in prime cost as per CIMA Terminology. The CIMA defines direct cost as the expenditure which can be economically indentified with a specific saleable cost unit.

4. *Factory overhead* Factory overhead, also called manufacturing overhead or factory burden, may be defined as the cost of indirect materials, indirect labour and indirect expenses. The term "indirect materials" refers to materials that are needed for the completion of the product but whose consumption with regard to the product is either so small or so complex that it would not be appropriate to treat it as a direct materials item. They are production supplies and other materials that cannot conveniently or economically be charged to a specific unit of output. Examples of such items are lubricants, cotton waste, handtools, works stationery etc.

The term "indirect labour" is the labour cost of production-related activities that cannot be associated with or conveniently and economically traced to specific products via physical observation. Some examples of indirect labour are: foremen, shop clerks, general helpers, cleaners, material handlers, plant guards, employees engaged in maintenance work or other service work.

The term "indirect expenses" covers all indirect expenditure incurred by the manufacturing enterprise from the time production has started to its completion and its transfer to the finished goods store. Any expenses not classified as direct expenses are known as indirect expenses. The Institute of Cost and Management Accountants (UK) defines indirect expenses as the "expenses which cannot be allocated but which can be apportioned to or absorved by cost centres or cost units." They are incurred for the benefit of more than one product, job or activity and must be apportioned by appropriate bases to the various functions. Expenses of this type include items such as heat, light, maintenance, factory managers's salary etc.

The total of (i) prime cost, and (ii) factory overheads is known as 'Factory cost'. Direct labour and factory overhead together are known as Conversion Costs because they are the costs of converting raw materials into finished products.

Chapter 6 explains in detail the nature and accounting of overhead costs.

5. *Selling, distribution and administrative overheads* Selling and distribution overheads usually begin when the factory costs end. Such expenses are generally incurred when the product is in saleable condition. It covers the cost of making sales and delivering/despatching products. These costs include advertising, salesmen salaries and commissions, packing, storage, transportation, and sales administrative costs.

Administrative overhead includes costs of planning and controlling the general policies and operations of a business enterprise. Usually, all costs which cannot be charged either to the production or sales division are considered as administrative costs. Typical of such items are fees of the board of directors, the chairman's salary, the rent for general offices and costs of the general accounting and other departments. Sometimes, some such expenses such as manager's salary are often allocated to manufacturing and included in factory overhead.

The sum of (i) Prime cost, (ii) Factory overhead and (iii) Selling and distribution and Administrative Overhead is the total cost, i.e., the cost "to make and sell."

Chapter 7 discusses selling and distribution and administrative overhead costs.

Figure 2.1 presents the natural classification of costs as discussed above.

Direct Material + Direct Labour + Direct Expenses = Indirect Materials + Indirect Labour + Indirect Expenses =			(1) Prime Cost + Factory Overhead
Threads, lubricants, glue, other factory supplies.	Supervision, Inspection, superintendence, salary of factory clerks, experimental work, general helpers, cleaners, employees engaged in maintenance work.	Rent, insurance — fire and liability, taxes, depreciation, maintenance and repair, power, light, heat, misc., factory overhead, small tools, hire of machinery.	(2) Factory cost +
Selling and Distribution Overhead + Administrative Overhead =			Selling and Distribution, and Administrative overhead.
Advertising, samples, salesmen's salaries travel, depreciation of sales equipment, rent of branches, telephone, telegraph, supplies, stationery and printing, freight and carriage out, sales promotion, sales accounting, misc. expenses.	office salaries, rent, executive salaries, depreciation of equipment, telephone and telegraph, travel, property taxes, auditing expenses, stationery and printing, postage, other administrative expenses.		(3) Total cost

Fig. 2.1 Natural classification of costs in a manufacturing concern

COST BEHAVIOUR (IN RELATION TO CHANGES IN OUTPUT OR ACTIVITY OR VOLUME)

Costs can be classified into (i) fixed, (ii) variable and (iii) mixed costs, in terms of their variability or changes in cost behaviour in relation to change in output, or activity or volume. Activity may be indicated in any forms such as units of output, hours worked, sales, etc.

Fixed Cost

Fixed cost is a cost which does not change in total for a given time period despite wide fluctuations in output or volume of activity. These costs are also known as standby costs, capacity costs or period costs. Examples of fixed costs are rent, property taxes, supervising salaries, depreciation on office facilities, advertising, insurance, etc. They accrue or are incurred with the passage of time and not with the production of the product or the job. This is the reason why fixed costs are expressed in terms of time, such as per day, per month or per year and not in terms of unit. It is totally illogical to say that a supervisor's salary is so much per unit. But it can be said that supervisor's salary is so much per month.

Any fixed cost can be represented by a constant (See Fig. 2.2).

However it should be improper to say that fixed costs never change in amount. The basic concept is that the term "fixed" refers to fixity (non-variability) related to specific volume (or relevant range); the term does not imply that there will be no changes in fixed cost. This characteristic of fixed cost has been shown in Fig. 2.3. According to Fig. 2.3, the following are the fixed costs at different levels of production:

1. Rs 50,000 fixed cost between 20,000 and 80,000 units of production.

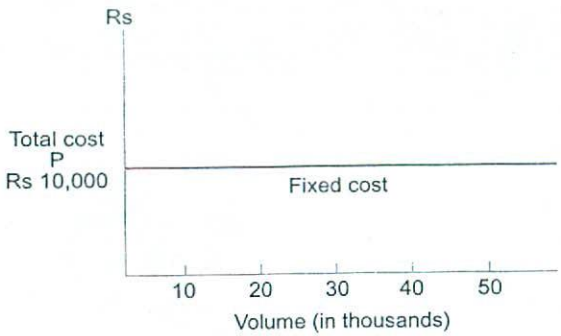

Fig. 2.2 Fixed Cost

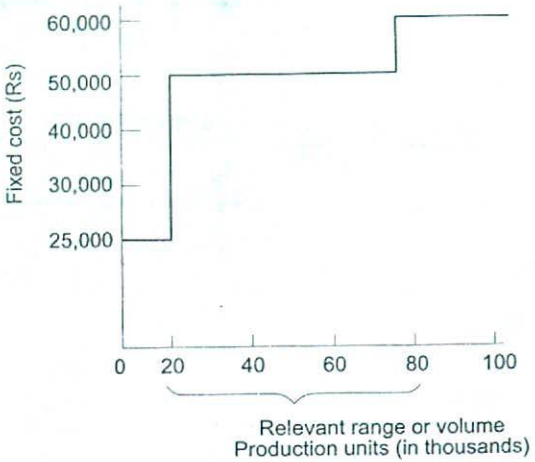

Fig. 2.3 Total Fixed Cost at Different Levels of Production

2. Rs 60,000 fixed cost in excess of 80,000 units. This assumes that increase in production after a certain level (80,000 units) requires increase in fixed expenses which have been fixed earlier, e.g., additional supervision, increase in quality control costs.

3. Rs 25,000 fixed cost from zero units (shut down) to 20,000 units. This explains that if the level of activity comes to less than 20,000 units, some fixed costs may not be incurred. For example, if the plant is shut down or production is reduced, many of the fixed costs, such as costs on accounting functions, supplies, staff, will not be incurred.

However, if laying off of staff and personnel, etc. is not possible, then the fixed cost will remain at Rs 50,000.

Fixed costs can be classified in the following categories for the purpose of analysis:

1. *Committed costs* Such costs are primarily incurred to maintain the company's facilities and physical existence, and over which management has little or no discretion. Plant and equipment depreciation, taxes, insurance premium rate and rent charges are examples of committed costs.

2. *Managed costs* Managed costs are related to current operations which must continue to be paid to ensure the continued operating existence of the company, e.g. management and staff salaries.

3. *Discretionary costs* They are also known as programmed costs. Discretionary costs result from special policy decisions, management programmes, new researches, etc. Some examples of such costs are research and development costs, marketing programmes, new system development costs.

The difference between committed and discretionary costs lies in the fact that it is difficult to eliminate or avoid committed costs in times of low production or decline in business activity, whereas discretionary costs such as research and development could be eliminated or reduced to a desirable level.

4. *Step costs* A step cost is constant for a given amount of output and then increases in a fixed amount at a higher output level. For example, in a manufacturing company, one supervisor is required at a salary of Rs 10,000 p.m. for every 50 workers. So long as 50 workers or less than that are working, the supervision costs will be Rs 10,000 p.m. But as soon as the 51st worker is employed, the cost of supervision increases by Rs 10,000 p.m. and will be Rs 20,000. The cost of supervision remains fixed at

Rs 20,000 if not more than 100 workers are working. But it will go up if more than 100 workers have been employed. Figure 2.4 exhibits the behaviour pattern of step costs.

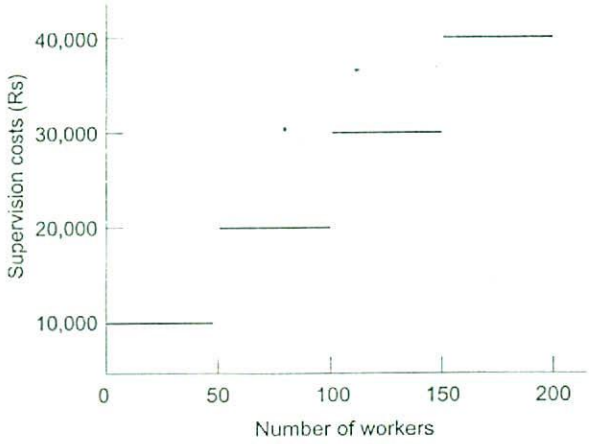

Fig. 2.4 Step Costs

Variable Cost

Variable costs are those costs that vary directly and proportionately with the output. There is a constant ratio between the change in the cost and change in the level of output. Direct materials cost and direct labour cost are the costs which are generally variable costs. For example, if direct material cost is Rs 50 per unit, then for producing each additional unit, a direct material cost of Rs 50 per unit will be incurred. That is, the total direct material cost increases in direct proportion to increase in units manufactured. However, it should be noted that it is only the total variable costs that change as more units are produced; the per unit variable cost remains constant.

Variable overheads like factory supplies, indirect materials, sales commission, office supplies are some other examples of variable costs. If the factory is shut down, variable costs are eliminated. Variable cost is always expressed in terms of units or percentage of volume; it cannot be stated in terms of time. Variable cost is depicted in Fig. 2.5. Figure 2.5 shows graphically the behaviour pattern of direct material cost. For every increase in the units produced there is a proportionate increase in the cost. When production increases to 3,000 units from a level of 2,000 units, the cost of direct materials increases in direct proportion at the constant rate of Rs 50 per unit. The variable cost line is shown as linear rather than curvilinear. That is, on a graph paper a variable cost line appears as an unbroken straight line in place of a curve.

Mixed Cost

Mixed costs are costs made up of fixed and variable elements. They are a combination of semi-variable costs and semi-fixed costs. Because of the variable component, they fluctuate with volume; because of the fixed component, they do not change in direct proportion to output. Semi-fixed costs are those costs which remain constant upto a certain level of output after which they become variable as shown in

Direct materials costs Rs 50 per unitv

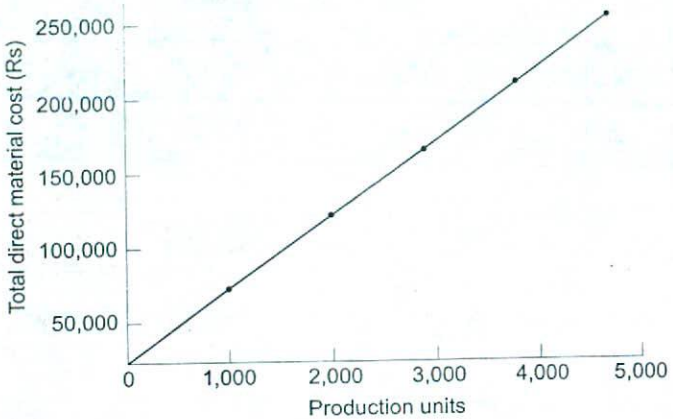

Fig. 2.5 Behaviour of Variable Costs

Fig. 2.6. Semi-variable cost is the cost which is basically variable but whose slope may change abruptly when a certain output level is reached as shown in Fig. 2.7.

An example of a mixed cost is the earnings of a worker who is paid a salary of Rs 1500 per week (Fixed) plus a bonus of Re 1 for each unit completed (variable). If he increases his weekly putput from 1,000 units to 1,500 units, his earnings increase from Rs 2,500 to Rs 3,000.

Earnings	*Units produced*	
	1,000	1,500
Fixed component	Rs 1,500	Rs 1,500
Variable component	1000	1,500
Total	Rs. 2,500	Rs 3,000

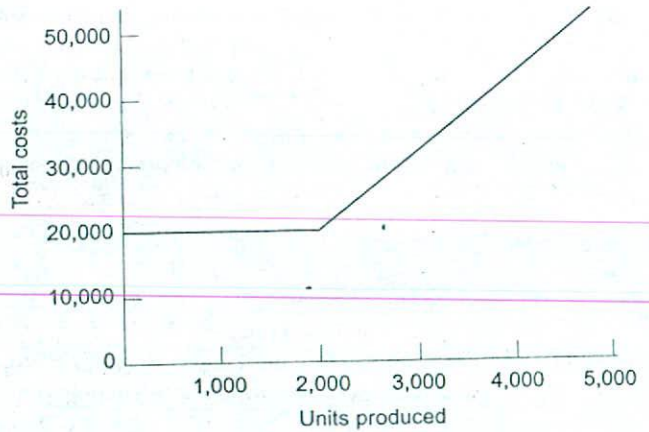

Fig. 2.6 Semi-fixed Cost

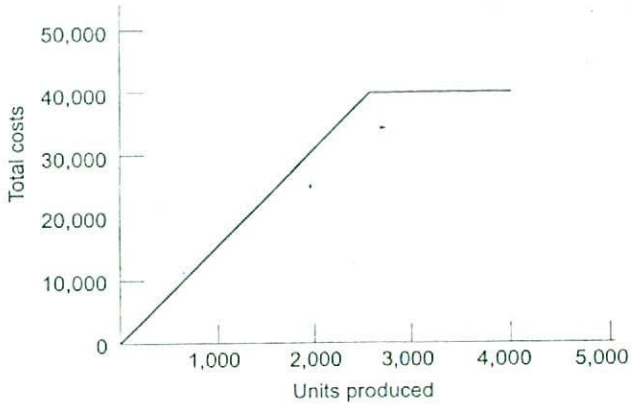

Fig. 2.7 Semi-variable Cost

An increase of 50% in output brings only a 20% increase in his earnings. Mathematically, mixed costs can be expressed as follows:

Total mixed cost = Total fixed cost + (Units × Variable cost per unit)

DEGREE OF TRACEABILITY TO THE PRODUCT

Cost is divided into direct and indirect cost in terms of degree of traceability to the product.

Direct Cost

Costs which are easily traceable or identifiable with a product are called direct costs. If output units are the objects of costing, then direct costs represent costs and resources that can be traced to or identified with the finished product.

Direct materails, direct labour and direct expenses are examples of direct costs.

Indirect Cost

Indirect costs are those costs which cannot be identified with, or traced to a single product because they are incurred for several products. The examples of indirect costs are: indirect materials (lubricants and scrap materials), salary of factory supervisors (indirect labour), rent, rates and depreciation (indirect expenses). Indirect costs, often referred to as overheads, have to be apportioned to different products.

Costs also may be direct or indirect with respect to particular company segments or divisions. That is some cost which are indirect for a product, may be traced to a segment or department and thus, will be direct costs for that department. A segment may mean any one of a number of things, viz. department, division, specific activity, sales territory and the like.

Before dividing the cost into direct and indirect, it is necessary to know whether it is being associated with a product, sales area, department or some other activity. For example, if a salesman simultaneously handles several products, his salary is an indirect cost for each product, but a direct cost to his sales area or department.

ASSOCIATION WITH THE PRODUCT

Cost is classified into product costs and period costs in terms of assocation with the product.

Product Cost

Product costs are those costs which are identified with the product and included in inventory values. In other words, the costs that are included in the cost of manufacturing a product are called product costs. In a manufacturing concern, it is composed of four elements: (i) direct materials, (ii) direct labour (iii) direct expenses and (iv) manufacturing overhead. That is, product cost is a full factory cost. Prior to sale, product costs are deferred as inventories and until the goods are sold, are shown on the balance sheet as assets. As finished inventory goods is sold, product costs are transferred from the inventory accounts to the cost of goods sold account, thus becoming expenses and part of the period costs at the time revenue is realised.

Period Cost

Period costs are the costs which are not identified with product or job and are deducted as expenses during the period in which they are incurred. They are not carried forward as a part of value of inventory to the next accounting period.

These costs are necessary to genetate revenues but they cannot be directly associated with units of product. Difference of opinion exists regarding whether certain costs should be considered as product or period costs. It is generally accepted that selling and administrative expenses should be treated as period costs for the following reasons:

(i) It is difficult to select equitable bases to apportion these costs to products. On the other hand, product costs can be assigned to specific products through objective and direct measurements and some by allocation.
(ii) The majority of these expenses are fixed regardless of the change in production or activity..
(iii) It is difficult, if not impossible, to determine the relationship between the incurrence of these costs and the production of individual units of output.
(iv) It is difficult to get evidence as to any future benefits that would be obtained from these expenses at the end of the accounting period. Such is the case with clerical salaries, used postage, office supplies, rent, advertising, sales promotion, consulting fees which may be expected to provide future benefits, but they are usually expensed when incurred. Even if it is argued that there will be future benefits, it is difficult to make accurate measurements of such benefits.

Effect of Product Costs and Period Costs

The net income of a business enterprise is influenced by the amount of product costs and period costs. Therefore, the manner in which some costs are divided as product or period will have a bearing on the reported net income of a business firm. Product costs, in the first instance, influence the value of inventory as such costs by nature should be included in the cost of product. Product costs affect net income in the period in which products representing the product costs have been sold. This event of influencing net income may take place in the current accounting period or subsequent accounting period. In other words, products costs do not reach the income statement and will not influence net income of a business enter-

prise until the product is sold. However, period costs appear directly on the income statement in the month or the period in which they are incurred.

FUNCTIONAL CLASSIFICATION OF COSTS

Functional classification of costs refers to how the cost was used (manufacturing, administration or selling). A functional classification implies that the business performs many functions for which costs are incurred. In measuring net income, expenses are usually classified by function and grouped under the headings of manufacture, selling and administrative costs. Manufacturing costs are all production costs incurred to manufacture the products and to bring them to a saleable condition, including direct materials, direct labour and indirect manufacturing (or factory overhead) costs. Selling and administrative charges may be treated as expenses when incurred or charged to prepaid expense accounts such as prepaid insurance. Functional classification is also important because it provides an opportunity to the management to evaluate the efficiency of departments performing different functions in the organisation.

RELATIONSHIP WITH ACCOUNTING PERIOD

Capital Cost and Revenue Cost

Costs can also be divided into two broad classes on the basis of the accounting period to which they relate:
(i) capital expenditures and (ii) revenue expenditures. A capital expenditure provides benefit to future periods and is classified as an asset; a revenue expenditure is assumed to benefit the current period and is classified as an expense. A capital expenditure will flow into the cost stream as an expense when the asset is used up or written off.

The distinction between capital and revenue expenditures is vital to the proper matching of costs and revenue and to the accurate measurement of periodic net income.

COSTS FOR DECISION MAKING AND PLANNING

Opportunity Cost

Opportunity cost is the cost of opportunity lost. Opportunity cost is the cost of selecting one course of action in terms of the opportunities which are given up to carry out that course of action. Opportunity cost is the benefit lost by rejecting the best competing alternative to the one chosen. The benefit lost is usually the net earnings or profits that might have been earned from the rejected alternative. For example, assume that a manufacturer can sell a semi-finished product to a customer for Rs 5,00,000. He decides, however, to keep it and finish it. The opportunity cost of the semi-finished product is Rs 5,00,000 because this is the amount of economic resources foregone by the manufacturer to complete the product. Similarly, capital which is invested in plant and inventories cannot now be invested in shares and debentures that will earn interest and dividends. The loss of interest and dividend that would be earned is the opportunity cost. Other examples of opportunity cost are when the owner of a business foregoes the opportunity to employ himself elsewhere; or a machine used to make Product A is said to have an opportunity cost if the machine can be sold or if it can also make Product B.

Opportunity costs are important in decision-making and evaluating alternatives. Decision making is selecting the best alternative which is facilitated by the help of opportunity costs. But opportunity costs are not recorded in an accounting system as they relate to opportunities lost.

Sunk Cost

A sunk cost is the cost that has already been incurred. Generally known as unavoidable cost, it refers to all past costs since these amounts cannot be changed once the cost is incurred. They are the costs which have been created by a decision in the past and cannot be changed or avoided by any decision that is made in the future. Examples of sunk costs are the book values of existing assets, such as plant and equipment, inventory, investment in securities, etc. Except the possible gains or losses on sales of any of such assets, the book value is not relevant for decisions regarding whether to use them or dispose them off.

Some argue that the total cost of a fixed asset is not the sunk cost, but sunk cost is the difference between the purchase price of a fixed asset and the net amount that could be realised from its sale. For example, if a plant has a book value of Rs 10,00,000 and a scrap value of Rs 50,000 then the sunk cost is Rs 9,50,000 (Rs 10,00,000–50000) and not Rs 10,00,000. That is, the sunk cost is the difference between book value and scrap value.

Relevant Cost

Relevant costs are those future costs which differ between alternatives. Relevant costs may also be defined as the cost which are affected and changed by a decision. On the contrary, irrelevant costs are those costs which remain the same and not affected by the decision whatever alternative is chosen. Relevant costs have the following two features:

(i) Relevant costs are only future costs, i.e. those costs which are expected to be incurred in future. Relevant costs therefore, are not historic (sunk) costs which have already been incurred and cannot be changed by a decision.

(ii) Relevant costs are only incremental (additional) or avoidable costs. Incremental costs refer to an increase in cost between two alternatives. Avoidable costs are those which are not incurred from one alternative to another.

To take an example, assume a business firm purchased a plant for Rs 10,00,000 and has now a book value of Rs 1,00,000. The plant had become obsolete and cannot be sold in its present condition. However, the plant can be sold for Rs 1,50,000 if some modification is done on it which will cost Rs 60,000. In this example, Rs 60,000 (modification cost) and Rs 1,50,000 (sales value) both are relevant as they reflect future, incremental costs and future revenues respectively. The firm will have incremental benefit of Rs 90,000 (Rs 1,50,000–Rs 60,000) on sale of the plant.

Rs 10,00,000 has already been incurred and being a sunk cost is not relevant to the decision, i.e. whether modification should be done. Similary, the book value of Rs 1,00,000 which has to be written off, whatever alternative future action is chosen is also not relevant because it cannot be changed by any future decision.

Differential Cost

Differential cost is the difference in total costs between any two alternatives. Differential costs are equal to the additional variable expenses incurred in respect of the additional output, plus the increase in

fixed costs, if any. This cost may be calculated by taking the total cost of production without the additional contemplated output and comparing it with the total costs incurred if the extra output is undertaken.

Differential costs are also known as incremental costs, although technically an incremental cost should refer only to an increase in cost from one alternative to another; decrease in cost should be referred to as decremental cost. Differential cost is a broader term, encompassing both cost increases (incremental costs) and cost decreases (decremental costs) between alternatives.

For example, assume that a company has normal capacity to manufacture 50,000 units of a product; production beyond that point would require the installation of additional plant and equipment that would increase the amount of fixed costs. Normal utilisation of available capacity ranges between 40,000 and 50,000 units. Fixed costs for the range of output and expanded capacity have been estimated as follows:

	Normal capacity	*Expanded capacity*
Number of units	40,000 to 50,000	50,000 to 60,000
Fixed costs	Rs 2,00,000	Rs 2,50,000

Now assume that the variable cost is Rs. 4 per unit. A statement comparing manufacturing costs at three different production levels would be as follows:

	Number of units		
	40,000	50,000	60,000
Variable costs	Rs 1,60,000	Rs 2,00,000	Rs 2,40,000
Fixed costs	Rs 2,00,000	2,00,000	2,50,000
Total manufacturing cost	3,60,000	4,00,000	4,90,000
Average per unit	Rs 9.0	Rs 8	Rs 8.17
Incremental costs	—	40,000	90,000
Additional output (units)	—	10,000	10,000
Incremental cost per unit	—	Rs 4.00	Rs 9.00

The additional capacity which would be required to expand operations to 60,000 units would increase the fixed costs by Rs 50,000. The incremental cost of an additional 10,000 units would total Rs 90,000 or Rs 9.00 per unit. The average cost of the 60,000 units would be Rs 8.17 per unit.

The concept of differential costing is vital in planning and decision making. It is an important tool in evaluating the profitability of alternative choice decisions and helping management in choosing the best alternative. The diffferential cost analysis can assist management in knowing the additional profit that would be earned if idle or unused capacity is used for extra production or if some additional investments are made by the firm.

Imputed Cost

Imputed costs are costs not actually incurred in some transaction but which are relevant to the decision as they pertain to a particular situation. These costs do not enter into traditional accounting system. Interests on internally generated funds, rental value of company-owned property and salaries of owners of a single proprietorship or partnership are some examples of imputed costs. Costs paid or incurred are not imputed costs. For example, if Rs 5,00,000 is paid for purchase of raw materials, it is an outlay cost but not an imputed cost, because it would enter into ordinary accounting systems. When a company uses internally generated funds, no actual interest payment is required. But if the internally generated funds

are invested in some projects, interest would have been earned. The revenue foregone (loss of interest) represents an opportunity cost, and thus, imputed costs are opportunity costs.

Out-of-Pocket Cost

While imputed costs do not involve cash outlays, out-of-pocket costs signify the cash cost incurred on an activity. Non-cash costs such as depreciation are not included in out-of-pocket costs. This cost concept is significant for management in deciding whether or not a particular project will at least return the cash expenditures associated with the project selected by management. Similary acceptance of a special order for production may necessitate the consideration of out-of-pocket costs that need not be incurred if the special order proposal is not accepted. Depreciation on plant and equipment is not relevant in decision-making because no cash goes outside the business.

Fixed, Variable and Mixed Costs

Fixed, variable and mixed costs have been explained in the preceding sections.

Shut Down Cost

Shut down costs are those costs which have to be incurred under all situations in the case of stopping manufacture of a product or closing down a department or a division. Shoutdown costs are always fixed costs. If the manufacture of a product is stopped, variable costs like direct materials, direct labour, direct expenses, variable factory overhead will not be incurred. However, a part of fixed costs (if not total fixed costs) associated with the product will be incurred such as rent, watchman's salary, property taxes etc. Such fixed costs are unavoidable. Some fixed costs associated with the product become avoidable and need not be incurred in case production is stopped such as supervisor's salary, factory manager's salary, lighting, etc. Shutdown costs, thus refer to minimum fixed costs which are incurred in the event of closure of a department or division.

COSTS FOR CONTROL

Controllable and Uncontrollable Cost

The concept of controllable cost is very important in cost accounting and contributes to the achievement of the objectives of cost control and responsibility accounting. The ICMA (UK) defines controllable cost as "a cost which can be influenced by the action of a specified member of an undertaking" and a non-controllable cost as "a cost which cannot be influenced by the action of a specified member of an undertaking." Basically, a controllable cost is the cost over which a manager has direct and complete decision authority. That is, controllable costs can be controlled (reduced) by a manager at a given organisational level. Some examples of controllable costs are indirect labour, lubricants, cutting tools, and power costs incurred in the machining department.

Controllable costs do not imply that they are 100% controllable. Some costs are partly controllable by a responsibility centre manager. For example, the cost of raw materials is controlled by the production managers as well as purchase managers. The production manager controls at quantity level, and the purchase manager at the price level. Such costs are reported to both of them, but one responsible manager should be held accountable for those costs which he can control.

The term "controllable cost" should not be confused with the terms "variable cost" "direct cost". These terms are not synonymous. Variable costs vary with the output but are not necessarily controllable. For example, factory supplies used for servicing plant and equipment may vary with the output in the production department, but the production manager cannot control them.

It is contended that two factors: (i) the time period factor, and (ii) the decision-making authority, can make a cost controllable or uncontrollable. If the time period is long enough, all costs can be controllable and curtailed. Similarly, the decision-making authority influences the cost. If a responsibility center manager has been delegated the authority to spend the cost, he can control it. But all costs can be said to be controllable by somebody in the organisation. The managing director of a company is responsible for all costs. But practically, the responsibility and authority of controlling costs is delegated to different levels in the organisation.

Standard Cost

Standard costs are those costs which are planned or predetermined cost estimates for a unit of output in order to provide a basis for comparison with actual costs. Standard costs are used to prepare budgets. Standard cost is a unit concept and indicates standard cost per unit of output, per labour hour etc. On the contrary, the term 'Budgeted Cost' is a total concept and indicates total budgeted cost of an item at some activity level or output level such as budgeted cost of material is Rs 8,00,000 if 8000 units are manufactured.

Fixed, Variable and Mixed Costs

Fixed, variable and mixed costs have been discussed earlier in this chapter.

OTHER COSTS

Joint Cost

Joint costs arise where the processing of a single raw material or production resources results in two or more different products simultaneously. Joint costs relate to two or more products produced from a common production process or element-material, labour, or overhead or any combination thereof, or so locked together that one cannot be produced without producing the other(s).

Thus, joint cost is the cost of two or more products that are not identifiable as individual types of products until a certain stage of production known as the split-off point (point of separation) is reached. For example, kerosene, fuel oil, gasolene and other oil products are derived from crude oil. Joint costs are total costs incurred upto the point of separation. Joint costs can be apportioned to different products only by means of some suitable bases of apportionment.

Common Cost

Common costs are those which are incurred for more than one product, job, territory or any other specific costing object. Common costs are not easily identifiable with individual products and, therefore, are generally apportioned.

Common costs are not only common to products, but they may be common to processes, functions, responsibilities, customers, sales territories, periods of time and similar costing units. For example, the salary of a manager of a production department which is manufacturing three products is an example of

common cost with respect to the products. But his salary is direct cost to the departments located in the factory. The basic point is that a particular (common) cost may be direct to one object and common as far as other objects are concerned.

Although both the terms, "common costs" and "joint costs" are sometime used interchangeably, they differ from each other. Joint costs emerge when multiple products are manufactured in a common process and when common inputs are used. The multiple products have a definite quantitative relationship to each other and the production of one product influences the output of the other product, though in a lesser proportion. Common costs are not the result of any manufacturing compulsion or the use of any single raw material. Besides common costs can be apportioned to costing objects like products, job, department, etc. without much difficulty. But the apportionment of joint cost involves many difficulties in cost accounting.

COST CONTROL

Cost control can be defined as the comparative analysis of actual costs with appropriate standards or budgets to facilitate performance evaluation and formulation of corrective measures. It aims at accomplishing conformity between actual result and standards or budgets. Cost control is keeping expenditures within prescribed limits. Cost control has the following features:

1. Creation of responsibility centres with defined authority and responsibility for cost incurrence.
2. Formulation of standards and budgets that incorporate objectives and goals to be achieved.
3. Timely cost control reports (responsibility reporting) describing the variances between budgets and standards and actual performance.
4. Formulation of corrective measures to eliminate and reduce unfavourable variances.
5. A systematic and fair plan of motivation to encourage workers to accomplish budgetary goals.
6. Follow-up to ensure that corrective measures are being effectively applied.

Cost control does not necessarily mean reducing the cost but its aim is to have the maximum utility of the cost incurred. In other words, the objective of cost control is the performance of the same job at a lower cost or a better performance for the same cost.

COST REDUCTION

Meaning

Cost reduction may be defined as an attempt to bring costs down. Cost reduction implies real and permanent reduction in the unit cost of goods manufactured or services rendered without impairing their (product or goods) suitability for the use intended. The goal of cost reduction is achieved in two ways: (i) by reducing the cost per unit and (ii) by increasing productivity. The steps for cost reduction include elimination of waste, improving operations, increasing productivity, search for cheaper materials, improved standards of quality, finding other means to reduce unit costs.

Cost reduction has to be achieved using internal factors within the organisation. Reduction of costs due to external factors such as reduction in taxes, government subsidies, grant etc. do not come under the concept of cost reduction.

Difference between Cost Control and Cost Reduction

Cost reduction is a much wider concept than cost control. As stated earlier, cost control aims at controlling costs within prescribed limits with the help of budgets and standards. The following are the differences between the two:

Cost Control	*Cost Reduction*
1. Cost control process involves (a) setting targets and standards (b) ascertaining actual performance (c) comparing actual performance with targets (d) investigating the variances and (e) taking corrective action.	1. Cost reduction is not concerned with setting targets and standards and maintaining performance according to standards. Cost reduction is the final result in the cost control process.
2. Cost control aims at achieving standards, i.e. cost targets. It assumes existence of standards.	2. Cost reduction aims at improving the standards. It challanges standards and assumes existence of concealed potential savings in the standards.
3. It follows a conservative procedure and lacks dynamic approach.	3. It is continuous, dynamic and innovative in nature, looking always for measures and alternative to reduce costs.
4. It is a preventive function.	4. It is a corrective function.
5. In cost control, costs are optimised before they are incurred.	5. In cost reduction, there is always assumed a scope for reducing the incurred costs under controlled conditions.
6. It is generally applicable to items which have standards.	6. This is applicable to every activity of the business.
7. It contains guidelines and directive of management as to how to do a thing.	7. It adds thinking and analysis to action at all levels of management.

Tools and Techniques of Cost Reduction

Generally speaking, the following tools and techniques are used for the purpose of cost reduction:

1. Value analysis or value engineering
2. Work study
3. Job evaluation and merit rating
4. Production planning and control
5. Organisation and method study
6. Operations and method study
7. Rationalisation
8. Quality control
9. Economic order quantity
10. Use of better technology
11. Mechanisation and automation
12. Standardisation
13. Simplification
14. Classification and codification
15. Variety reduction

16. Improvement in the design of a product
17. Market research
18. Inventory management and control

Cost Reduction Areas

Some of the important cost reduction areas are as follows:

1. *Product improvement* Product improvement and the level of efficiency determine the costs incurred. Important factors in product improvement are:

(a) Quality of the product.
(b) Unnecessary weight, materials content, machine or labour operations.
(c) Waste and losses to be eliminated.
(d) Proper designing of the product.

2. *Production methods and layout* The area of production methods and organisation is important for the purpose of cost reduction. There are many vital activities relating to production and production planning where a cost reduction programme may be applied, e.g. materials control, labour control, production layout, system analysis, time and motion study, work measurements, standardisation of methods, designing of tools, equipment and machinery, modernisation of plant and equipment, use of incentive schemes, etc.

3. *Marketing areas* In marketing, the following are the cost reduction areas: channels of distribution, sales promotion schemes, marketing research plan, territorial responsibilities, methods of remunerating salesmen, advertising methods, after-sales service costs, packaging methods, materials handling, transport arrangement, etc.

4. *Administrative areas* Administrative functions include personnel, purchase and general administration.

The goal of cost reduction requires efficiency administration, effective purchasing procedure and a fair personnel policy and schemes. Some of the important areas are investment planning, cash discount policy, mechanised system of accounting, labour relations, labour welfare measure, availability of servicing facilities.

Management should always attempt to remove difficulties generally found in cost reduction programmes. Some such difficulties are as follows:

(i) Workers and employees may not welcome cost reduction programmes and may resist their implementation.
(ii) Cost reduction programmes are generally carried out on an ad hoc basis.
(iii) The schemes may be applied in some areas but it should cover all activities.
(iv) Cost reduction programmes may be implemented hurridly, whereas, they should be carried out after careful thought and in a planned manner.

COST MANAGEMENT

Cost management identifies, collects, measures, classifies and reports information that is useful to managers and other internal users in cost ascertainment, planning, controlling and decision making. Thus,

cost management aims to produce and provide information to internal users and personnel working in the organisation.

Developing information within cost management requires that one should be aware about the cost structure of a business enterprise. Managers should know how to ascertain costs of different activities, processes, customers, goods, services and any other costing objects. Financial accounting does not deal with these costs and these costs are not found on the financial statements. However, knowledge about these costs is essential to help managers in productivity enhancement, strategic planning and management, total quality management, management control, total quality management. By nature cost management includes both management accounting information system as well as cost accounting.

Example 2.1

A company manufactures and retails clothing. You are required to group the costs which are listed below and numbered 1 to 20 into the following classification: (Each cost is intended to belong to only classification).

(a) Direct Materials
(b) Direct Labour
(c) Direct Expenses
(d) Indirect Production Overhead
(e) Selling and Distribution Costs
(f) Research and Development Costs
(g) Finance Cost
(h) Administration Costs

1. Telephone rental plus metered calls
2. Wages of security guards for factory
3. Parcels sent to customers
4. Wages of operatives in cutting department
5. Developing a new product in the laboratory
6. Wage of fork lift truck drivers who handle raw materials
7. Wages of storekeepers in materials store
8. Chief accountant's salary
9. Cost of painting advertising slogans in delivery vans
10. Auditor's fee
11. Cost of advertising on television
12. Lubricants for sewing machines
13. Floppy disks for general office computer
14. Maintenance contract for office photo copying machine
15. Interest on bank overdraft
16. Market research undertaken prior to new product launch
17. Carriage on purchase of raw materials
18. Royalty paid on number of units of a particular product produced
19. Road licences for delivery vehicles
20. Amount payable to a company for broadcasting music throughout the factory

(ICWA Inter)

Solution:

Cost element	*Numbers*
Direct materials	17
Direct labour	4
Direct expenses	18
Finance cost	15
Research and development expenses	5
Selling and distribution cost	3, 9, 11, 16, 19
Administration cost	1, 8, 10, 13, 14
Indirect production costs	2, 6, 7, 12, 20

COST STATEMENT OR COST SHEET

Cost Statement is a statement which is prepared usually to present the detailed costs of total production during the period in question. It provides information relating to cost per unit at different stages of the total cost of production or at different stages of completion of the product. Sometimes standard cost data are also provided to facilitate comparison with the actual cost incurred. The preparation of the cost sheet requires understanding of the treatment of the following items:

1. *Stock of raw materials* The cost statement requires the determination of the value of raw materials consumed for the output produced. If the opening stock of raw materials, purchase of raw materials during the period and closing stock of raw materials are given, then the value of raw materials consumed is computed as follows:

	Rs
Opening stock of raw materials	—
Add: Purchase of raw materials	—
Total	—
Less: Closing stock of raw materials	—
Value of raw materials consumed	—

2. *Stock of work-in-progress* Work-in-progress represents the accumulated costs on goods that have not yet been completed. As such these goods are not yet available for sale. The degree of completion of work-in-progress is usually expressed as a fraction or as a percentage, such as 2/5 complete for materials or 50% complete for labour.

Work-in-progress is valued on a prime cost or factory cost basis. In case it is to be valued on a factory cost basis, the following procedure would be followed:

	Rs
Prime Cost	—
Add: Factory overhead	—
Add: Work-in-progress (beginning)	—
Total	—
Less: Work-in-progress (closing)	—
Factory Cost	—

3. *Stock of finished goods* Finished goods inventory covers the products on which all factory work has been completed. It carries the cost of completed production. Nothing more is to be done to finished goods at the factory and no further costs are added to finished goods. If opening and closing stock of finished goods are given, then they would be adjusted as under:

	Rs
Cost of production	—
Add: Finished goods (beginning)	—
Total	—
Less: Finished goods (closing)	—
Cost of goods sold	—

As stated earlier, cost sheet gives details about the cost of manufacturing a product or completing an activity. A cost sheet discloses:

(1) Prime Cost
(2) Factory Cost (also known as works cost)
(3) Cost of Production
(4) Total Cost (or cost of sales)

A cost sheet shows total cost and cost per unit. Cost per unit is obtained by dividing total cost by the number of units produced. A cost sheet will have separate columns for the total and the unit cost of each element of cost. Cost sheet can be prepared on weekly, monthly or other time period basis as desired by management. Specimen of a cost sheet is given below:

Specimen of Cost Sheet
Cost Sheet for the Period _____
Production _____ Units

	Total cost (Rs)	*Cost per unit (Rs)*
Direct Materials:		
Opening stock...		
Purchases...		
Carriage inwards...		
Less: Closing stock...		
Less: Scrap		
Direct materials consumed		
Direct wages		
Direct expenses		
I. *Prime Cost*		
Add: Factory Overheads:		
Indirect materials		
Loose tools		
Indirect wages		
Rent and rates (factory)		
Lighting and heating (factory)		
Power and fuel		

	Total cost (Rs)	*Cost per unit (Rs)*
Repairs and maintenance		
Cleaning		
Drawing office expenses		
Cost of research and experiments		
Depreciation of factory plant		
Works stationery		
Welfare service expenses		
Insurance—Fixed assets etc.		
—Stock and finished goods		
Works manager's salaries		
II. *Factory or Works Cost*		
Add: Office and Administrative Overheads:		
Rent and rates (office)		
Salaries (office)		
Lighting and heating		
Insurance of office building and equipments etc.		
Telephone and postages		
Printing and stationery		
Depreciation of furniture and office equipments and buildings.		
Legal expenses		
Audit fees		
Bank charges		
III. *Cost of Production*		
Add: Selling and Distribution Overheads:		
Showroom rent and rates		
Lighting and heating		
Salesmen's salaries		
Commissions		
Travelling expenses of salesmen		
Sales printing and stationery		
Advertising		
Bad debts		
Postage		
Depreciation and expenses of delivery van		
Debt collection expenses		
Carriage freight outwards		
Samples and other free gifts		
IV. *Cost of Sales*		
Net profit (or loss)		
Sales		

Note Items of expenses which are an appropriation of profit should not form a part of the costs of a product. Examples of such expenses are: (i) Income Tax; (ii) Dividends to shareholders; (iii) Commission (out of profit) to Managing Directors or Partners; (iv) Capital loss, i.e. loss arising out of sale of assets; (v) Interest on loan; (vi) Donations; (vii) Capital expenditure; (viii) Discount on shares and debentures; (ix) Underwriting commission; (x) Writing off goodwill.

Example 2.2

From the following particulars, prepare a cost sheet for the year ended 31.12.2002

	Rs
Stock of finished good (1.1.2002)	6,000
Stock of raw materials (1.1.2002)	40,000
Work-in-progress (1.1.2002)	15,000
Purchase of raw materials	4,75,000
Carriage inwards	12,500
Factory rent, taxes	7,250
Other production expenses	43,000
Stock of goods (31.12.2002)	15,000
Wages	1,75,000
Work manager's salary	30,000
Factory employees salary	60,000
Power expenses	9,500
General expenses	32,500
Sales for the year	8,60,000
Stock of raw materials	50,000
Work-in-progress (31.12.2002)	10,000

Solution:

Cost Sheet for the Year Ending 31.12.2002

		Rs	Rs
	Stock of raw materials on 1.1.2002	40,000	
Add:	Purchase during the year	4,75,000	
		5,15,000	
Less:	Stock of materials on 31.12.2002	50,000	
	Cost of materials consumed		4,65,000
	Wages		1,75,000
	Carriage inwards		12,500
	Prime Cost		6,52,500
Add:	Factory overheads:		
	Works manager's salary	30,000	
	Factory employees salary	60,000	
	Factory rent, taxes and insurance	7,250	
	Power expenses	9,500	
	Other production expenses	43,000	
		1,49,750	
Add:	Works-in-progress (1.1.2002)	15,000	

		1,64,750	
Less:	Works-in-progress (31.12.2002)	10,000	
			1,54,750
	Factory Cost		8,07,250
Add:	Office overheads:		
	General expenses		32,500
	Total Cost		8,39,750
Add:	Stock of finished goods (1.1.2002)		6,000
			8,45,750
Less:	Stock of finished goods (31.12.2002)		15,000
	Cost of Sales		8,30,750
	Profit		29,250
	Total Sales		8,60,000

Example 2.3

A manufacturing company has shown Rs 32,380 as "Establishment Expenses" which include the following expenses:

		('000) Rs
1.	Warehouse wages	3600
2.	Office salaries	2260
3.	Office lighting	140
4.	Directors remuneration	2800
5.	Rent, rates and insurance of warehouses	620
6.	Warehouse lighting	540
7.	Trade magazine	140
8.	Bank charges	200
9.	Bad debts	340
10.	Agents commission	11500
11.	Warehouse repair	1020
12.	Travelling expenses	1520
13.	Rent, rates and insurance of office	460
14.	Printing and stationery	3000
15.	Donation	300
16.	Discount allowed	3940

From the above information, find out the total of (i) selling expenses (ii) distribution expenses (iii) administration expenses and (iv) expenses which will not be considered in determining total costs. (CA inter)

Solution:

		('000) Rs	('000) Rs
(i)	*Selling Expenses:*		
	Bad debts	340	

	Rs	
Agents commission	11500	
Travelling expense	1520	13360
(ii) *Distribution Expenses:*		
Warehouse wages	3600	
Rent, rates and insurance of warehouse	620	
Warehouse lighting	540	
Warehouse repair	1020	5780
(iii) *Administrative Expenses:*		
Office salaries	2260	
Office lighting	140	
Director's remuneration	2800	
Trade magazine	140	
Bank charges	200	
Rent, rates and insurance of office	460	
Printing and stationery	3000	9000
(iv) *Expenses Not to be Used in Estimating Costs:*		
Donation	300	
Discount allowed	3940	4240
		32380

Note Discount allowed has been assumed to be cash discount. Cash discount is a financial item and, therefore not considered in cost accounts.

Example 2.4

Vijay Industries manufactures a product X. On 1st January 2002, there were 5000 units of finished product in stock. Other stocks on 1st January 2002 were as follows:

Works-in-progress	Rs 57,400
Raw materials	Rs 1,16,200

The information available from cost records for the year ended 31st December 2002 was as follows:

	Rs
Direct materials	9,06,900
Direct labour	3,26,400
Freight on raw materials purchased	55,700
Indirect labour	1,21,600
Other factory overheads	3,17,300
Stock of raw materials on 31.12.2002	96,400
Work in progress on 31.12.2002	78,200
Sales (150000 units)	30,00,000
Indirect materials	2,13,900

There are 15000 units of finished stock in hand on 31st December 2002. You are required to prepare:

A statement of cost and profit assuming that opening stock of finished goods is to be valued at the same cost per unit as the finished stock at the end of the period.

Solution:

Statement of Cost and Profit of Product X

Particulars	*Amount (Rs)*	*Amount (Rs)*
Opening Stock of Raw Materials	1,16,200	
Add: Direct materials	9,06,900	
Add: Freight on raw materials purchased	55,700	
	10,78,800	
Less: Closing stock of raw materials	96,400	
Value of Raw Materials Consumed		9,82,400
Add: Direct wages		3,26,400
Prime Cost		13,08,800
Add: Factory overheads:		
Indirect materials	2,13,900	
Indirect labour	1,21,600	
Other factory overheads	3,17,300	
	6,52,800	
Add: Opening work-in-progress	57,400	
	7,10,200	
Less: Closing work-in-progress	78,200	6,32,000
Works Cost of Goods Manufactured		19,40,800
Add: Opening stock of finished goods 5000 units @ Rs 12.13		60,650
		20,01,450
Less: Closing stock of finished goods 15000 units @ Rs 12.13		1,81,950
Cost of Goods Sold		18,19,500
Profit		1,80,500
Sales		30,00,000

Working Notes:

Units produced during the year are not given and therefore have been computed as follows:

$$\text{Sales} = \text{Opening stock} + \text{Units produced} - \text{Closing stock}$$

$$150000 = 5000 + X - 15000$$

$$-X = 5000 - 15,000 - 1,50,000$$

Hence $X = 1,60,000$ units

$$\text{Value of closing stock} = \frac{\text{Total cost}}{\text{Units produced}} = \frac{\text{Rs } 1940800}{160000} = \text{Rs } 12.13 \text{ per unit}$$

$$= 15000 \text{ units} \times \text{Rs } 12.13 = \text{Rs } 1,81,950$$

Value of opening stock of 5000 units × Rs 12.13 = Rs 60650

Example 2.5

The books of Adarsh Manufacturing Company present the following data for the month of April 2002:

Direct labour cost Rs 17,500 being 175% of works overheads

Cost of goods sold excluding administrative expenses Rs 56000.

Inventory accounts showed the following opening and closing balances:

	April 1	*April 30*
Raw materials	Rs 8,000	Rs 10,600
Work-in-progress	10,500	14,500
Finished goods	17,600	19,000

Other data are:

Selling expenses	Ra 3,500
General and administrative expenses	2,500
Sales for the month	75,000

You are required to:

(i) Compute the value of materials purchased

(ii) Prepare a cost statement showing the various elements of cost and also the profit earned.

(*CA Inter*)

Solution

(i) Computation of Value of Materials Purchased

		Rs
	Cost of goods sold	56,000
Add:	Closing stock of finished goods	19,000
		75,000
Less:	Opening stock of finished goods	17,600
	Cost of goods manufactured	57,400
Add:	Closing stock of work-in-progress	14,500
		71,900
Less:	Opening stock of work-in-progress	10,500
	Works cost	61,400
Less:	Factory overheads (100/175 of direct labour cost)	10,000
	Prime cost	51,400
Less:	Direct labour	17,500
	Raw materials consumed	33,900
Add:	Closing stock of raw materials	10,600
	Raw materials available	44,500
Less:	Opening stock of raw materials	8,000
	Value of materials purchased	36,500

(ii) Cost Statement

	Rs
Raw materials consumed (as calculated above)	33,900

Add:	Direct labour cost	17,500
	Prime cost	51,400
Add:	Factory overheads	10,000
	Works cost	61,400
Add:	Opening work-in-progress	10,500
		71,900
Less:	Closing work-in-progress	14,500
	Cost of goods manufactured	57,400
Add:	Opening stock of finished goods	17,600
		75,000
Less:	Closing stock of finished goods	19,000
	Cost of production of goods sold	56,000
Add:	General and administrative expenses	2,500
Add:	Selling expenses	3,500
	Cost of sales	62,000
	Profit (balancing figure Rs 75,000 – Rs 62,000)	13,000
	Sales	75,000

Example 2.6

The following particulars relating to the year 2001 have been taken from the books of a chemical works manufacturing and selling a chemical mixture:

	kg	*Rs*
Stock on January 1, 2001		
Raw materials	2000	2,000
Finished mixture	500	1,750
Factory stores		7,250
Purchases:		
Raw materials	1,60,000	1,80,000
Factory stores		24,250
Sales:		
Finished mixture	1,53,050	9,18,000
Factory scrap		8,170
Factory wages		1,78,650
Power		30,400
Depreciation of machinery		18,000
Salaries:		
Factory		72,220
Office		37,220
Selling		41,500
Expenses:		
Direct		18,500
Office		18,200
Selling		18,000

Stock on December 31, 2001		
Raw materials	1200	
Finished mixture	450	
Factory stores		5,550

The stock of finished mixture at the end of 2001 is to be valued at the factory cost of the mixture for that year. The purchase of raw materials remained unchanged throughout 2001.

Prepare a statement giving the maximum possible information about cost and its break-up for the year 2001.

Solution:

Statement of Cost for the Year 2001

			Quantity (kg)	*Amount (Rs)*
Raw materials consumed:				
	Opening stock		2,000	2,000
Add:	Purchases		1,60,000	1,80,000
			1,62,000	1,82,000
Less:	Closing stock of raw materials at current prices		1,200	1,350
	Cost of raw materials consumed		1,60,800	1,80,650
	Factory wages			1,78,650
	Direct expenses			18,500
	Prime Cost		1,60,800	3,77,800
Add:	Factory overheads (Factory stores)			
	Opening stock	7,250		
Add:	Purchases	24,250		
		31,500		
Less:	Closing stock	5,550		
Factory stores consumed		25,950		
	Power	30,400		
	Depreciation	18,000		
	Salaries	72,220		1,46,570
				5,24,370
Less:	Sale of scrap		7,800	8,170
	Factory Cost		1,53,000	5,16,200
Add:	Opening stock of finished mixture		500	1,750
			1,53,500	5,17,950
Less:	Closing stock of finished mixute (valued at		450	1,518
	factory cost of current year production)		1,53,050	5,16,432
Add:	Office overheads:			
	Salaries	37,220		
	Expenses	18,200		55,420
Cost of production of finished mixture sold				5,71,852

		Quantity (kg)	Amount (Rs)
Add:	Selling and distribution overhead:		
	Salaries	41,500	
	Expenses	18,000	59,500
			6,31,352
	Cost of goods sold or cost of sales:		2,86,648
	Profit		
	Sales	1,53,050 kg	9,18,000

Working Notes:

1. Value of closing stock of raw materials $\left(\frac{\text{Rs } 1,80,000}{\text{Rs } 1,60,000} \times 1,200\text{kg}\right) = \text{Rs } 1,350$

2. Value of factory scrap given in the question is Rs 8170. Hence quantity of factory scrap will be:

		(kg)
	Sales	1,53,050
Add:	Closing stock	450
		1,53,500
Less:	Opening stock	500
	Produced during the year	1,53,000
	Inputs introduced	1,60,800
	Scrap	7,800

Example 2.7

The following figures are extracted from the trial balance of Gogetter Co. on 30th September, 2002:

	Rs	*Rs*
Inventories:		
Finished Stock	80,000	
Raw Materials	1,40,000	
Work-in-Process	2,00,000	
Office appliances	17,400	
Plant and machinery	4,60,500	
Buildings	2,00,000	
Sales		7,68,000
Sales return and rebates	14,000	
Materials purchases	3,20,000	
Freight incurred on materials	16,000	
Purchases returns		4,800
Direct labour	1,60,000	
Indirect labour	18,000	
Factory supervision	10,000	
Repairs and upkeep factory	14,000	
Heat, light and power	65,000	
Rates and taxes	6,300	

Miscellaneous factory expenses	18,700
Sales commission	33,600
Sales travelling	11,000
Sales promotion	22,500
Distribution deptt. sales and expenses	18,000
Office salaries and expenses	8,600
Interest on borrowed funds	2,000

Further details are abailable as follows:

(i)	Closing Inventories:	
	Finished goods	1,15,000
	Raw materials	1,80,000
	Work-in-process	1,92,000
(ii)	Accrued Expenses on:	
	Direct labour	8,000
	Indirect labour	1,200
	Interest on borrowed funds	2,000
(iii)	Depreciation to be provided on:	
	Office appliance	5%
	Plant and machinery	10%
	Buildings	4%

(iv) Distribution of the Following Costs:

Heat, light and power to factory, office and selling in the ratio 8:1:1.

Rates and taxes two-thirds to factory and one-third to office. Depreciation on buildings to factory, office and selling in the ratio 8:1:1.

With the help of the above information, you are required to prepare a condensed profit and loss statement of Gogetter Co. for the year ended 30th September, 2002 along with supporting schedules:

(a) Cost of sales.
(b) Selling and distribution expenses.
(c) Administration expense. *(C A Inter)*

Solution

Gogetter Company
Profit and Loss Statement
For the Year Ended 30th September, 2002

	Rs	Rs
Gross Sales	Rs 7,68,000	
Less: Returns	14,000	7,54,000
Less: Cost of sales (Schedule 1)		7,14,020
Net Operating Profit		39,980
Less: Interest on borrowed funds		4,000
Net Profit		35,980

(i) Schedule 1: Cost of Sales

	Rs	Rs
Raw Material:		
Opening Balance		1,40,000
Add: Material purchased	3,20,000	
Add: Freight on material	16,000	
Less: Purchased returns	(4,800)	3,31,200
Cost of materials available		4,71,200
Less: Closing stock		1,80,000
Raw materials consumed		2,91,200
Direct labour		1,68,000
Prime Cost		4,59,200
Factory Overheads:		
Indirect labour	19,200	
Factory supervision	10,000	
Repairs and factory upkeep	14,000	
Heat, light and power	52,000	
Rates and taxes	4,200	
Miscellaneous factory expenses	18,700	
Depreciation of plant	46,050	
Depreciation of buildings	6,400	1,70,550
Gross Works Cost		6,29,750
Add: Opening work-in-process		2,00,000
		8,29,750
Less: Closing work-in-process		1,92,000
Works Cost		6,37,750
Add: Administration expenses (Schedule 3)		18,870
Cost of Production		6,56,620
Add: Opening stock of finished goods		80,000
		7,36,620
Less: Closing stock of finished goods		1,15,000
Cost of Production of Goods Sold		6,21,620
Add: Selling and distribution overheads (Schedule 2)		92,400
Cost of sales		7,14,020

(ii) Schedule 2: Selling and Distribution Overheads (Expenses)

Sales commission	33,600
Sales travelling	11,000
Sales promotion	22,500
Distribution deptt: Salaries and expenses	18,000
Heat, light and power	6,500
Depreciation of buildings	800
	92,400

(iii) Schedule 3: Administrative Overheads (Expenses)	
Office salaries and expenses	8,600
Depreciation of office appliances	870
Depreciation of buildings	800
Heat, light and power	6,500
Rates and taxes	2,100
	18,870

Example 2.8

The following inventory data relates to XYZ Ltd:

	Inventories	
	Beginning	*Ending*
Finished goods	Rs 1,10,000	95,000
Work-in-progress	Rs 70,000	80,000
Raw materials	Rs 90,000	95,000
Additional information:		
Cost of goods available for sale		Rs 6,84,000
Total goods processed during the period		Rs 6,54,000
Factory overheads		Rs 1,67,000
Direct materials used		Rs 1,93,000

Requirements:

(i) Determine raw materials purchases.
(ii) Determine the direct labour cost incurred.
(iii) Determine the cost of goods sold *(B. Com. Hons. Delhi 1999)*

Solution:

		Rs
(i)	*Raw Materials purchases*	
	Direct Materials used	1,93,000
Add:	Closing Stock	95,000
		2,88,000
Less:	Opening Stock	90,000
		1,98,000
(ii)	*Direct Labour cost incurred*	
	Goods processed during the period	6,54,000
Add:	Closing Work-in-process	80,000
		7,34,000
Less:	Opening Work-in-process	70,000
	Cost of goods introduced during the period for processing	6,64,000
Less:	Factory overheads	1,67,000
	Prime Cost	4,97,000
Less:	Direct Materials used	1,93,000
	Direct Labour cost incurred	3,04,000

(iii) *Cost of goods sold*

		Rs.
	Cost of goods available for sale	6,84,000
Add:	Opening Stock of Finished Goods	1,10,000
		7,94,000
Less:	Closing Stock of Finished Goods	95,000
	Cost of goods sold	6,99,000

Example 2.9

The following particulars relate to a company for a period of three months:

Raw materials 1.1. 2002	55,000
Raw materials 31.3.2002	35,000
Factory wages	80,000
Materials purchased	60,000
Sales	1,54,000
Indirect expenses	10,000
Stock of finished goods (1.1.2002)	Nil
Stock of finished goods (31.3.2002)	30,000
No. of units produced during the period was	2,000

Prepare a statement of cost for the period and compute the price to be quoted for 500 units in order to realise the same % of profit as for the period under review, assuming no alteration in wages and cost of materials.

Solution:

Statement of Cost for the Period Ending 31.3.2002

Output 2,000 Units

Particulars		*Rs*	*Amount Rs*
	Opening stock of raw materials	55,000	
Add:	Purchases	60,000	
		1,15,000	
Less:	Closing stock of raw material	35,000	
	Raw material consumed		80,000
	Factory wages		80,000
	Prime cost		1,60,000
	Indirect expenses		10,000
	Cost of production		1,70,000
Less:	Closing stock of finished goods		30,000
	Cost of goods sold		1,40,000
	Profit $\left(\frac{14,000 \times 100}{1,40,000}\right) = 10\,\%$ of cost		14,000
	Sales		1,54,000

Tender Statement Showing Quotation for 500 Units

	Details	Amount
	Materials consumed $\left(\frac{80{,}000 \times 500}{2{,}000}\right)$	20,000
	Wages $\left(\frac{80{,}000 \times 500}{2{,}000}\right)$	20,000
	Prime cost	40,000
Add:	Indirect expenses $\left(\frac{10{,}000 \times 500}{2{,}000}\right)$	2,500
	Cost of production	42,500
Add:	Profit (10% of cost of production)	4,250
	Price to be quoted	46,750

Example 2.10

X Ltd. manufactures four brands of toys —A, B, C and D. If the company limits the manufacture to just one brand, the monthly production will be—

A – 50000 units
B – 100000 units
C – 150000 units
D – 300000 units

You are given the following set of information from which you are requested to find out the profit or loss made on each brand showing clearly the following elements—

(a) Direct Cost
(b) Works Cost
(c) Total Cost

	A	*B*	*C*	*D*
Actual production (units)	6750	18000	40500	94500
Direct wages (Rs)	15000	27500	37500	105000
Direct materials cost (Rs)	50000	92500	127500	380000
Selling perice per unit (Rs)	20	15	10	8

Factory overhead expenditure for the month was Rs 162000. Selling and distribution cost should be assumed @20% of works cost. Factory overhead expenses should be allocated to each brand on the basis of units which could have been produced in a month when single brand production was in operation.

(ICWA Inter.)

Solution:

The relative ratios of each brand of products are as follows:

1 Unit of A = 2 units of B = 3 units of C = 6 units of D. Therefore, the overhead ratio in the inverse order should be 1 : 2: 3:6. In case of D, the overhead expense rate will be

$$\frac{\text{Rs } 1{,}62{,}000}{6750 \times 6 + 18000 \times 3 + 40500 \times 2 + 94500}$$

$$= \text{Rs } \frac{162000}{270000}$$

$$= \text{Re } 0.60$$

The overhead expense rate for the various brands are :

A – Rs 6×0.60 = Rs 3.60

B – Rs 3×0.60 = Rs 1.80

C – Rs 2×0.60 = Rs 1.20

D – Re 1×0.60 = Re 0.60

This follows the logic that the rate should be highest in case of brand which will be produced in least number when single brand production is in operation.

Statement of Profitability
Brands

	A Rs	*B* Rs	*C* Rs	*D* Rs	*Total* Rs
Direct materials	50000	92500	127500	380000	650000
Direct wages	15000	27500	37500	105000	185000
Prime cost	65000	120000	165000	485000	835000
Factory overhead	24300	32400	48600	56700	162000
Works cost	89300	152400	213600	541700	997000
Selling and distribution cost (20% of works cost)	17860	30480	42720	108340	199400
Total Cost	107160	182880	256320	650040	1196400
Sales	135000	270000	405000	756000	1566000
Profit	27840	87120	148680	105960	369600

Example 2.11

On June 30, 1996, a flash flood damaged the warehouse and factory of ABC Corporation completely destroying the work-in-progress inventory. There was no damage to either the raw materials or finished goods inventories. A physical verification taken after the flood revealed the following valuations:

Raw Materials	Rs.	62,000
Work-in-progress		0
Finished Goods	Rs.	1,19,000

The inventory on Jan. 1, 1996, consisted of the following:

Raw Materials	Rs.	30,000
Work-in-progress	Rs.	1,00,000
Finished Goods	Rs.	1,40,000
		2,70,000

A review of the books and records disclosed that the gross profit margin historically approximated 25% of sales. The sales for the first six months of 1996 were Rs. 3,40,000. Raw Material purchases were Rs. 1,15,000, Direct Labour costs for this period were Rs. 80,000 and manufacturing overhead has historically been 50% of direct labour. Compute the cost of work-in-progress inventory lost at June 30, 1996 by preparing a statement of cost and profit. *(B. Com. Hons. Delhi 1998)*

Solution

Computation of Work-in-Progress Inventory Lost on June 30, 1996

		Rs.
Sales		3,40,000
Less: Gross Profit @ 25%		85,000
Cost of Goods sold		2,55,000
Add: Closing Stock of Finished Goods		1,19,000
		3,74,000
Less: Opening Stock of Finished Goods		1,40.000
Cost of Finished Goods Produced (1)		2,34,000
Less: Raw Materials Consumed:		
Purchases	1,15,000	
Add: Opening Stock	30,000	
	1,45,000	
Less: Closing Stock	62,000	
	83,000	
Add: Wages	80,000	
Manufacturing Overhead	40,000	
Opening Stock of Work-in-progress	1,00,000	
		3,03,000
Closing stock of work-in-progress		69,000

This can be verified as follows:	Rs.
Raw Materials Consumed	83,000
Direct Wages	80,000
Manufacturing Overhead	40,000
Work-in-progress	1,00,000
	3,03,000
Less: Closing stock of work-in-progress	69,000
Work Costs	2,34,000
Add: Opening stock of Finished Goods	1,40,000
	3,74,000
Less: Closing Stock of Finished goods	1,19,000
Cost of Goods sold	2,55,000
Add: Gross profit @ 25%	85,000
Sales	3,40,000

THEORY QUESTIONS

1. Define the term 'cost'. How is it different from expense?
2. What is meant by 'differential cost'?
3. What is the meaning of the term incremental cost? Does incremental cost mean the same thing as variable cost?
4. Explain the nature of product and period cost. How do they affect net income of a business enterprise? *(B. Com. (Hons), Delhi 1997)*
5. "Product cost is a general term that denotes different costs allocated to products for different purposes." Describe three purposes. Explain the composition of 'product cost' for the purpose of external financial reporting along with its rationale. *(B.Com.(Hons), Delhi 1998)*
6. Distinguish between
   (a) Expired cost and unexpired cost
   (b) Direct and indirect costs. *(B.Com. (Hons), Delhi, 1998, 2000)*
7. (a) Distinguish between fixed cost and variable costs.
   (b) Explain the significance of 'dicision-making cost.'
   (c) Elucidate the meaning and formulation of 'Product cost' for the purpose of income measurement and determination of financial position.
   (B.Com. (Hons) Delhi 1999, 2001)
8. Distinguish between
   (a) Prime cost and conversion cost.
   (b) Controllable and uncontrollable cost. *(B. Com. (Hons) Delhi 1999)*
9. Bring out clearly the significance of the following costs for management:
   (a) Opportunity cost
   (b) Sunk cost
   (c) Imputed costs
   (d) Out-of-pocket costs
10. Discuss the various costs used in decision-making and explain their characteristics. *(B. Com. (Hons), Delhi)*
11. Distinguish between period costs and product costs. Why is this distinction considered important? *(B. Com. (Hons), Delhi)*
12. Distinguish between the following:
    (i) Controllable cost and Non-controllable cost, and
    (ii) Direct material and indirect material.
    (B. Com. (Hons), Delhi)
13. (a) Distinguish between out-of-pocket cost and opportunity cost.
    (b) Explain and illustrate the distinction between 'direct cost' and 'indirect cost' specially from the point of view of decision making.
    (B. Com. (Hons), Delhi, 1990)
14. Explain whether you agree with each of the following statements:
    (a) "All direct costs are variable."
    (b) "Variable costs are controllable and fixed costs are not."
    (c) "Sunk costs are irrelevant when providing decision-making information."
15. Lists two costs which are used in decision making but not entered in the accounting system under that designation.
16. Name a cost which is reflected in the accounting system but not used in decision making?

17. Distinguish between
    (i) Cost control and Cost Reduction
    (ii) Cost alloction and cost absosption
    (iii) Controllable cost and uncontrollable cost
    (iv) Direct and indirect labour cost *(C.A. Inter Nov. 2001)*

SELF-EVALUATION QUESTIONS

1. Match the items in Column 1 with the best choice in Column 2

Column 1	*Column 2*
1. Total fixed costs	A Costs incurred during a period
2. Incurred costs	B Total amount remains constant
3. Cost of goods manufactured	C Expired costs
4. Total manufacturing costs	D Direct materials and direct labour
5. Unit variable cost	E Costs of completed production after adjustment for work in progress inventory
6. Prime costs	F Direct labour and factory overhead
7. Expenses that are matched against revenue	G Added cost of a new product
8. Materials, labour and factory overhead	H Remains constant per unit
9. Conversion costs	I Direct materials, direct labour and factory overhead.
10. Cost of goods sold	J Cost of goods manufactured, adjusted for changes in finished goods stock

2. Classify each of the following costs using the following classifications:
    (a) Direct materials
    (b) Direct labour
    (c) Manufacturing overhead
    (d) Non-manufacturing expense
        (i) Managing Director's salary
        (ii) Oil for a milling machine
        (iii) Salary of the milling machine operator
        (iv) Salary of the supervisor of assembly department for products A, B and C
        (v) Depreciation on the factory building
        (vi) Income tax expense
        (vii) Depreciation on direct materials warehouse
        (viii) Depreciation on the administrative office building
        (ix) Rent on the finished goods warehouse
        (x) Rent on the sales office
        (xi) Insurance on the truck used for delivery of finished goods sold
        (xii) Gasoline for the truck used for transfer of work in process from one department to another
        (xiii) Contribution to Earthquake Relief Fund paid
        (xiv) Interest on borrowed money
3. Classify each of the following manufacturing costs using the following classifications:
    (a) Fixed
    (b) Variable
    (c) Mixed

(i) Rent on the factory building
(ii) Salary of the supervisor of the casting department
(iii) Wages of machine operators
(iv) Overtime premium for machine operators
(v) Fire insurance on the factory equipment
(vi) Cost of water used to cool production machinery
(vii) Depreciation on production machinery
(viii) Cost of paint used on products
(ix) Cost of electricity used to operate production machinery
(x) Lubricants used for production machinery.

4. Classify each of the following costs of a manufacturing company using the following classifications:

A – Production overhead
B – Selling and distribution overhead
C – Administration overhead
D – Research and development overhead

(i) Depreciation of factory plant and equipment
(ii) Trade discount given to customers
(iii) Cost of oils used to lubricate production machinery
(iv) Motor vehicles licenses for lorries
(v) Cost of chemicals used in laboratory
(vi) Commission paid to sales representative
(vii) Salary of the secretary to the Finance Director
(viii) Holiday pay of machine operators
(ix) Salary of the security guard in raw materials warehouse
(x) Fees to advertising agency
(xi) Rent of finished goods warehouse
(xii) Insurance of the company's premises
(xiii) Salary of scientist in laboratory
(xiv) Salary of supervisor working in the factory
(xv) Cost of typewriter ribbons in the general office
(xvi) Protective clothing for machine operatives.

5. Choose the correct answer for the following multiple-choice questions:

(i) For a manufacturing company, which of the following is an example of a period rather than a product cost?
  (a) depreciation on factory equipment
  (b) wages of sales people
  (c) wages of machine operators
  (d) insurance on factory equipment

(ii) Prime costs and conversion costs share which common element of total cost?
  (a) variable overhead
  (b) fixed overhead
  (c) direct materials
  (d) direct labour

(iii) Indirect materials are
  (a) a prime cost
  (b) a fixed cost

(c) an irrelevant cost
(d) a factory overhead cost

(iv) Factory overhead
(a) is a prime cost
(b) can be a variable cost or a fixed cost
(c) can only be a fixed cost
(d) includes all factory labour

(v) Fixed cost per unit increases when
(a) Production increases
(b) Production decreases
(c) Variable cost per unit decreases
(d) Prime cost per unit decreases

(vi) Factory supplies for a manufacturing plant are generally
(a) Prime cost
(b) Period costs
(c) Variable costs
(d) Excluded from product costs

(vii) Costs that increase as the volume of activity decreases within the relevant range are:
(a) Average cost per unit
(b) Average variable cost per unit
(c) Total fixed costs
(d) Total variable costs

PROBLEMS

1. Calculate prime cost, factory cost, cost of production and cost of sales from the following particulars:

		(Rs '000)
Direct materials		40,000
Direct wages		10,000
Direct expenses		2,000
Oil and waste		100
Wages of foreman		1,000
Storekeeper's wages		500
Electric power		200
Lighting—Factory	500	
Office	200	700
Rent—Factory	2000	
Office	1000	3,000
Repairs and Renewals:		
Factory plant	500	
Machinery	1000	
Office premises	200	1,700
Depreciation—Office premises	500	
Plant and machinery	200	700
Consumable stores		1,000
Manager's salary		2,000

Director's fees	500
Office printing and stationery	200
Telephone charges	50
Postage and telegrams	100
Salesmen's commission and salary	500
Travelling expenses	200
Advertising	500
Warehousing charges	200
Carriage outward	150

Ans: Prime cost Rs 5,20,00,000; Factory cost Rs 5,90,00,000; Cost of production Rs 6,37,50,000; Cost of sales Rs 6,53,00,000.

2. The following data are related to the manufacture of a standard product during the month of December 2001.

	Rs
Raw materials consumed	15,000
Direct wages	9,000
Machine hours worked	900
Machine hours rate	5
Administrative overheads	20% on works cost
Selling overheads	Re 0.50 per unit
Units produced	17,100
Units sold	16,000 (at Rs 4 per unit)

You are required to prepare a cost sheet from the above showing:
(a) The cost per unit.
(b) The profit per unit sold and profit for the period.

(CA. Inter)

Ans: Cost per unit Rs 2; Profit per unit sold Rs 1.50; and Profit Rs 24,000.

3. A factory produces a standard product. The following information is given to you from which you are required to prepare a cost sheet for January 2000.

	Rs
Raw materials consumed	91,000
Direct wages	29,000
Other direct expenses	11,000
Factory overheads 80% of direct wages	
Office overheads 10% of works cost	
Selling and distribution expenses Rs 2 per unit sold.	

Units produced and sold during the month 10,000.
Also find 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 stock or work-in-progress either at the beginning or at the end of the period.
Ans: Cost of sales Rs 1.89,620; profit Rs 47,405.

4. From the following particulars of a manufacturing firm, prepare a statement showing:
   (a) Cost of materials consumed
   (b) Works cost
   (c) Cost of production
   (d) Percentage of works overhead to productive wages
   (e) Percentage of general overhead to works cost

	Rs
Stock of materials on January 1, 2002	40,000
Purchase of raw materials in January 2002	11,00,000
Stock of finished goods on 1.1. 2002	50,000
Productive wages	5,00,000
Finished goods sold	24,00,000
Works overhead charges	1,50,000
Office and general expenses	1,00,000
Stock of materials on 31.1.2002	1,40,000
Stock of finished goods on 31.1.2002	60,000

Ans. (a) Rs 10,00,000;
(b) 16,50,000;
(c) Rs 17,50,000;
(d) 30%; and
(e) 6.6%.

5. The following data have been extracted from the books of M/s Moonshine Industries for the calendar year 2002.

	(Rs 000)
Opening stock of raw materials	25,000
Purchase of raw materials	85,000
Closing stock of raw materials	40,000
Carriage inward	5,000
Wages—Direct	75,000
Indirect	10,000
Other direct charges	15,000
Rent and rates—Factory	5,000
Office	500
Indirect consumption material	500
Depreciation—Plant etc.	1,500
Office furniture	100
Salary—Office	2,500
Salesman	2,000
Other factory expenses	5,700
Other office expenses	900
Managing Director's remuneration	12,000
Other selling expenses	1,000
Travelling expenses of salesmen	1,100
Carriage and freight outward	1,000
Sales	2,50,000
Advance income tax paid	15,000
Advertisement	2,000

The Managing Director's remuneration is to be allocated as Rs 40,00,000 to the factory, Rs 20,00,000 to the office and Rs 60,00,000 to the selling departments. From the above information prepare (a) Prime cost (b) Works cost (c) Cost of production (d) Cost of sales and (e) Net profit.

Ans: Prime cost Rs 16,50,00,000, Factory cost Rs 19,17,00,000, Cost of production Rs 19,77,00,000, Cost of sales Rs 21,08,00,000 Profit Rs 3,92,00,000. Income tax is not included in costs.

Elements of Cost

- Materials Control
- Materials Costing
- Labour Costs: Accounting and Control
- Factory Overheads : Distribution
- Administrative and Selling and Distribution Overheads

3

Materials Control

MATERIALS

The term "materials", generally used in manufacturing concerns, refers to raw materials used for production, sub-assemblies and fabricated parts. The terms "materials" and "stores" are sometimes used interchangeably. However, both the terms differ. "Stores" is wider in meaning and comprises many other items besides raw materials, such as tools, equipments, maintenance and repair items, factory supplies, components, jigs, fixtures. Sometimes, finished goods and partly finished goods are also included within the scope of this term.

CONCEPT AND OBJECTIVES OF MATERIALS CONTROL

Materials cost constitutes a prime part of the total cost of production of manufacturing firms. Proper accounting, therefore, for and control over materials purchase, consumptions, and inventories are important for effective management of a business firm. Materials control basically aims at efficient purchasing of materials, their efficient storing and efficient use or consumption.

Materials control consists of controls at two levels: (i) quantity controls, and (ii) financial controls. For instance, the production department in a manufacturing company aims at quantity controls, i.e., lesser and lesser units should be used in the production department. Although lesser units would result in lower investments on purchase of materials, yet the user (production) department normally does not think in terms of expenditure. In contrast, the finance manager is interested in keeping the investments on materials at the lowest point. In materials control, balance has to be maintained between two opposing needs, i.e., (i) maintenance of sufficient inventory for efficient production and (ii) maintenance of investment in inventory at the lowest level. In detail, the following are the objectives in a good system of materials control:

1. Materials of the desired quality will be available when needed for efficient and uninterrupted production.
2. Material will be purchased only when need exists and in economic quantities.
3. The investment in materials will be maintained at the lowest level consistent with operating requirements.

4. Purchase of materials will be made at the most favourable prices under the best possible terms.
5. Materials are protected against loss by fire, theft, handling with the help of proper physical controls.
6. Materials should be stored in such a way that they can provide minimum of handling time and cost.
7. Vouchers will be approved for payment only if the material has been received and is available for issue.
8. Issues of material are properly authorised and properly accounted for.
9. Materials are, at all times, charged as the responsibility of some individual.

PURCHASING AND RECEIVING PROCEDURE

Purchasing procedures vary with different business firms, but all of them follow a general pattern in the purchases and receipt of materials and payment of obligations. The important steps may be listed as follows:

1. Purchase requisition A form known as a purchase requisition is commonly used as a formal request to the purchasing department to order goods or services. The purchase requisition serves three general purposes:

(i) It automatically starts the purchasing process and informs the purchasing department of the need for the purchase of materials.
(ii) It fixes the responsibility of the department/personnel making the purchase requisition.
(iii) It can be used for future reference.

Usually, purchase requisitions are prepared by the storekeepers for regular store items which are below or approaching the minimum level of stock or to replace stock of materials and parts in stores. The production control department can also give requisitions for the purchase of specialised materials. A typical purchase requisition contains details, such as number, date, department, quantity, description, specification, signature of the person initiating the requisition, and signature of one or more officers approving the purchase (see Fig. 3.1). Copies of the purchase requisition are sent to the purchasing department and accounting department.

2. Purchase order After the requisition is received duly approved, the purchasing department places an order with a supplier, offering to buy certain materials at stated prices and terms. The purchase order is a formal contract for the supply of materials. The order should clearly state the materials required and the price; and provide information, such as delivery period and the department for whom the materials are purchased (Fig. 3.2). Copies of the purchase order are sent to the department concerned, the sender of the purchase requisition, and the stores department advising them to expect the materials as specified and where to send them upon receipt. Copies of the purchase requisition and the purchase order are sent to accounting department, to be used in checking the supplier's invoice when a voucher is being prepared for payment.

3. Receiving materials The receiving department performs the function of unloading and unpacking materials which are received by an organisation. This will need an inspection report which is sometimes incorporated in the receiving report, indicating the items accepted and rejected, with reason.

ABC Company Limited
Purchase Requisition

Purchase Requisition No. _____
Purchase Order No. _____
Date _____

Department _____
Delivery Required _____

Item No.	Quantity	Particulars of articles	Grade or quality	Remarks

Requested by _____ Checked by _____ Approved by

Fig. 3.1 Purchase Requisition

ABC Company Limited
Purchase Order

Date _____
Supplier _____
_____
_____

Purchase Order No. _____
Requisition No. _____
Department No. _____
Date Required _____

Please supply the following items on the terms and conditions mentioned herewith:

Item no.	Quantity	Particulars about items	Rate per unit	Total cost	Remarks

Purchase Manager

Terms and Conditions:

_____
_____
_____
_____
_____

Fig. 3.2 Purchase Order

Several copies of the receiving report or goods received note (Fig. 3.3) are prepared, one going to each department interested in the arrival of materials, including stores, buying and accounts departments.

ABC Company Limited
Materials Receiving Report

Purchase Order No. _____
Date _____

Received from _____
(Vendor's Name and Address)
_____
_____
_____
_____

Items no.	Quantity received	Particulars	Weight, if any	Remarks

Counted by _____ Approved by _____

Inspected by _____

Fig. 3.3 Materials Receiving Report

4. Approval of invoices Invoice approval indicates that goods according to the purchase order have been received and payment can now be made. However, if the goods or equipment received are not of the type ordered, or are not in accordance with specifications, or are damaged, the purchasing department issues a return order indicating that the goods are to be returned to the supplier.

5. Marking payment After the purchase invoice total is approved, the process of making payment begins. Payment depends on the terms agreed upon on any particular order, and any terms which differ from normal practice should be considered individually. When it is found that items written on the invoice qualify for payment, a remittance advice is prepared after providing for deduction on discounts, if any.

Creating a Purchase Department

It is useful to set up a separate purchase department to perform purchasing activities relating to purchase of materials and other stores. The organisation of the purchase department depends on the size of the organisation and the quantum of purchases it is likely to make. A purchase department generally performs the following functions:

(i) Purchasing materials and stores after receiving requisitions from the stores department for regular or routine items or from the departmental head, works manager or planning department for the purchase of special items, if any.
(ii) Purchasing materials of right quality.
(iii) Determining the quantity, quality, items, price, time to buy and the supplier from whom purchases are to be made.

(iv) Possessing knowledge about possible sources of supply, prices of materials and supplies prevailing in the market, terms and conditions relating to purchases, market trends, usual lead time taken by the suppliers.
(v) Having expertise in drafting of purchase agreements and contracts.
(vi) Avoiding the purchase of obsolete, deteriorated and surplus materials.
(vii) Purchasing at the most favourable terms and conditions, at the lowest rates and from the best market and the most reliable suppliers.
(viii) Ensuring timely delivery of purchased items.
(ix) Comparing the invoice received from the suppliers with the purchase order to ensure that materials received are of right quality, in right quantity and at right prices.
(x) Knowing the defaulters suppliers.
(xi) Having information about consumption and usage pattern of materials of production and other departments and stock levels maintained by them and the stores department.
(xii) Preparing a latest list of approved suppliers along with brief particulars about their dealing terms.
(xiii) Possessing details about materials and stores received, on order, and outstanding.

Qualities of Purchase Manager

A purchase manager or a purchaser should possess the following qualities:
(i) Having information and knowledge about all aspects of materials to be purchased such as quantity, specifications, quality, price, purchasing procedures, etc.
(ii) Having knowledge about the sources of supply, market conditions, terms of delivery, qualities and dealings of different suppliers.
(iii) Knowing the policy of management, funds position, requirements of manufacturing units and stores departments.
(iv) Having good information base such as price lists, business journals and periodicals, catalogues, industrial directories to enable him to find the best market for the purchase of materials.
(v) Having knowledge about government policies, taxes on purchase of such materials, import and export restrictions thereon.
(vi) Having fair knowledge about the legal provisions and rules relating to making of agreement and contract.
(vii) Having expertise and skill to organise and manage his department efficiently and in coordination and cooperation with other departments of the organisation.

SOME ISSUES IN MATERIALS PROCUREMENT

It is generally accepted that quantities be bought in economic size so that there may not be over-stocking. If a company purchases in large quantities, the cost of carrying the inventory would be high because of the high investment involved. Working capital which could have been used for other productive purposes has to be diverted. Over-stocking requires more storage space which, in turn, means increase in insurance expenses, storage costs and deterioration in quality and depreciation in quantity. In contrast, if purchases are made in small quantities (under-stocking), frequent orders would have to be placed for the purchase of materials. There will be danger of "stock outs" also. Because of under-stocking, production is likely to suffer; materials have to be purchased immediately at high prices; low output would increase cost and decrease profit; the other department's work may be adversely affected.

Economic Order Quantity (*EOQ*) (Reorder Quantity)

The *EOQ* is the optimum or the most favourable quantity which should be purchased each time the purchases are to be made. The *EOQ* is one where the costs of carrying inventory is equal or almost equal to the cost of not carrying inventory (cost of placing orders). Also at *EOQ* level, the total of these two costs is minimum.

The cost of carrying the inventory is the real out-of-pocket cost associated with having inventory on hand, such as warehouse charges, insurance, heat, light, and losses due to spoilage, breakage, pilferage. Another opportunity cost, which is not the out-of-pocket cost, is important and should be considered, i.e., cost incurred (capital used) in purchasing the inventory. If funds have been borrowed to finance the inventory purchase, interest payments on borrowed funds will be the direct cost. Carrying or holding costs of inventory are explicit as well as implicit. That is, some costs are readily ascertained from accounting records while others require extensive study to estimate them because they are not expressly stated. Insurance on inventory is an explicit cost while the cost of funds invested in inventory are implicit costs. Generally, inventory carrying costs are considered to be proportional to the value of inventory carried.

The costs of not carrying adequate inventory arise because of frequent placing of order at short intervals. This includes costs, such as extra purchasing, handling and transportation costs, higher price due to small order quantities, frequent stock-outs resulting in disruption of production schedules, overtime and extra set up time, loss of sales and customer goodwill, etc.

The costs of carrying the inventory, and ordering costs change in the reverse order. The costs of placing the order decrease as the size of the order increase since with a bigger size of order, the number of the order will be lower. However, simultaneously the costs of carrying the inventory will go up because purchases have been made in large quantities. It may be possible to have a point which provides the lowest total cost and this point (ideal size) is known as the *EOQ*. This equilibrium can be determined mathematically as follows:

$$EOQ = \sqrt{\frac{2 \times U \times O}{IC}}$$

where U = Annual usage in units
O = Cost of placing an order
I = Per cent cost of carrying inventory
C = Cost per unit of material

Assume

Annual usage units = 6,000
Cost of placing an order = Rs 30
Carrying cost as a per cent of inventory = 20%
Cost per unit of material = Rs 5

Then,

$$EOQ = \sqrt{\frac{2 \times 6{,}000 \times 30}{5 \times 20\%}}$$

$$= \sqrt{3{,}60{,}000}$$

$$= 600 \text{ units}$$

In the above example, the *EOQ* is 600 units. That is, ten orders per year are needed. At the level of 600 units, the ordering costs and the carrying costs are equal and also the total cost is at minimum as it is clear from Table 3.1.

Table 3.1 Table Showing Economic Order Quantity

Annual usage	*Orders per year*	*Units per order*	*Average inventory (units)*	*Value per order (Rs)*	*Average inventory amount (Rs)*	*Order cost*	*Carrying cost (20%)*	*Total cost (Rs)*
6,000 units	1	6,000	3,000	30,000	15,000	30	3,000	3030
	2	3,000	1,500	15,000	7,500	60	1,500	1560
	3	2,000	1,000	10,000	5,000	90	1,000	1090
	4	1,500	750	7,500	3,750	120	750	870
	5	1,200	600	6,000	3,000	150	600	750
	6	1,000	500	5,000	2,500	180	500	680
	7	857	429	4,285	2,142	210	428	638
	8	750	375	3,750	1,875	240	376	616
	9	667	334	3,335	1,668	270	334	604
	10	600	300	3,000	1,500	300	300	600
	11	545	273	2,725	1,363	330	272	602
	12	500	250	2,500	1,250	360	250	610

Table 3.1 shows that quantities of other orders resulting in more or less than ten orders per year are not so economical as they involve higher total costs.

The *EOQ* formula is sometimes expressed in the following manner which is not in any way different from the formula explained earlier.

$$EOQ = \sqrt{\frac{2U \times P}{S}}$$

where U = Annual demand or consumption or purchased quantity (in units)

P = Cost of placing an order

S = Annual cost of carrying inventory per unit (Storage and interest)

The ordering costs, holding costs, total costs and *EOQ* can be shown graphically also as displayed in Fig. 3.4.

When to Order (Reorder Level)

The *EOQ* determines how much to buy at a particular time. But the question "when to buy" is equally important for business firms. This question is easy to answer only if we know the lead time—the time interval between placing an order and receiving delivery—and know the *EOQ*, and are certain of the consumption pattern during lead time. The order point or re-order level is a point or quantity level at which if materials in stores reach, the order for supply of materials must be placed. This point automatically initiates a new order. The order point is calculated from three factors:

1. The expected usage.
2. The time interval between initiating an order and its receipt, referred to as the lead time.
3. The minimum inventory, or safety stock.

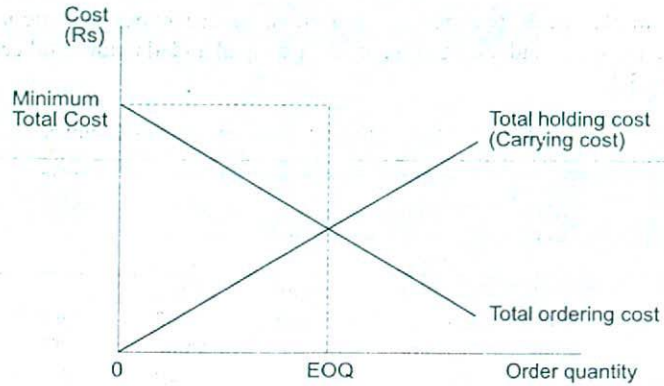

Fig. 3.4 Behaviour of Carrying Costs, Ordering Costs, Minimum Total Costs and Economic Order Quantity

For example, if daily usage is 400 units of material which have a lead time of 20 days and the safety (minimum) stock is 500 units, the order point will be calculated as follows:

Daily consumption × lead time = 400 × 20	=	8,000
Add safety stock	=	500
Order point units		8,500

The order point is determined after considering the worst possible expected conditions. This only ensures that the minimum stock will always remain in the inventory and will not be used atleast in the short run. However, situations may arise where there will be stock-out and thus, the order point may not be an absolutely accurate forecasting.

Determination of Safety or Minimum Stock Level

It is advisable to carry a reserve or safety stock to prevent stock-out. The safety stock should be used only in abnormal circumstances, and the working stock in ideal or normal conditions. Therefore, for normal working conditions, the stock should not be allowed to fall below the safety limit, kept only for emergencies. If the usage pattern is known with certainty, and the lead time is also known accurately, then no safety stock would be needed. However, if either usage or lead time is subject to variation then it is necessary for a business firm to maintain safety stock levels equal to the difference between the expected usage over lead time and the maximum usage over lead time that the firm feels is necessary for cost minimisation. The safety stock level can be computed by using the following formula:

Safety stock level = Ordering level – (Average rate of consumption × Re-order period)

Or

Safety stock level = (Maximum rate of consumption – Average rate of consumption) × Lead time

That is, = (425 – 400) × 20 days

= 500 units

Maximum Stock Level

The maximum level ensures that the stocks will not exceed this limit although there may be low demand for materials or quick delivery from the suppliers. Maximum stock level can be computed as follows:

Maximum stock level = EOQ + Minimum stock

Or

Maximum stock level = Re-order level + EOQ – (Minimum consumption × Minimum re-order period)

Danger level

Generally the danger level of stock is indicated below the safety or minimum stock level. Sometimes, depending on the practices of the firm and circumstances prevailing, the danger level is determined between reorder level and minimum level. In the second case (danger level being between reorder level and minimum level), the firm can only take steps to ensure that materials ordered will arrive in time.

Average stock level

Average stock level is computed in the following manner:

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

Or

$$= \frac{\text{Minimum level} + \text{Re-order quantity}}{2}$$

The following example further illustrates the different stock levels.

Maximum usage (units)	650 per day
Minimum usage (units)	300 per day
Normal usage (units)	500 per day
Economic order quantity (units)	75000
Re-order period—lead time	25 to 30 days
Minimum level (units) (10 days at normal usage)	5000

The different stock levels will be as follows:

Re-order level = Normal usage × Normal lead time + Minimum level

= (500 × 30) + 5000

= 20000 units

Maximum level = Re-order level + EOQ – Minimum quantity used in re-order period

= 20,000 + 75000 – (300 × 25)

= 87500 units

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

$$= \frac{87500 + 5000}{2}$$

= 46250 units

After placing an order, if usage goes above average or if the lead time is longer than expected, then the stock will fall below minimum. However, stock will not be exhausted, so long as the maximum usage and maximum re-order periods are not exceeded. In the above example, maximum usage during the lead time would cause an extra 4500 units (30 days × 150 units) to be consumed. Therefore, in this situation, the purchasing officer should try to chase supplies to ensure that delivery promises are kept.

The different stock levels, as found in the above example, are displayed in Fig. 3.5.

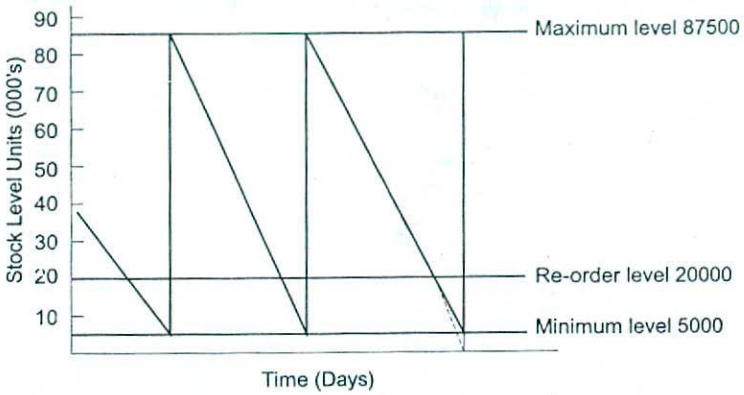

Fig. 3.5 Stock Levels

Example 3.1

In a company weekly minimum and maximum consumption of material *A* are 25 and 75 units respectively. The re-order quantity as fixed by the company is 300 units. The material is received within 4 to 6 weeks from issues of supply order. Calculate minimum level and maximum level of material *A*.

(CA Inter, May 1995)

Solution Minimum Level = Re-order level – (Average Rate of Consumption × Average Re-order Period)
= 450 units – (50 units × 5 weeks) = 200 units.

Maximum level = Re-order Level + Re-order Quantity – (Min. Rate of Consumption × Min. Re-order Period)
= 450 units + 300 units – (25 units × 4 weeks)
= 650 units.

Working Note:

Re-order Level = Maximum Usage per Period × Maximum Re-order Period
= 75 units × 6 weeks = 450 units.

Example 3.2

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

(i) Economic Order Quantity
(ii) Re-order level

(CA Inter, Nov. 1996)

Solution

Annual Consumption (U) = 50 items × 365 days
= 18,250 units

Ordering Cost (P) = Rs. 50

Inventory Carrying cost per item per annum (S) = Re 0.02 × 365 = Rs. 7.30

(i) Economic Order Quantity $= \sqrt{\frac{2U \times P}{S}}$

$= \sqrt{\frac{2 \times 18{,}250 \times \text{Rs. } 50}{\text{Rs. } 7.30}}$

= 500 units

(ii) Re-order Level = Maximum Usage per day × Maximum Lead Time
= 50 units per day × 32 days
= 1,600 items

Example 3.3

From the following information calculate Economic Order Quantity, and the number of orders to be placed in one quarter of the year:

(i)	Quarterly consumption of materials	2,000 kg.
(ii)	Cost of placing one order	Rs 50
(iii)	Cost Per unit	Rs 40
(iv)	Storage and carrying Cost	8% on average inventory

(B. Com. (Hons), Delhi 1997)

Solution

$$EOQ = \sqrt{\frac{2U \times P}{S}}$$

Where:

U = Annual Consumption
S = Storage cost per unit per annum

Anual usage of materials = 2000 kg × 4 = 8000 kg
Cost of placing order = Rs. 50

Annual storage or carrying cost of one unit $= \frac{40 \times 8}{100} = 3.2$

$$EOQ = \sqrt{\frac{2 \times 8000 \times 50}{3.2}}$$

$$= \sqrt{\frac{8{,}00{,}000}{3.2}}$$

$= \sqrt{2,50,000} = 500$ kg

No. of orders per quarter = 2000 kg ÷ 500 kg = 4

Example 3.4

If the minimum stock level and average stock level of raw-material *A* are 4,000 and 9,000 units respectively, find out its 'Re-order quantity'. *(CA Inter, May 1997)*

Solution

Minimum Stock Level of Material *A*	= 4,000 units
Average Stock Level of Material *A*	= 9,000 units
Average Stock Level	= Minimum Stock level + 1/2 Re-order Quantity
or 1/2 Reorder Quantity	= 9,000 units – 4,000 units
	= 5,000 units
or Re-order quantity	= 10,000 units.

Example 3.5

From the details given below, calculate:

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

Cost of placing a purchase order is Rs. 20
Number of units to be purchased during the year is 5,000.
Purchase price per unit inclusive of transportation cost is Rs. 50.
Annual cost of storage per unit is Rs. 5

Details of lead time: Average 10 days, Maximum 15 days, Minimum 6 days. For emergency purchases 4 days.

Rate of Consumption: Average : 15 units per day, Maximum : 20 units *(CA Inter, May 1996)*

Solution

(i) Re-ordering Level (*ROL*) = Maximum Usage per day × Maximum Re-order period
= 20 units per day × 15 days
= 300 units

(ii) Maximum Level (*WN* 1 and 2) = *ROL* + *ROQ* – (Min. Rate of Consumption × Min. Re-order Period)
= 300 units + 200 units – (10 units per day × 6 days)
= 440 units.

(iii) Minimum Level = *ROL* – (Average rate of consumption × Average reorder period)
= 300 units – (15 units per day × 10 days)
= 150 units.

(iv) Danger Level = Average consumption × Lead time for emergency purchases
= 15 units per day × 4 days
= 60 units.

Working Notes:

1. $ROQ = \sqrt{\frac{2U \times P}{S}} = \sqrt{\frac{2 \times 5000 \text{ units} \times \text{Rs } 20}{\text{Rs } 5}}$

$= 200$ units

Where: ROQ = Reorder Quantity
U = Annual Consumption
P = Cost per order
S = Storage Cost per unit

2. Average Rate of Consumption

$$= \frac{\text{Minimum Rate of Consumption } (x) + \text{Maximum Rate of Consumption}}{2}$$

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

or $x = 10$ units per day.

Example 3.6

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

You are required to calculate:

(i) Economic order quantity.

(ii) If the minimum lot size to be supplied is 4,000 units, what is the extra cost, the company has to incur?

(iii) What is the minimum carrying cost, the company has to incur? *(CA Inter, May 1999)*

Solution

(i) *Computation of Economic Ordering Quantity*

$$EOQ = \sqrt{\frac{2U \times P}{S}}$$

Where U = Annual Consumption
P = Cost of Placing an Order
S = Storage Cost per unit per annum

$$= \sqrt{\frac{2 \times 48{,}000 \text{ units} \times \text{Rs. } 120}{10\% \times \text{Rs. } 20}} = \sqrt{5{,}76{,}000}$$

$= 2{,}400$ units.

(ii) *Extra cost incurred by the company*

Total cost when order size is 4000 units

= Total Ordering Cost + Total Carrying Cost
= 12 orders × 120 + 4,000 × 1/2 × 20 × 10/100
= Rs. 1,440 + Rs. 4,000 = Rs. 5,440

Total cost when order size is 2400 units

Total Cost = 20 orders × Rs. 120 + 2,400 × 1/2 × 20 × 10/100

= Rs. 2,400 + Rs. 2,400 = Rs. 4,800

Extra Cost incurred by the company = Rs. 5,440 – Rs. 4,800 = Rs. 640

(iii) *Minimum Carrying Cost*

The carrying or storage cost depends upon the size of the order. It will be minimum when the order size is least.

In the question the two order sizes are 2,400 units and 4,000 units. Hence, 2,400 units is the least of the two order sizes. At this order size carrying cost will be minimum.

The minimum carrying cost in this case will be as under:

Minimum Carrying Cost = 1/2 × 2,400 units × 10/100 × Rs. 20 = Rs. 2,400

Example 3.7

ZEE is product manufactured out of three raw materials M, N and Q. Each unit of ZEE requires 10 kgs, 8 kgs, and 6 kgs. of M, N and Q respectively. The re-order levels of M and N are 15,000 kgs and 10,000 kg. respectively while the minimum-level of Q is 2,500 kg. The weekly production of ZEE varies from 300 to 500 units, while the weekly average production is 400 units. You are required to compute

(i) the minimum stock level of *M*.

(ii) the maximum stock level of *N*, and

(iii) the re-order level of *Q*.

The following additional data are given:

Re-order Quantity (in kgs.)	*M*	*N*	*Q*
Delivery (in weeks)	*20,000*	*15,000*	*20,000*
Minimum	2	4	3
Average	3	5	4
Maximum	4	6	5

(ICWA Inter, Dec. 1995)

Solution

(i) Minimum Stock Level of *M*

= Re-order Level – (Average Usage × Average Delivery Time)

= 15,000 kgs – (400 units of Zee × 10 kgs. per unit × 3 weeks)

= 15,000 – 12,000 = 3,000 kgs.

(ii) Maximum Stock Level of *N*

= Re-order Level + Re-order Quantity – (Minimum Usage × Minimum Re-order Period)

= 10,000 kgs + 15,000 kgs. – (300 × 8 × 4) kgs.

= 15,400 kgs.

(iii) Re-order Level of *Q*

= Maximum Re-order period × Maximum Usage

= 5 × 500 × 6

= 15,000 kgs.

Example 3.8

M/s Tubes Ltd. are the manufacturers of picture tubes for T.V. The following are the details of their operation during 1997:

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

Compute from the above:

1. Economic Order Quantity. If the supplier is willing to supply quarterly 1,500 units at a discount of 5%, is it worth accepting?
2. Maximum level of stock.
3. Minimum level of stock.
4. Reorder level. *(CA Inter, May 1998)*

Solution

1. $$EOQ = \sqrt{\frac{2UP}{S}}$$

Where U = Annual usage of tubes

= Normal usage per week × 52 weeks

= 100 tubes × 52 weeks = 5,200 tubes.

P = Ordering cost per order = Rs. 100 per order.

S = Inventory carrying cost per unit per annum.

20% × Rs. 500 = Rs. 100 per unit per annum.

$$EOQ = \sqrt{\frac{2 \times 5{,}200 \text{ units} \times \text{Rs. } 100}{\text{Rs } 100}} = 102 \text{ tubes (approx.)}$$

Evaluation of offer. If the supplier is willing to supply 1,500 units at a discount of 5%:

(i) Total Cost When order size is 1500 units

= Cost of 5,200 Units + Ordering Cost + Carrying Cost

$$= 5{,}200 \text{ units} \times \text{Rs. } 475 + \frac{5{,}200 \text{ units}}{1{,}500 \text{ units}} \times \text{Rs. } 100 + \frac{1}{2} \times 1{,}500 \text{ units} \times 20\% \times \text{Rs. } 475$$

= Rs. 24,70,000 + Rs. 346.67 + Rs. 71,250

= Rs. 25,41,596.67

(ii) Total Cost (when order size is 102 units):

$$= 5{,}200 \text{ units} \times \text{Rs. } 500 + \frac{5{,}200 \text{ units}}{102 \text{ units}} \times \text{Rs. } 100 + \frac{1}{2} \times 102 \text{ units} \times 20\% \times \text{Rs. } 500$$

= Rs. 26,00,000 + Rs. 5,098.03 + Rs. 5,100

= Rs. 26,10,198.03

The above calculation shows the total cost under quarterly supply of 1,500 units with 5% discount is lower than that when order size is 102 units. Therefore, the offer should be accepted. However, while accepting this offer consideration of capital blocked on order size of 1,500 units per quarter has been ignored.

2. *Maximum Level of Stock*
   = Re-order level + Re-order quantity – (Min. usage × Min. Re-order period)
   = 1,600 units + 102 units – 50 units × 6 weeks
   = 1,402 units.
3. *Minimum Level of Stock*
   = Re-order level – (Normal usage × Average Re-order period)
   = 1,600 units – 100 units × 7 weeks = 900 units.
4. *Reorder Level*
   = Maximum Consumption × Maximum Re-order Period
   = 200 units × 8 weeks
   = 1,600 units.

Example 3.9

Shagoon India Ltd. provides the following information in respect of material X

Supply period	:	5 to 15 days
Rate of Consumption:		
Average	:	15 units per day
Maximum	:	20 units per day
Yearly	:	5,000 units

Ordering costs are Rs. 20 per order.
Purchase price per unit is Rs. 50.
Storage costs are 10% of unit value.

Compute:
(i) Reorder Level
(ii) Minimum Level
(iii) Maximum Level

(B. Com. (Hons), Delhi 1998)

Solution

(i) Re-ordering Level = Maximum Usage per period × Maximum Re-order per period
= 20 units per day × 15 days
= 300 units

(ii) Maximum Level = *ROL* + *ROQ* – (Min. Rate of Consumption × Min. Re-order Period)
= 300 units + 200 units – (10 units per day × 5 days)
= 450 units

(iii) Minimum Level = *ROL* – (Average Rate of Consumption × Average Re-order Period)
= 300 units – (15 units per day × 10 days)
= 150 units

Working Notes:

1. $$ROQ = \sqrt{\frac{2U \times P}{S}} = \sqrt{\frac{2 \times 5000 \text{ units} \times \text{Rs. } 20}{\text{Rs. } 5}} = 200 \text{ units}$$

where: ROQ = Reorder Quantity
U = Annual Consumption
P = Cost per order
S = Storage cost per unit

2. Average Rate of Consumption

$$= \frac{\text{Minimum Rate of Consumption } (x) + \text{Maximum Rate of Consumption}}{2}$$

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

or $x = 10$ units per day.

Example 3.10

Materials X and Y are used as follows:

Minimum usage – 50 units each per week.
Maximum usage – 150 units each per week.
Normal usage – 100 units each per week.

Ordering quantities $X = 600$ units
$Y = 1000$ units

Delivery period $X = 4$ to 6 weeks
$Y = 2$ to 4 weeks

Calculate for each material : (a) Minimum level; (b) Maximum level; and (c) Order level.

Solution

Material X

Ordering level = maximum usage × Maximum delivery period
= 150 × 6
= 900 units

Minimum level = Ordering level – (Normal usage × Normal delivery period)
= 900 – (100 × 5)
= 900 – 500
= 400 units

Maximum level = (Ordering level + Ordering quantity) – (Minimum usage × Minimum delivery period)
= 900 + 600 – (50 × 4)
= 1500 – 200
= 1300 units

Material Y

Ordering level = Maximum usage × Maximum delivery period
= 150 × 4
= 600 units

Minimum level = Ordering level – (Normal usage × Normal delivery period)
= 600 – (100 × 3)
= 600 – 300
= 300 units

Maximum level = (Ordering level + Ordering quantity) – (Minimum usage × Minimum delivery period)
= 600 + 1000 – (50 × 2)
= 1600 – 100
= 1500 units

Notes: Normal period of delivery has been computed as follows:

$$\text{Material } X = \frac{(4+6)}{2} = 5 \text{ weeks}$$

$$\text{Material } Y = \frac{(2+4)}{2} = 3 \text{ weeks}$$

Example 3.11

From the following data, calculate the economic order quantity and the re-order point for Part Z:

Working days in a year	200
Safety stock	400 units
Lead time	10 days
Order costs	Rs 300 per order
Holding cost	15% of cost
Annual consumption	10,000 units
Cost per unit	Rs 10

Solution

$$EOQ = \sqrt{\frac{2U \times P}{S}}$$

$$\sqrt{\frac{2 \times 10{,}000 \times \text{Rs } 300}{15\% \times 10}} = \sqrt{\frac{6{,}000{,}000}{1.5}} = \sqrt{4000000} = 2000 \text{ units}$$

Trial and error calculation to arrive at the above answer:

Times ordered	4	5	6
Order size (units)	2,500	2,000	1,666
Average stock (units)	1,250	1,000	833
Holding costs (Rs)	1,875	1,500	1,250
Order costs (Rs)	1,200	1,500	1,800
	Rs 3,075	Rs 3,000	Rs 3050

Holding cost has been calculated as follows:
Average stock units × Cost per unit × 15%
Economic order quantity : 2,000 units, order 5 times per annum.

Re-order point:	
Daily consumption X lead time (10,000 ÷ 200) × 10 =	500
Add safety stock	400
Re-order point	900 Units

Holding cost has been calculated as follows :
Average stock units × cost per unit × 15%

Example 3.12

Eats Ltd. supply a number of products to bakers and confectioners. One of their products consists of packets of cake decorations. The cake decorations are sold in packets of twelve decorations for Rs 20 per packet. The demand for the cake decorations is very constant and has over a long period of time been at the rate of 2,000 packets per month. The packets cost Eats Ltd. Rs 10 each from the manufacturer and a lead time of four days is required from date of order to date of delivery. Ordering costs are Rs 1.20 per order and the holding or carrying cost is 10 per cent per annum.

(a) Calculate the following:
  (i) the economic order quantity:
  (ii) the number of orders to be placed per annum:
  (iii) the total cost of buying and carrying cake decorations per annum.

(b) Assume that the present stock level is 200 packets and that no buffer stocks are kept. When must the next order be given to the supplier? (For purposes of your calculation one year consists of 360 days).

(c) There are certain major difficulties often experienced by firms in seeking to use the EOQ Formula. List them briefly.

Solution

(a) (i) Economic order quantity $= \sqrt{\frac{2U \times P}{S}}$

$$\sqrt{\frac{2 \times 24{,}000 \times 1.20}{0.10 \times 10}} = \sqrt{\frac{57{,}600}{1}} = 240 \text{ units}$$

(ii) Number of orders to be placed per annum

$$\frac{\text{Annual usage}}{EOQ} = \frac{24{,}000}{240} = 100 \text{ orders}$$

(iii) Cost of buying 100 orders × Rs 1.20	Rs 120
Cost of holding = average stock × holding cost per unit = 120 units × Re 1	Rs 120
Total cost of buying and holding cake decorations per annum	Rs 240

(b) $\frac{200}{2{,}000} = \frac{1}{10}$th of a month or 3 days supply.

With a lead time of four days the order must be placed tomorrow without fail.

(c) Difficulties often experienced by firms in seeking to use the *EOQ* formula are difficulty of estimating, with accuracy, such items as the annual demand for stock items, the cost of ordering and the cost of carrying. Also the *EOQ* formula makes the assumption that stock is used at a constant rate throughout the year. This may not be so.

Example 3.13

The Purchase Department of your organisation has received an offer of quantity discounts on its orders of materials as under:

Price per tonne	*Tonnes*
Rs	
1,200	Less than 500
1,180	500 and less than 1,000
1,160	1,000 and less than 2,000
1,140	2,000 and less than 3,000
1,120	3,000 and above.

The annual requirement for the material is 5,000 tonnes. The ordering cost per order is Rs 1,200 and the carrying cost is estimated at 20% per annum.

You are required to compute the most economic order quantity presenting the information in a tabular form. *(B. Com. (Hons), Delhi 2001)*

Solution

Ordering quantity (Tonnes)	*Price per tonne (Rs)*	*Purchasing cost of 5,000 tonnes (Rs)*	*Ordering cost (Rs)*	*Inventory carrying (Rs)*	*Total cost (Rs)*
EOQ		*5,000 × Per order delivery cost*	$\frac{5{,}000 \times 1{,}200}{\text{Ordering quantity}}$	$\frac{EOQ}{2} \times$ *price per tonne* $\times 20\%$	
400	1,200	60,00,000	15,000	48,000	60,63,000
500	1,180	59,00,000	12,000	59,000	59,71,000
1,000	1,160	58,00,000	6,000	1,16,000	59,22,000
2,000	1,140	57,00,000	3,000	2,28,000	59,31,000
3,000	1,120	56,00,000	2,000	3,36,000	59,38,000

The above table shows that most economical purchase level is at a level where the ordering quantity is 1,000 tonnes, since at this level the total cost (i.e. inventory carrying cost and ordering cost) is the minimum.

Example 3.14

Shriram Enterprises manufactures a special product "ZED". The following particulars were collected for the year 2002:

(a) Monthly demand of ZED 1,000 units.
(b) Cost of placing an order Rs 100.
(c) Annual carrying cost per unit Rs 15.
(d) Normal usage 50 units per week.
(e) Minimum usage 25 units per week.

(f) Maximum usage 75 units per week.
(g) Re-order period 4 to 6 weeks.

Compute from the above

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

(ICWA Inter)

Solution

1. Re-order quantity (of units used)

$$= \sqrt{\frac{2U \times P}{S}}$$

where U = Annual demand of input units

P = Cost of placing an order

S = Annual carrying cost per unit

$$= \sqrt{\frac{2 \times 2{,}600 \times \text{Rs. } 100}{\text{Rs. } 15}} = \sqrt{34667}$$

= 186 units (approx.)

2. Re-order level = Maximum re-order period × Maximum usage
   = 6 weeks × 75 units
   = 450
3. Minimum level = Re-order level – (Normal usage × Average re-order period)
   = 450 units – (50 units × 5 weeks)
   = 450 units – 250 units = 200 units
4. Maximum level = Re-order level + Re-order quantity – (Minimum usage × Minimum order period)
   = 450 units + 186 units – (25 units × 4 weeks)
   = 536 units.
5. Average stock level = 1/2 (Minimum stock level + Maximum stock level)
   = 1/2 (200 units + 536 units)
   = 368 units

Working Notes:

U = Annual demand of input units for 12,000 units of 'ZED'.
= 52 weeks × Normal usage of input units per week.
= 52 weeks × 50 units of input per week

= 2,600 units

Example 3.15

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

Raw material	*Usage per unit of product kg*	*Re-order quantity (kg)*	*Price per kg*	*Delivery (in weeks)*			*Re-order level (kgs)*	*Minimum level (kgs)*
				Min.	*Av.*	*Max.*		
A	10	10,000	0.10	1	2	3	8,000	
B	4	5,000	0.30	3	4	5	4,750	
C	6	10,000	0.15	2	3	4		2,000

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

(i) Minimum stock of *A*?
(ii) Maximum stock of *B*?
(iii) Re-order level of *C*?
(iv) Average stock level of *A*? *(CA Inter)*

Solution

(i) Minimum stock of *A*
Re-order level – (Average rate of consumption × Average time required to obtain fresh delivery)
= 8,000 – (2,000 × 2) = 4,000 kg

(ii) Maximum stock of *B*
Re-order level – (Minimum consumption × Minimum re-order period + Re-order quantity)
= 4,750 – (4 × 175 × 3) + 5,000
= 9,750 – 2,100 = 7,650 kg

(iii) Re-order level of *C*
Maximum re-order period × Maximum usage = 4 × 1,350 = 5,400 kg
Or
Re-order level of *C* = Minimum stock of *C* + (Average rate of consumption × Average time required to obtain fresh delivery)
= 2,000 + [200 × 6 × 3] kg = 5,600 kg

(iv) Average stock level of *A*

$$= \frac{\text{Minimum stock} + \text{Maximum stock}}{2} = \frac{4{,}000 + 16{,}250}{2}$$

= 10,125 kg

Working Note:

Maximum stock of *A* = *ROL* + *ROQ* – (Min. consumption × Min. re-order period)
= 8000 kg + 10000 – [(175 × 10) × 1]
= 16250 kg

Example 3.16

XYZ Company buys in lots of 500 boxes which is a 3 months supply. The cost per box is Rs 125 and the ordering cost is Rs 150. The inventory carrying cost is estimated at 20% of unit value. What is the total annual cost of the existing inventory policy? How much could be saved by employing the economic order quantity?

Solution

		Rs
(i)	Ordering Cost	
	4 orders in a year @ Rs 150 each order	600
	Carrying cost of average inventory	
	$\frac{500}{2}$ = 250 units × 20% × 125 =	6250
	Total annual cost of existing inventory policy	6850

(ii) Economic Order Quantity (*EOQ*)

$$= \sqrt{\frac{2U \times P}{S}}$$

$$= \sqrt{\frac{2 \times 2000 \times 150}{20\% \text{ of Rs } 125}}$$

$$= \sqrt{\frac{6,00,000}{25}}$$

= 155 units

(iii)	Ordering Cost	
	$= \frac{2000}{155}$ = 12.90 or 13 orders approx.	
	13 orders are to be placed at Rs 150 each	1950.00
	carrying cost of average inventory	
	$= \frac{155}{2} \times \frac{20}{100} \times 125$	1937.50
	Total annual cost	3887.50

Saving in annual cost if *EOQ* is adopted

Rs 6850 – Rs 3887.50 = Rs 2962.50

Example 3.17

The following information in an inventory problem is available:

Annual demand	2400 units
Unit price (Rs)	2.40
Ordering cost (Rs)	4.00
Storage cost (Rs)	2% per year
Interest rate	10% p.a.
Lead time	1/2 month

Calculate *EOQ*, Re-order level and total annual inventory cost. How much does the total inventory cost vary if the unit price is changed to Rs 5? *(ICWA Inter)*

Solution

Inventory carrying cost = 10% + 2% = 12% p.a.
Carrying cost per unit p.a. = 12% of Rs. 2.40 = Rs 0.288

$$EOQ = \sqrt{\frac{2U \times P}{S}} = \sqrt{\frac{2 \times 2400 \times 4}{0.288}} = \sqrt{66667} = 258 \text{ units}$$

ROL = 1/2 month × 2400/12 = 100 units

	Rs
Total Annual Inventory Cost:	
Cost of 2400 units at Rs 2.40	5760.00
Ordering cost 2400/258 = 9.3 orders	
Approximately 10 orders at Rs 4	40.00
Carrying cost of average inventory of 258 units	
$= \frac{258}{2} = 129$ units	
i.e., 129 units × Rs 0.288	37.15
Total Annual Inventory Cost	5837.15

Unit Price Rs 5

$$EOQ = \sqrt{\frac{2 \times 2400 \times 4}{12\% \text{ of } 5.00}} = \sqrt{32000} = 179 \text{ units}$$

	Rs
Total Annual Inventory Cost:	
Cost of 2400 units at Rs 5 each	12,000
Ordering cost 24000/179 = 13.4 orders	
Or 14 orders at Rs 4 each	56.00
Carrying cost 179/2 × 0.60	53.70
Total annual inventory cost	12109.70

Difference = Rs 12109.70 – 5837.15
= Rs 6272.55

Example 3.18

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

(i) What should be the optimum run size for bearing manufacture?
(ii) What would be the interval between two consecutive optimum runs?
(iii) Find out the minimum inventory cost per annum. *(CA Inter, Nov. 2000)*

Solution:

(i) *Optimum run size for bearing manufacture*

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

$$= \sqrt{\frac{2 \times 24{,}000 \text{ bearings} \times \text{Rs. } 324}{12 \text{ months} \times 0.10\text{P.}}} = \sqrt{12960000}$$

= 3600 bearings

(ii) *Interval between two consecutive optimum runs*

$$= \frac{12 \text{ months}}{\text{Number of production runs per annum}} = \frac{12 \text{ months}}{\left(\frac{\text{Annual production}}{\text{Optimum run size}}\right)}$$

$$= \frac{12 \text{ months}}{\left(\frac{24{,}000 \text{ bearings}}{3{,}600 \text{ bearings}}\right)} = \frac{12 \text{ months}}{6.66}$$

= 1.8 months or 55 days approximately

(iii) *Minimum inventory cost per annum*

= Total production run cost + Total carrying cost per annum

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

= Rs. 2,160 + Rs. 2,160

= Rs. 4,320

Example 3.19

PQR Tubes Ltd. are the manufacturers of picture tubes for T.V. The following are the details of their operations during 1999-2000:

	Rs. 100 per order
Ordering cost	
Inventory carrying cost	20% p.a.
Cost of tubes	Rs. 500 per tube
Normal usage	100 tubes per week
Minimum usage	50 tubes per week
Maximum usage	200 tubes per week
Lead time to supply	6–8 weeks

Required:

(i) Economic order quantity. If the supplier is willing to supply quarterly 1,500 units at a discount of 5%, is it worth accepting?

(ii) Re-order level

(iii) Maximum level of stock

(iv) Minimum level of stock

(CA Inter May 2000)

Solution

(b) (i) *Economic order quantity (EOQ)* $= \sqrt{\frac{2u \times P}{S}}$

Here u is the annual requirement of tubes,

P is the ordering cost per order.

S is the inventory carrying cost p.u. p.a.

$$E.O.Q. = \sqrt{\frac{2 \times (100 \text{ tubes} \times 52 \text{ weeks}) \times (\text{Rs. } 100 \text{ per order})}{20\% \times \text{Rs. } 500}}$$

$$E.O.Q. = \sqrt{\frac{2 \times 5{,}200 \text{ tubes} \times \text{Rs. } 100}{\text{Rs. } 100}} = 102 \text{ tubes (approx.)}$$

$(T.C)_{q = 102 \text{ units}}$ = Total purchase cost of 5,200 + Total ordering cost + Total carrying cost

$$= 5{,}200 \text{ units} \times \text{Rs } 500 + \frac{5{,}200 \text{ units}}{102 \text{ units}} \times \text{Rs } 100 + \frac{1}{2} \times 102 \text{ units} \times \text{Rs. } 100$$

$$= \text{Rs } 26{,}00{,}000 + \text{Rs } 5{,}098 + \text{Rs } 5{,}100$$

$$= \text{Rs } 26{,}10{,}198$$

Total cost when the supplier is willing to give a discount of 5% on an order size of 1,500 units will be:

$$(T.C)_{q = 1{,}500 \text{ units}} = 5{,}200 \text{ units} \times \text{Rs } 475 + \frac{5{,}200 \text{ units}}{1{,}500 \text{ units}} \times \text{Rs } 100 + \frac{1}{2} \times 1{,}500 \times 20\% \times \text{Rs } 475$$

$$= \text{Rs } 24{,}70{,}000 + \text{Rs. } 346.66 + \text{Rs } 71{,}250$$

$$= \text{Rs } 25{,}41{,}596.66 \text{ approx.}$$

Decision Since the total cost of inventory when supplier supplies quarterly 1,500 units at a discount of 5% is less than that when the order size is of 102 units. Therefore, it is advisable to accept the offer of 5% discount and save a sum of Rs. 68,601.34 (Rs 26,10,198 – Rs. 25,41.596.66).

Note: In the case of *EOQ* the total ordering cost and the total carrying cost are always equal, but in the above case it is not so because of the approximation made in arriving at the figure of *EOQ*.

(ii) *Re-order level (ROL)*

= Maximum usage × Maximum lead time to supply

= 200 tubes per week × 8 weeks

= 1,600 tubes.

(iii) *Maximum level of stock*

= Re-order level + Re-order quantity – Minimum usage × Minimum lead time to supply

= 1,600 tubes + 102 tubes – 50 tubes × 6 weeks

= 1,402 tubes.

(iv) *Minimum level of stock*

= Re-order level – Normal usage × Average lead time to supply

= 1,600 tubes – 100 tubes × 7 weeks.

= 900 tubes.

STORES ORGANISATION

Efficient storing—after efficient purchasing—is another important step in materials control system.

The storekeeper and persons working in stores are primarily responsible for safeguarding the materials and keeping materials and supplies in proper places until required in production. It is difficult to list

out all the functions performed by stores in different organisations. But usually they perform the following functions:

1. Acting as a buffer or protection against the consequences of non-availability.
2. Acting as a link between bulk purchases and the breaking down into units of need.
3. Providing security.
4. Avoiding damage and deterioration.
5. Establishing a proper system for ensuring control over usage, through a discipline of authority for withdrawals, formalised rationing of materials issued, recording of data for control, etc.
6. Marshalling during the course of manufacture.
7. Performing checking function on work done.
8. Serving as a means of reducing cost in movement of materials through systematic location, economy of handling, etc.
9. Forming a basis for good housekeeping, discipline and hence control. Storage brings a sense of tidiness and good arrangements and helps to emphasise the importance of responsibility and accountability.

Storage Layout

Storage layout, i.e. careful design and arrangement of storerooms is desirable for savings in cost. Materials can be stored according to: (i) account number specially given for different types of materials; (ii) the frequency of use of the item; (iii) the production area where the item is used; or (iv) the nature, size and shape of the item. Practically, no single one of these factors could be the sole basis for deciding the storing arrangement, but shape and size of the materials significantly influence storeroom arrangement.

The basic accounting records of any inventory system are the documents required to authorise and record materials movement into or out of the stores. These are the goods received note, materials requisition and materials return note. Stores ledger cards—stock ledger cards or materials ledger cards—may show quantities on order, expected delivery dates and quantities reserved or required for work due to be processed (Fig. 3.6).

ABC Company Limited
Stores Ledger Card

Description _____ Code _____
Unit _____ Location _____
Maximum _____ Minimum _____
Re-order level _____ Re-order Quantity _____

Receipt			Issues			Physical Balance	Reserved			Ordered			Free Balance
Date	Ref.	Qty.	Date	Ref.	Qty.		Date	Ref.	Cum Qty.	Date	Ref.	Cum Qty.	

Fig. 3.6 Stores Ledger Card

Bin card Bin cards usually show quantities of each type of material received, issued and on hand. The bin card is placed in the bin or shelf or is hung over the almirah or the rack otherwise known as bin. Separate bin cards are prepared for each item of stores and if two different materials are kept in one almirah, two bin cards, one of each, are prepared, treating the almirah as two bins. A physical bin cards is presented in Fig.3.7.

ABC Company Limited
Bin Card

Description _____ Bin No. _____
Store ledger No. _____ Code No. _____
Minimum level _____ Unit No. _____

	Received		Issue		Balance	
Date	Ref.	Qty.	Ref.	Qty.	Quantity	Check
May 1, 2002					500	
May 15, 2002		200			700	
May 30, 2002				300	400	
June 7, 2002		150			550	
June 25, 2002				400	150	

Fig. 3.7 Bin Card with Sample Data

Classification and Codification of Materials

Classification and codification of materials facilitates prompt identification of the materials in storage or when they are being issued to production departments. All items in the stores department should be properly classified and codified. Codification implies giving some symbols through letters or figures under a proper codification system. Codification provides certain benefits: (i) Simplicity in identifying and tracing the stores. (ii) Full particulars need not be given and thus clerical labour and time are saved. (iii) Secrecy is maintained about the details of the stores and all employees may not know them. (iv) Codification is necessary to adopt a mechanical system of accounting.

Issue of Materials

It is the quality of every good system of materials control that no materials can be issued from storerooms except on properly prepared and approved materials requisitions or stores requisitions. The materials requisition is a written order to the storekeeper to deliver materials or supplies to the place and the department designated or to give the materials to the person presenting a properly executed requisition. The materials requisition note (see Fig. 3.8) includes date, requisition number, department charged, name of stock ledger account to be credited, description of materials, quantity, unit price, total value, delivery point, signature of the person requisitioning the material and signature of the department executive approving the request for material. The requisitions are prepared in triplicate, one copy is retained by the preparer and two are sent to the storekeeper.

Department having standard materials requirements or a comparatively fixed list of materials or supplies generally use a special form of materials requisition called the "bill of materials". The bill of materials is a printed or duplicated form listing all the materials and part necessary for a typical job or production (see Fig. 3.9). In preparing such a requisition, it is necessary only to indicate the quantity in the blank space in front of the name or symbol of the material required.

ABC Company Limited
Materials Requisition Note

Job No. _____ Serial No. _____
Date _____

Code No.	Description	Qty or Weight	Cost office			
			Rate	Unit	Amount	Stores ledger

Authorised by _____ Storekeeper _____
Prices entered by _____ Received by _____
Bin Card entered _____ Calculation checked _____

Fig. 3.8 Materials Requisition Note

ABC Company Limited
Bill of Material

Job/work order No. _____ No. _____
Description of job _____ Date _____

S. No.	Description	Code No.	Details of Issues			Remarks
			Date	Rate (Rs)	Amount (Rs)	

Prepared by Stores Department Cost Department
Checked by

Fig. 3.9 Bill of Material

Materials Returned to the Storeroom

Materials requisitioned from a storeroom and not needed or found to be defective are returned to the storeroom, where a returned material report is prepared either by the person returning the materials or by the storekeeper upon receipt of the materials. Two copies of the report are usually prepared; the original is used as a basis for crediting the accounts charged while the duplicate is retained in the files of the department returning the materials to the storeroom (Fig. 3.10).

Some departments may prefer to use the excess materials on the next job instead of returning them to the storeroom. But it is always advisable to prepare a returned materials report, otherwise one job will be charged unnecessarily with too much materials cost and the other job with too little. A materials transfer note (see Fig. 3.11) is prepared to transfer costs from one original job to the new job and also the transfer is noted in the stock records.

ABC Company Limited
Material Return Note

Issuing Department _____ No. _____
Job No. _____ Date _____

S.No.	Description	Code No.	Quantity (Rs)	Rate (Rs)	Amount

Signature of
Works Manager/Foreman

Fig. 3.10 Material Return Note

ABC Company Limited
Materials Transfer Note

Serial No. _____
Date _____

The following materials have been transferred:
from Job No. _____ to Job No. _____

Code	Description	Quantity	Cost Office		
			Rate	Unit	Amount

Authorised	Delivered	Received	Priced
_____	_____	_____	_____

Fig. 3.11 Materials Transfer Note

Materials Returned to Supplier

It may be necessary to return any rejected, specified excess, damaged or unsatisfactory materials to the supplier. Since goods are returned after having been received in storerooms and entered in the stock ledger accounts, some correcting entries are required. From the reject/despatch note issued by the purchasing department, information regarding the quantity and value may be entered in the Received Section of the stock ledger accounts in red ink. Alternatively, an entry can be made in the Issued Section with a special notation or symbol to indicate that the goods were returned to the supplier and not issued to departments or jobs or processes.

INVENTORY SYSTEMS

There are two principal ways of accounting for inventories:

Perpetual Inventory System

The perpetual inventory method requires a continuous record of additions to or reductions in materials, working-progress, and cost of goods sold on a day-to-day basis. Physical inventory counts are usually taken atleast once a year in order to check on the validity of the accounting records. The Institute of Cost and Management Accountant (U.K.) has defined perpetual inventory as:

A system of records maintained by the controlling department which reflects the physical movement of stocks and their current balance... A perpetual inventory is usually checked by a programme of continuous stocktaking, and the two terms are sometimes loosely considered synonymous. Perpetual inventory means the system of records, whereas continuous stocktaking means the physical checking of those records with actual stocks.

The perpetual inventory method has the following advantages:

1. The stock-taking task which is long and costly is avoided under this method.
2. The inventory of different items of materials in accordance with the stores ledger can be promptly prepared for the preparation of the income statement and balance sheet at interim periods if required without a physical inventory being taken.
3. Management may be informed daily of the number of units and the value of each kind of material on hand—information which tends to eliminate delays and stoppage in production.
4. The investment in materials and supplies may be kept at the lowest point in conformity with operating requirements.
5. A system of internal check is always in operation and the activities of different departments, such as purchasing, stores and production are continuously checked against each other.
6. It is not necessary to stop production so as to carry out a complete physical stock-taking.
7. Discrepancies and errors are promptly discovered and localised and remedial action can be taken to avoid their occurrence in the future.
8. This method has a moral effect on the staff, makes them disciplined and careful and acts as a check against dishonest actions.
9. The disadvantages of excessive stock are avoided, such as loss of interest on capital invested in stock, loss through deterioration, risk of obsolescence.

Periodic Inventory System

Under the periodic method, the entire book inventory is verified at a given date by an actual count of materials on hand. This physical inventory is usually taken near the end of the accounting period. This method provides for the recording of purchases, purchase returns and purchase allowances on a daily basis but does not provide for a continuous inventory or for a daily computation of the cost of goods sold. At the end of each accounting period, a physical count is made of the quantity of goods on hand and the value of the inventory is determined by using an inventory pricing method (FIFO, LIFO or Average Cost) and attaching cost to units counted. The cost of goods sold is computed by deducting closing inventory from the sum of opening inventory and purchases made during the current period. It is assumed that goods not on hand at the end of accounting period have been sold. There is no system and

accounting for shrinkage, losses, theft and waste throughout the accounting period and they can be discovered only after the end of the period.

It can be concluded that perpetual inventory assists management in planning future purchases, reduces possibilities of stock shortages and aids in the reduction of waste, spoilage, etc., associated with the storage of inventory. But it is also more costly of the two procedures. The periodic inventory procedure is simple in concept and application. Yet it normally requires the shutdown of operation while it is carried out; it is error-prone due to inexperience of inventory takers; it cannot pinpoint shortages resulting from theft or waste.

INVENTORY SHORTAGES (LOSSES) AND OVERAGES

Under the perpetual inventory system, inventory accounts are maintained up-to-date in a stores ledger. It is, however, necessary to make physical counts of the materials at regular intervals to compare with the stores ledger records. It is possible that physical counting of materials may not agree with the stores ledger. The difference may be because of the following reasons:

A. Unavoidable

1. Evaporation
2. Absorption, moisture
3. Temperature changes affecting the volume of stock
4. Shrinkage
5. Deterioration of quality in stores, e.g., through rust
6. Loss due to breaking bulk or cutting up.

B. Avoidable

1. Pilferage
2. Unsuitable storage
3. Careless handling
4. Under and over issues
5. Materials unused but not returned to stores

INVENTORY CONTROL

Nature of Inventory

Inventory is stores of goods and stocks. The Council of the Institute of Chartered Accountants of India (Accounting Standards 2) defines inventories as:

"Tangible property held (i) for the sale in the ordinary course of business, or (ii) in the process of production for such sale, or (iii) for consumption in the production of goods or service for sale, including maintenance supplies and consumables other than machinery spares."

In other words, in manufacturing organisations, inventories include (a) raw-materials, (b) work-in-progress, (c) finished produced goods, and (d) manufacturing supplies. In trading concerns, inventories consists of (a) merchandise held for sale, and (b) office, packing and other supplies.

Meaning of Inventory Control

Inventory control is the technique of maintaining inventory items (raw materials, work-in-progress, finished products, factory supplies) at desired levels. Manufacturing firms face several inventory control problems as compared to service-oriented organisations. In manufacturing organisations, production is of some tangible physical product. Therefore, emphasis is given to control of all inventory items. In service organisations, the focus is on service, and therefore there is very little emphasis on inventory control. In such service firms, services are used (consumed) as they are generated and not stocked for future consumption. However, there are some service organisations, such as hospitals, military organisations, educational institutions which have to maintain inventories of items related to their nature of work.

Importance of Inventory Control

Inventory control is of great significance in almost all types of business enterprises. If inventories pile up due to over-production or slow demand, capital is tied up which cannot be used for other productive purposes. Alternatively, production is likely to suffer because of inadequate inventory on hand. As stated earlier in this chapter, the basic objective of inventory control is identical to materials control, i.e. maintaining inventory of adequate size for uninterrupted production and lowest investment on the inventory in conformity with production requirements.

Inventory control is also necessary because of the following significant factors:

1. *Demand fluctuations* There are likely to be fluctuations in demand pattern. To cope with the changing consumers' demand, it is necessary that adequate inventory should be maintained.
2. *Uncertainty about lead time* Sometimes the supplier may take more time in supplying the raw materials than expected. During this additional time, inventory has to be maintained so that the production does not suffer.
3. *Avoiding over-stocking and under-stocking* Over-stocking and under-stocking both are undesirable and should be avoided.

Inventory Control Techniques

Different business concerns may apply different inventory control techniques to meet specific requirements and circumstances. However, the following techniques are commonly used by firms for inventory control:

1. Two-bin system—bag and tag system.
2. Order cycling system.
3. Determination of inventory levels.
4. Statistical control system.
5. Control ratios.
6. Reservation system.
7. Budgetory control system.
8. ABC classification and control method.
9. Perpetual inventory system.
10. Just-In-Time-Method

The ABC Method

In a large manufacturing company where stocks of direct materials and component parts consist of many thousands of different items, companies find it useful to divide materials, parts, supplies and finished goods into sub-classifications for purposes of inventory control. Many business firms introduce a system of analysing stocks by value categories known as "ABC Analysis". Under this method, inventory items are ranked according to investments in each item in the inventory. The large value items are grouped together into one class for inventory control purposes. The lowest value items are grouped into another class and those items which are of intermediate value are grouped into a "middle" classification. High value items are labelled "Class A", middle value items, "Class B", and low value items, "Class C". All items in stock are listed in order of descending values showing quantity held and the corresponding value of the materials (see Table 3.3).

The percentage given in Table 3.3 are only guidelines and are subject to change according to prevailing circumstances and choice of management. Table 3.3 shows that only 20% of the items represent 72% of the total costs.

Table 3.3 Stock Analysis under ABC

Class	Items		Investment	
	No. of items	*Per cent of total items*	*Total cost*	*Per cent of total*
A	20,000	20%	2,88,000	72%
B	30,000	30%	76,000	19%
C	50,000	50%	36,000	9%
	100,000	100%	4,00,000	100%

The items under Class A are subject to greater continuous control and planning than are the items under other categories. The Class A items account for high annual consumption costs and correspondingly high investment in inventories. Because of high investments in Class A items, there would be frequent ordering and low safety stocks. This also assumes that the cost of placing and following up orders is relatively low in comparison with the costs of carrying excess inventories. A number of things can be done to reduce inventory of 'A' items. For example, A items can generally be ordered for specific runs, the economic order quantity could be applied; local suppliers could be asked to stock supplies so that delivery time can be shortened. On the other hand, where the total annual purchase cost is relatively low as in the case of Class C items, there will be less frequent ordering and higher safety stocks. Items in Class C receive the least amount of control and should be under simple physical controls such as the two-bin system with safety stocks.

A graph can be prepared to show quantity and amount of items in different categories in descending order of value (Fig. 3.12).

Just-In-Time Method

Just-In-Time (JIT) is a purchasing and inventory control method in which materials are obtained just in time for production to provide finished goods just in time for sale. A just-in-time manufacturing system requires making goods or service only when the customer, internal or external, requires it. JIT requires better coordination with suppliers so that materials arrive immediately prior to their use. JIT reduces or

eliminates inventory and the costs associated with carrying the inventory. JIT emphasizes that workers immediately correct the system making defective units because they have no inventory. With no inventory to draw from for delivery to customers, just-in-time relies on high quality materials and production. It is required that the companies that use just-in-time manufacturing must eliminate all the sources of failure in the system. Production people must be better trained so that they can carry out their works without errors. Suppliers must be able to produce and deliver defect free materials or components just when they are required, and equipment must be maintained so that machine failures are eliminated.

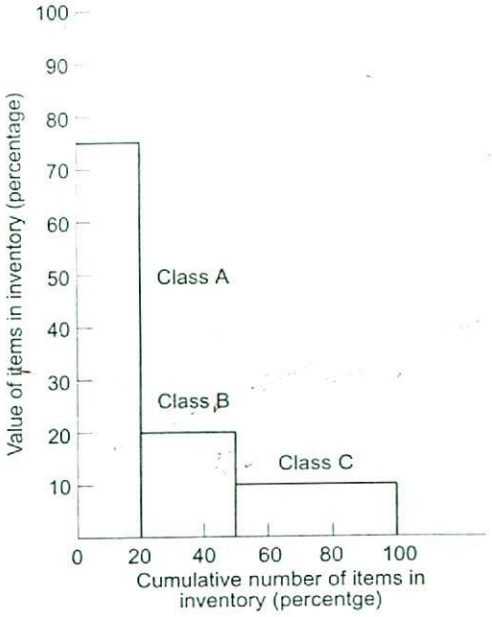

Fig. 3.12 ABC Method of Inventory Classifications

JIT applies to raw materials inventory as well as to work-in-process inventory. The goals are that both raw materials and work in process inventory are held to absolute minimums. JIT is used to complement other materials planning and control tools, such as EOQ and safety stock levels. In JIT system, production of an item does not commence until the organization receives an order. When an order is received for a finished product, productions people give orders for raw materials. As soon as production is complete to fill the order, production ends. In theory, in JIT, there is no need for inventories because no production takes place until the organization knows that it will sell them. In practice, however, companies using just in time inventory generally have a backlog of orders or stable demand for their products to assure continued production.

The fundamental objective of JIT is to produce and deliver what is needed, when it is needed, at all stages of the production process—just in time to be fabricated, sub-assembled, assembled, and despatched to the customer. Although in practice there are no such perfect plans, JIT is an ideal and therefore a worthy goal. The benefits are low inventory, high manufacturing cycle rates, high output per employee, minimum floor space requirements, minimum indirect labour, and perfect in-process control. An associated requirement of a successful JIT operation is the pursuit of perfect quality in order to reduce, to an absolute minimum, delays caused by defective product units.[1]

INVENTORY TURNOVER

Business enterprises can analyse the turnover of different items of stock to find out which stocks are slow moving. Inventory turnover ratio enables the management to avoid capital being locked up in

1. Milton F. Usry and Lawrence H. Hammer, Cost Accounting, Planning and Control, Cincinnati: South Western Publishing Co., 1999, p. 257.

undesirable stocks. This ratio indicates the efficiency or inefficiency with which inventories are maintained. Inventory turnover ratio is calculated as follows:

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

The cost of average stock here is taken as the average of opening and closing stock.
The stock turnover can also be calculated in days as below:

$$\frac{\text{Days during the period}}{\text{Inventory turnover ratio}}$$

Detection of Slow-moving and Non-moving or Obsolete Materials

It is essential for a business firm to detect slow-moving and non-moving or obsolete materials. Obsolete materials become useless or obsolete due to change in product, process, design or method of production. Obsolete materials are different from slow-moving materials. Slow-moving stocks move at a slow rate. In case of slow and non-moving materials, capital remains locked unnecessarily and also cost of storing continue to be incurred if these materials are stored in excess of the requirements. Management should make proper investigation into slow-moving and obsolete materials and take steps to minimise losses arising therefrom. Management should prepare regular reports to examine the situations relating to these stocks so that useless stocks could be disposed off or used in some profitable work and effective steps could be taken to increase the movement of slow moving stocks.

Example 3.20

Compute the materials turnover ratio for materials *A* and *B* and comment upon the results.

	Materials A (Rs)	*Materials B (Rs)*
Opening stock	10,000	35,000
Purchase during the year	76,000	50,000
Closing stock	6,000	25,000

Solution

Cost of materials consumed:	*Materials A*	*Materials B*
Opening stock	10,000	35,000
Add: Purchases	76,000	50,000
	86,000	85,000
Less: Closing stock	6,000	25,000
Cost of materials consumed	80,000	60,000
Average stock held:	*Materials A*	*Materials B*
Opening stock	10,000	35,000
Closing stock	6,000	25,000
	16,000	60,000
	16,000 ÷ 2	60,000 ÷ 2
Average stock	8,000	30,000

Material turnover ratio

$$= \frac{\text{Cost of materials consumed}}{\text{Cost of stock held}}$$

$$\text{Materials } A = \frac{80{,}000}{8{,}000} = 10 : 1 \text{ or } 10$$

$$\text{Materials } B = \frac{60{,}000}{30{,}000} = 2 : 1 \text{ or } 2$$

Materials turnover in days

$$= \frac{\text{Days during the year}}{\text{Materials turnover ratio}}$$

$$\text{Materials } A = \frac{365}{10} = 36.5 \text{ days}$$

$$\text{Materials } B = \frac{365}{2} = 182.2 \text{ days}$$

From the above results, it can be said that materials *A* are very fast moving materials, while materials *B* are very slow moving when compared with materials *A*. Since, the normal standard inventory turnover ratio should be 2 : 1, the materials *B* turnover ratio can be said to be normal. Materials *A* turnover ratio is 36.5 days which shows that an average stock is being kept for 36.5 days. In contrast, materials *B* average stock is being kept for 182.5 days. Therefore, materials *B* are slow-moving materials.

Less: Closing Stock of raw material	1,10,000
Cost of Raw Material consumed	2,50,000

2. Average Stock of Raw Material $= \frac{1}{2}$ (Opening stock of raw material + Closing stock of raw material)

$$= \frac{1}{2} \{\text{Rs } 90{,}000 + \text{Rs } 1{,}10{,}000\} = \text{Rs } 1{,}00{,}000$$

Example 3.21

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

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

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

(CA Inter, Nov. 1998)

Solution

Classification of the Items of Inventory as per ABC Analysis

Category A: 15 number of varieties of inventory items, should be classified as those of A category because of the following reasons:

(i) They constitute 0.375% of total number of varieties of inventory items handled by stores of factory. This is the minimum as per the given classification in the table.

(ii) The total usage of these items is 50% of total use value of inventory holding (average) which is maximum according to the given table.

(iii) The consumption of these items is about 85% of usage in end product.

Category B: 110 number of inventory items, should be classified as those of *B* category because of the following reasons:

(i) They constitute 2.750% of total number of varieties of inventory items handled by the stores of the factory.

(ii) They require moderate investment of about 30% of total use value of inventory holding (average).

(iii) Their consumption is moderate about 10% of inventory usage in the end-product.

Category C: 3,875 number of varieties of inventory items, should be classified as those of category C because of the following reasons:

(i) They constitute 96.875% of total varieties of inventory items handled by stores of factory.

(ii) They require investment of 20% of total use value of average inventory holding.

(iii) Their consumption is minimum i.e., just 5% of inventory usage in end product.

ACCOUNTING FOR MATERIAL LOSSES

Some materials losses are bound to occur during manufacturing operations because of the nature of the raw materials or other factors which reduce the expected production. These losses may be waste, scrap, spoilage, defective.

Scrap

Scrap is residue from manufacturing operations that has measurable but relatively minor recovery value. Scrap is saleable material resulting from the primary manufacturing operations. Scrap results from: (i) the processing of materials, (ii) defective and broken parts, (iii) obsolete stock, revisions or abandonment of experimental projects, and scrapping of worn out or obsolete machinery. In some cases scrap can be sold and should therefore be collected and placed in storage so that it can be sold to scrap dealers. Scrap should be accounted for in some manner not only from the point of view of efficiency, but because scrap is often a tempting source of theft.

Treatment of Scrap

Scrap may be treated in the cost accounts in the following ways:

1. Where the value of scrap is very insignificant, it is not considered in the cost accounts. That is, the cost of scrap is charged to good units and income from the sale of scrap is treated as other income.
2. If the value of scrap is significant, the net sale proceeds of scrap (sales value of scrap—cost of selling the scrap) is deducted from the material cost. That is, the amount (net) realised from the

sale is treated as a reduction in the materials cost that has been charged to the individual job or product.

3. The scrap may be sold in a period different from that in which it was created and if the scrap has a low sales value, only a quantity record of the scrap should be maintained. It is not valued and does not appear on the balance sheet.

Scrap Report

It is advisable to prepare a daily, weekly, scrap report to account for scrap and to compare it with predetermined norms or standards which, in turn, can reveal unexpected items and unusual amounts. A specimen of scrap report is given in Fig. 3.13.

Production Department — Scrap Report

For the week ending April 10, 2002

No.	Description used	Units scrapped	Units	% Scrap	Cost	Reasons
Total for week						

Fig. 3.13 A Specimen Scrap Report

Spoilage

Spoilage can be defined as the materials which in the process of manufacture are badly damaged or have developed some imperfection which cannot economically be corrected, and thus the goods ought to be sold as seconds. Spoiled units fail to reach the required standard of quality specifications. The cost of spoiled goods may be treated by either of the following methods:

1. The loss due to spoilage may be charged to a specific product or job on which the spoilage occurred, if it is clearly traceable to the work done on that order.
2. The normal spoilage loss may be charged to factory overhead and thus spread over the cost of all jobs/products.
3. The cost of abnormal spoilage (i.e., due to causes not inherent in the manufacturing process) is transferred to the Costing Profit and Loss Account. Abnormal loss is unexpected and should have been avoided by management. It is considered controllable by management.

Spoilage Report

A spoilage report should be prepared detailing the spoiled units and cost of spoiled units and other relevant information (Fig. 3.14). To control spoilage, allowance for a normal spoilage should be determined in advance and actual spoilage should be compared with the standard (allowed) spoilage. A spoilage report may enable managements to provide overall control over the spoilage costs. If all or many departments are involved, spoilage costs are then treated as a factory overhead. Sometimes, spoil-

age can be controlled by the individual machine operators. This requires daily or weekly spoilage reports which can reveal the spoiled work occurred, the reason for its occurrence and the cost of correcting the defects.

Spoilage Report

Units/Depth No. _____ Date _____

Production Order No. _____

Units produced	Units spoiled	Normal spoilage		Abnormal spoilage		Cost of abnormal spoilage (Rs)	Reason for spoilage	Action taken
		Qty	%	Qty	%			

Fig. 3.14 A Spoilage Report

Defectives

Defective products are such semi-finished or finished products which in the process of manufacturing have developed some imperfection, but which, unlike spoiled materials, can be the expenditure of additional labour and possibly materials, be made into perfect finished articles. In the manufacturing process, imperfections may arise because of sub-standard materials, bad workmanship, careless planning, laxity in inspection, etc. If the unit can be reprocessed in one or more stages and made into a standard saleable product, it is often profitable to rework the defective unit. Defective work is to be distinguished from spoiled work. Defective work is work in which there is some imperfection which can be reworked or reconditioned by the application of additional materials, labour and/or processing and brought to the point of standard. However, the spoiled units cannot be reconditioned and the units must be sold either as scrap or as second or third-grade products.

The accounting treatment for defective work is similar to that relating to spoiled goods. The cost of defectives can be treated in the following manner:

1. Normal defectives, i.e., those defectives which are inherent in the manufacturing process and are identified as normal, can be treated in the following manner:
   (a) Charged to good products—The loss (the additional cost of defectives) is absorbed by good units produced.
   (b) Charged to general factory overheads—If defective units occur irregularly, the added cost of reworking and perfecting the defective goods is properly charged to factory overheads and apportioned as a part of that factory overhead.
   (c) Charged to the department overhead—If the department responsible for defective goods can be identified, the additional cost of perfection is charged to that department.
2. If the defective units are clearly identifiable with a specific job or production order and the defects are peculiar to the job, the cost to complete the defective units can be charged to that job.

3. If defectives are abnormal and as due to reasons beyond the control of the business firm, the rework cost is charged to the Costing Profit and Loss Account.

Defectives Report

Inspectors scrutinise work-in-process at the completion of each stage of production in order to separate defective and spoiled products from those which equal the standard of perfection required of all finished production.

After inspection if it is found that it is necessary to recondition work found defective, a defective work report (see Fig. 3.15) is prepared and attached to the production order representing the defective work. The defective work report contains the number of the production order, a description of the nature of the defective work, the number of units involved, and additional cost of material, labour and applied factory overheads necessary to bring the products upto standard.

Waste (or Wastage)

The terms "spoilage" and "waste" are sometimes used synonymously. However, wastage generally refers to that portion of raw material which is lost in storing, handling and in manufacturing processes. It does not possess any recovery or realisable value. Waste for the purpose of accounting treatment is classified in two categories: Normal waste and Abnormal waste, (i) Normal waste is expected (unavoidable) and uncontrollable. It is treated as a part of the cost of the product, i.e., the cost of normal waste unit is borne by the good remaining units. (ii) Abnormal waste is unexpected (avoidable) and controllable. It is valued like good output. Its cost is transferred to the Costing Profit and Loss Account. In case of normal waste, cost per unit of the finished output is relatively inflated, but in abnormal waste, cost per unit remains the same for abnormal units as well as good finished units.

Defective Work Report

Production order no. _____ No. _____
No. of units _____ Date _____
Department responsible for spoilage _____
Nature of defects _____

Department (Job No.)	Description of additional work required	Rework costs			Total costs
		Materials cost	Labour cost	Applied factory overhead	

Fig. 3.15 Defective Work Report

THEORY QUESTIONS

1. Describe the meaning objectives, and basic principles of materials control system. *(B. Com. (Hons), Delhi)*
2. What are the important requirements of a materials control system. *(B. Com. (Hons), Delhi 2000)*
3. Distinguish between Bill of Material and stores requisition. *(B. Com. (Hons), Delhi 1997)*
4. Explain ABC system of inventory control. *(B. Com. (Hons), Delhi 1999)*
5. Explain Just-In-Time purchases. *(B. Com. (Hons), Delhi 2001)*
6. What is meant by perpetual inventory and periodic inventory system. Describe their advantages.
7. What do you understand by 'inventory control'. State its objects.
8. What are the objectives of inventory control? How is inventory control effected through ABC analysis of stores? *(ICWA, Inter)*
9. Define waste, scrap, defectives and spoilage with examples. Discuss the respective treatment in cost accounts and set out a procedure for their control. *(ICWA)*
10. What is ABC analysis? Discuss its role in a sound system of materials control. *(CA Inter)*
11. "The Perpetual Inventory System is an integral part of materials control." Discuss this statement by bringing out briefly the salient features and advantages of the system. *(ICWA Inter)*
12. In ABC Company Ltd. waste, scrap, spoilage and defectives are very high. Suggest and explain various methods for accounting of wastage and scrap and also treatment of costs incurred on spoilage and defective work. *(ICWA Inter)*
13. Distinguish between spoilage and defectives in a manufacturing company. Discuss their treatment in cost accounts and suggest a procedure for their control. *(CA Inter)*
14. In a meeting of the department heads of a company, the purchase procedure and materials accounting were strongly criticised and blamed for high cost of materials. The Managing Director of the company authorises you to investigate and suggest improvements. Give your suggestions indicating the assumptions on which they are based.

SELF-EVALUATION QUESTIONS

Select the correct answer for the following multiple-choice questions:

1. Which one of the following items is not included in the annual carrying costs of inventory?
   (a) Cost of capital
   (b) Insurance on inventory
   (c) Annual warehouse depreciation
   (d) Taxes on inventory
   (d) Inventory breakage on stored inventory
2. Economic order quantity (EOQ) model is used by a business to
   (a) Minimise the cost of placing orders
   (b) Minimise the unit purchase price of inventory
   (c) Minimise the number of orders placed during a year
   (d) Minimise the required amount of safety stock
   (e) Minimise the combined costs of placing orders and carrying inventory
3. The calculation of inventory re-order point in units requires the
   (a) Purchase price per month
   (b) Annual demand for units
   (c) Daily demand for units

(d) Storage cost per unit
(e) Warehouse capacity

4. Materials control system would be most useful to a
   (a) Manufacturer
   (b) Wholesaler
   (c) Hospital
   (d) Retailer
5. Which of the following items would most likely be included in the calculation of economic order quality?
   (a) Price
   (b) Cost
   (c) Demand
   (d) Supply
6. Given the following information, identify the correct calculation for the economic order quantity (EOQ)

Cost per purchase order	Rs	40
Annual cost of carrying one unit in stock for one Year	Rs	1.20
Annual consumption units		20,000

   (a) $\sqrt{\frac{2(20000 \times \text{Rs } 40)}{\text{Rs } 1.20}}$

   (b) $\sqrt{\frac{20000 \times \text{Rs } 40}{\text{Rs } 1.20}}$

   (c) $\sqrt{\frac{2 \times 20{,}000 \times \text{Rs } 1.20}{\text{Rs } 20}}$

   (d) $\sqrt{\frac{20{,}000 \times \text{Rs } 1.20}{\text{Rs } 20}}$

PROBLEMS

1. A manufacturer buys certain equipment from an outside supplier at Rs 30 per unit. Total annual needs are 800 units. Further the following data are available.

annual return on investment	10%
Rent, taxes, insurance per unit per year Re 1	
Cost of placing an order	Rs 100

   Determine the economic order quantity.
   Ans: 200 units
2. Two components, A and B are used as follows:
   Normal usage per week each 50 units
   Minimum usage 25 units per week each
   Maximum usage 75 units per week each
   Re-order quantity A-300 units, B-500 units
   Re-order period A, 4 to 6 weeks, B, 2 to 4 weeks
   Calculate the each component:
   (a) Re-order level, (b) Minimum level (c) Maximum level,

Ans: Re-order level $A = 450$ units, $B = 300$ units
Minimum level $A = 200$ units, $B = 150$ units
Maximum level $A = 650$ units, $B = 750$ units
Average stock level $A = 425$ units, $B = 450$ units

3. From the following information, calculate 1. Re-order level 2. Maximum stock level and 3. Minimum stock level.

Re-order quantity	4000 units
Minimum stock level to allow for emergencies	5 weeks
Average delivery time from suppliers	4 weeks
Maximum stock level allowed by management	20 weeks
Average rate of consumption per week	250 units
Minimum Consumption in 4 weeks	800 units

(B. Com. Madras)

Ans: Re-order level = 2250 units
Maximum level = 5250 units
Minimum level = 1250 units

4. For the following inventory problem find out:
   (a) How much should be ordered each time?
   (b) When should the order be placed?
   (c) What should be the inventory level (ideally) immediately before the material ordered is received.

   Annual consumption—12000 units (360 days)
   Cost per unit—Re 1
   Ordering costs—Rs 12 per order
   Inventory carrying charge—24%
   Normal lead time—15 days
   Safety stock—30 days consumption
   Ans: (a) 1100 units approx.
   (b) 1500 units at the time of re-ordering level
   (c) Safety stock 1000 units

5. Calculate *EOQ* from the following information. Also state the number of orders to be placed in a year.

Consumption of materials per annum 10000 kg	
Ordering costs per order	Rs 50
Cost per kg of raw materials	Rs 2
Storage costs	8% on average inventory

Ans: EOQ 2500 kg, No. of order in a year 4.

6. A firm is able to obtain quantity discounts on its orders of materials as follows:

Price per tonne (Rs)	*Tonnes*
6.00	Less than 250
5.90	250 and less than 800
5.80	800 and less than 2000
5.70	2000 and less than 4000
5.60	4000 and over

The annual demand for the material is 4000 tonnes. Stock holding costs are 20% of material cost per annum. The delivery cost per order is Rs 6.00.
You are required to calculate the best quantity to order. *(CA Inter)*
Ans: 800 tonnes

7. Calculate the material turnover ratio for the year 2002 from the following information:

	Material X (Rs)	*Material Y* (Rs)
Opening Stock	25,000	87,500
Closing Stock	15,000	62,500
Purchases	1,90,000	1,25,000

Determine the fast moving material

Ans: Turnover ratio

Material X-10

Material Y-2

Material X is the fast moving material.

8. The following information is available about a company for the year 2002.

	Opening stock	*Purchases*	*Closing stock*
Material A	700 kg	11,500 kg	200 kg
Material B	200 litres	11,000 litres	1200 litres
Material C	1000 kg	1800 kg	1200 kg

The inventory is value @ Rs 1 per kg or litre.

Calculate the material turnover ratio for each of the above materials and express in number of days the average inventory held. What conclusions can be drawn?

Ans:

	Turnover ratio	No. of days inventory held
Material A	26.67	14 days approx.
Material B	14.29	26 days approx.
Material C	1.46	250 days

Material A has the highest inventory turnover ratio, while material C has the lower turnover ratio. Therefore, purchase of material C should be controlled.

9. A large local government authority places orders for various stationery items at quarterly intervals. In respect of an item of stock, data are as follows:

Annual usage 5000 boxes

Minimum order quantity 500 boxes

Cost per box Rs 2

Usage of material is on a regular basis and on average, half of the amount purchased is held in inventory. The cost of storage is considered to be 25% of the inventory value. The average cost of placing an order is estimated at Rs 1.25.

The chief executive of the authority has asked you to review the present situation and to consider possible way of effective cost savings. You are required to:

(a) Tabulate the cost of storage and ordering for each level of orders from four to twelve placed per year.

(b) Ascertain from the tabulation the number of orders which should be placed in year to minimise these costs.

(c) Calculate the percentage savings on the annual cost which could be made by using the economic order quantity system. *(CIMA, U.K.)*

Ans:

(a)

No. of orders per year	*Total cost (Rs)*	*No. of orders per year*	*Total cost (Rs)*
4	362.5	9	251.5
5	312.5	10	250.0
6	283.5	11	251.5
7	266.0		
8	256.5	12	254.0

(b) Number of orders which should be placed in a year to minimise costs is ten.

(c) Maximum savings that could be made if the government authority processes four orders per year would be:

$$\frac{\text{Rs } 362.50 - \text{Rs } 250}{\text{Rs } 362.50} = 31\%$$

10. A company manufactures a product from a raw material, which is purchased at Rs 60 per kg. The company incurs a handling cost of Rs 360 plus freight of Rs 390 per order. The incremental carrying cost of inventory of raw material is Re 0.50 per kg per month. In addition, the cost of working capital finance on the investment in inventory of raw materials is Rs 9 per kg per annum. The annual production of the product is 1,00,000 units and 2.5 units are obtained from one kg of raw material.

Required:

(i) Calculate the economic order quantity of raw materials.

(ii) Advise, how frequently should orders for procurement be placed.

(iii) If the company proposes to rationalise placement of orders on quarterly basis, what percentage of discount in the price of raw materials should be negotiated. *(C.A. Inter, Nov. 2001)*

Materials Costing

COSTING MATERIALS RECEIVED

The invoice received from the supplier is the basic document providing a base figure for determining the cost of materials to be entered in the accounting books. This figure, however, is subject to adjustment and some other items may affect the cost of materials received. These items are:

Discounts

Discounts may be trade discount, cash discount and quantity discount.

Trade discount is allowed when a supplier sells the materials to a retailer who, in turn, resells the materials. Trade discount is deducted from the purchase price to determine the cost of materials purchased.

Cash discount is also known as purchase discount. Cash discount arises after the materials have been purchased and is offered by the supplier to his customer, provided payment is made at once or within an agreed stipulated time. There are two methods of treating such purchase or cash discounts.

1. The cash discount received while purchasing materials should be deducted from the invoice price of the materials. Thus, the materials cost price will be relatively reduced.

2. Alternatively, it may be treated as an item of financial nature (as additional income) and therefore be kept outside the purview of cost accounting. The full invoice price should be charged to the materials account crediting the suppliers with the net invoice price, and the discount earned account with the amount of cash discount received. It can be argued, however, that there is little justification for recording income on purchase; one can only earn income by selling or holding assets. Income is not produced by buying.

Quantity discount is a reduction in price given by a supplier to all large users of his product. This discount is deducted from the purchase price in arriving at the materials cost price. Also, this discount varies according to the size of the order for the purchase of materials.

Carriage Inwards on Raw Materials

It represents the expenditure incurred in bringing raw materials to the factory from outside and include sea, land and air freight, insurance, duties, dock charges, etc.

There is a difference of opinion as to treatment of carriage inwards. Accounting theory suggests that such charges are proper additions to the costs of materials purchased, since these costs are incurred in bringing the materials to the factory. But what is sound in theory is not always practicable, and deviations from theory are common. Where such costs are immaterial (small), or it is difficult to trace or even allocate such charges to specific items of materials (the cost to allocate such expenses to individual products outweighs the benefits to be obtained from such allocation), then these charges should be treated as an indirect manufacturing cost (factory overhead) which should be apportioned to product indirectly.

Material Handling Charges

The term "material handling costs" refers to the expense involved in receiving, storing, issuing and handling materials. Generally, such costs are part of the cost of materials and should be treated as a direct cost. But, in practice, such costs are most often treated as indirect costs. There is a practical difficulty in apportioning this cost to various materials items. The costs of operating the service departments involved in materials handling become a part of indirect manufacturing cost which is apportioned among the producing departments and then they are charged to product on labour hours, labour cost, machine hours, weight or any other appropriate basis.

COSTING MATERIALS ISSUED

Where materials have been purchased for a specific product or specific job, the cost of materials received is wholly debited (charged) to that job. But most often, materials are purchased for several products or jobs. If all purchases were made at the same price, there would be no problem in costing materials issued and in inventory valuation. However, purchases made at different times usually carry different prices and the stores ledger card shows not one but several prices for the same kind of materials. Therefore, it becomes essential to consider the price at which it should be charged to production. Several methods are in use concerning the pricing of materials issued from the storeroom. They may be listed as follows:

A. Cost Price Methods
   1. First-in, First-out (FIFO)
   2. Last-in, First-out (LIFO)
   3. Highest-in, First-out ((HIFO)
   4. Base Stock Price

B Average Price Methods
   1. Simple average
   2. Weighted average
   3. Periodic simple average
   4. Periodic weighted average
   5. Moving simple average method
   6. Moving weighted average method

C. Notional Price Methods
   1. Standard price
   2. Inflated price
   3. Replacement or market price

First-in, First-out (FIFO)

The FIFO method follows the principle that materials received first are issued first. After the first lot or batch of materials purchased is exhausted, the next lot is taken up for supply. It does not suggest, however, that the same lot will be issued from stores. Sometimes, all materials are tagged with their arrival date and issued in date order especially with stocks that deteriorate. The inventory is priced at the latest costs.

Advantages

A good system of inventory management requires that oldest units should be sold or used first and inventory should consist of the latest purchases. This is found in the FIFO method of costing. Under the FIFO method, management has little or no control over the selection of units in order to influence recorded profits. Valuation of inventory and cost of goods manufactured are consistent and realistic. Besides, the FIFO method is easy to understand and operate.

Disadvantages

The objectives of matching current cost with current revenues is not achieved under the FIFO method. If the prices of materials are rising rapidly, the current production cost may be understated. If the sales price is fixed, then sales revenue may not produce enough income to cover the purchase of raw materials. The valuation of inventory in terms of current cost depends on the frequency of price changes and the stock turnover. In case stocks turnover rapidly, the inventory valuations will reflect current prices. There are other limitations under the FIFO method. FIFO costing is improper if many lots are purchased during the period at different prices. This method overstates profit especially with high inflation. It does not consider the cost of replacing used materials, a situation created by high inflation.

The FIFO method is suitable where (i) the size and cost of raw materials units are large, (ii) materials are easily identified as belonging to a particular purchased lot, and (iii) not more than two or three different receipts of the materials are on hand at one time.

Example 4.1 explains the FIFO method of costing.

Example 4.1

The following is a summary of the receipts and issue of materials in a factory during January.

January

1. Opening balance 500 units @ Rs 25 per unit
3. Issue 70 units
4. Issue 100 units
8. Issue 80 units
13. Received from supplier 200 units @ Rs 24.50 per unit
14. Returned to store 15 units @ Rs 24 per unit
16. Issue 180 units
20. Received from supplier 240 units @ Rs 24.75 per unit
24. Issue 304 units
25. Received from supplier 320 units @ Rs 24.50 per unit
26. Issue 112 units
27. Returned to store 12 units @ Rs 24.50 per unit
28. Received from supplier 100 units @ Rs 25 per unit

Work out on the basis of First-in, First-out. This revealed that on the 15th there was a shortage of five units and another on the 27th of eight units.

(CA Inter)

Solution

Stores Ledger Account (FIFO)

	Receipts			Issue			Stock		
Date	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*
Jan.									
1	—	—	—	—	—	—	500	25.00	12,500
3	—	—	—	70	25	1,750	430	—	10,750
4	—	—	—	100	25	2,500	330	—	8,250
8	—	—	—	80	25	2,000	250	—	6,250
13	200	24.50	4,900	—	—	—	250	25.00	6,250
	Refund						200	24.50	4,900
14	15	24.00	360	—	—	—	250	25.00	6,250
							200	24.50	4,900
							15	24.00	360
15	—	—	shortage	5	25	125	245	25.00	6,125
							200	24.50	4,900
							15	24.00	360
16	—	—	—	180	25	4,500	65	25.00	1,625
							200	24.50	4,900
							15	24.50	360
20	240	24.75	5,940	—	—	—	65	25.00	1,625
							200	24.50	4,900
							15	24.00	360
							240	24.75	5,940
24	—	—	—	65	25.00	1,625			
				200	24.50	4,900			
				15	24.00	360			
				24	24.75	594			
							216	24.75	5,346
25	320	24.50	7.680	—	—	—	216	24.75	5,346
							320	24.50	7,680
26	—	—	—	112	24.75	2,772	104	24.75	2,574
							320	24.00	7,680
27	12	24.50	294	—	—	—	104	24.75	2,574
							320	24.00	7,680
	—	—	—	—	—	—	12	24.50	294
27	—	—	shortage	8	24.75	198	96	24.75	12,376
							320	24.00	7,680
							12	24.50	294
28	100	2,500	2,500	—	—	—	96	24.75	2,376
							320	24.00	7,680
							12	24.50	294
							100	25.00	2,500

Closing stock 528 units = Rs 12,750

Last-in, First-out (LIFO)

The LIFO method of costing and inventory valuation is based on the principle that materials entering production are the most recently purchased. The method assumes that the most recent cost, generally the replacement cost is the most significant in matching cost with revenue in the income determination. The cost of the last lot of materials received is used to price materials issued until the lot is exhuasted, then the next lot pricing is used, and so on through successive lots. The inventory is priced at the oldest costs.

Advantages

1. It provides a better matching of current costs with current revenues.
2. It results in real income in times of rising prices, by maintaining net income at a lower level than other costing methods.
3. In industries subject to sharp materials price fluctuations, the method minimises unrealised inventory gains and losses and tends to stabilise reported operating profits. Income is reported only when it is available for distribution as dividends or for other purposes.
4. Probably the most important arguments in favour of LIFO is its role in tax saving. It is generally considered a cheap form of tax avoidance by business firms. By valuing inventory at beginning-of-period prices and calculating cost of sales at the current prices, the firm creates secret reserves which are not taxed. As long as prices and inventory levels do not decline, this benefit remains and in this case the tax saving is permanent. However, if the tax rates go up in the meantime, the so-called tax saving will be eliminated by higher tax rates.
5. LIFO produces an income statement which shows correct profit or losses and financial position. It correlates current cost and sales, and income statements show the result of operation, excluding profits or losses due to changing price levels.

Disadvantages

The following are the limitations of the LIFO method of costing:

1. Inventory valuations do not reflect the current prices and therefore are useless in the context of current conditions.
2. The argument that LIFO should be used for matching current costs with current revenue, is not sound. The most recent purchase costs are matched against the revenues of the current period. However, unless both purchases and sales occur regularly in even quantities, the revenues will not be matched with the current costs at the time of sale. When purchases are irregular and unrelated to the timing of sales, the matching is illogical and unsystematic, particularly if prices and costs are changing rapidly.
3. The profit of a firm can be manipulated with the LIFO method in operation. By timing purchases, a company can cause higher or lower costs to flow into the income statement, thus increasing or decreasing reported net income at will.
4. Another limitation which also results from LIFO's lowering of the earnings figure is the effect it will have on existing bonus and profit sharing plans. Employees and managers who are interested in the growth of these plans may have difficulty in understanding a drop in the benefits which were created wholly or partially by an accounting change.

During a period of rising costs, LIFO produces the desirable effect of reducing taxable income and tax liability; thereby conserving cash. On the other hand, it also affects the profit reported in the financial statements.

Example 4.2

Prepare a stores ledger account from the following transactions under the LIFO method.

Jan.	1	Received 1,000 units @ Re 1.00 per unit
	10	Received 260 units @ Rs 1.05 per unit
	20	Issued 700 units
Feb.	4	Received 400 units @ Rs 1.15 per unit
	21	Received 300 units @ Rs 1.25 per unit
March	16	Issued 620 units
April	12	Issued 240 units
May	10	Received 500 units @ Rs 1.10 per unit
	25	Issued 380 units

Solution

Stores Ledger Account (LIFO)

	Receipt			*Issue*			*Stocks*		
Date	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*
1	2	3	4	5	6	7	8	9	10
January									
1	1,000	1.00	1,000	–	–	–	1,000	1.00	1,000
10	260	1.05	273	–	–	–	1,260		1,273
20	–	–	–	260	1.05	273	560		560
				440	1.00	440			
February									
4	400	1.15	460	–	–	–	960		1,020
21	300	1.25	375	–	–	–	1,260		1,395
March									
16	–	–	–	300	1.25	375	640		652
				320	1.15	368			
April									
12	–	–	–	80	1.15	92	400		400
				160	1.00	160			
May									
10	500	1.10	550	–	–		900		950
25	–	–	–	380	1.10	418	520		532

The Closing Stock consists of
120 units at Rs 1.10 = 132
400 units at Re 1.00 = 400
Rs 532

Highest-in, First-out (HIFO)

This method is based on the principle that materials received at the highest price in the stock are issued first. This will have the effect of pricing materials issued at the highest price and inventory valuation

being made at the lowest possible prices. If the prices fluctuate widely, the highest cost will always be entering into the cost of goods sold. For instance, suppose on a particular date the stock ledger shows stock representing 500 units at the rate of Rs 20,700 units at the rate of Rs 12, and 300 units at the rate of Rs 25. If materials are issued, then out of the above three lots, first of all 300 units would be issued. After this lot is over, then the second lot of 500 units, which becomes the highest priced stock after despatches of 300 units, would be taken up for transmission to production departments. Like other methods, this method also requires detailed records on the stores ledger.

Base Stock Price

Under this method it is assumed that the minimum stock of a commodity which must always be carried is in the nature of a fixed asset and is never realised while the business continues. This minimum stock is carried at original cost. The stock in excess of this figure would be treated in accordance with one of the other methods, i.e., FIFO or LIFO. The limitation of this method is that while measuring the return on capital employed in the business, the stock value may be under-valued and therefore the resulting business results will not be reliable.

Example 4.3

From the following information prepare a stores ledger account assuming 100 units as base stock following the FIFO method:

Rate		*Rate per unit (Rs)*
January 1, 2002	Received 500 units	20
January 10	Received 300 units	24
January 15	Issued 700 units	—
January 20	Received 400 units	28
January 25	Issued 300 units	—
January 27	Received 500 units	22
January 31	Issued 200 units	—

Solution

Stores Ledger Account
Base Stock Price with FIFO (minimum stock 100 units)

	Receipts			*Issue*			*Stock*		
Date	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*
2002									
Jan. 1	500	20	10,000	–	–	–	500	20	10,000
Jan. 10	300	24	7,200				500	20	10,000
							300	24	7,200
Jan. 15	–	–	–	400	20	8,000	100	20	2,000
				300	24	7,200			
Jan. 20	400	28	11,200	–	–	–	400	28	11,200
Jan. 25	–	–	–	300	28	8,400	100	20	2,000
							100	28	2,800

Date	Receipt			Issue			Stocks		
	Qty	Rate	Amt	Qty	Rate	Amt	Qty	Rate	Amt
Jan. 27, 2002	500	22	1100				500	22	11,000
Jan. 31	–	–	–	100	28	2,800	100	20	2,000
				100	22	2,200	400	22	8,800

Simple Average

This method is based on the principle that materials issued should be priced on an average price and not on exact cost price. The simple average is an average of prices without having regard to the quantities involved. It should be used when prices do not fluctuate very much and the stock value is small. The average under this method is calculated by dividing the total of rates of materials in the storeroom by the number of rates of prices. This method is easy to operate.

Example 4.4

Prepare a stores ledger account by following the simple average method on the basis of information given in Example 4.3.

Solution

Stores Ledger Account
(Simple Average Price Method)

Date	Receipt			Issue			Stocks		
	Qty	Rate	Amt	Qty	Rate	Amt	Qty	Rate	Amt
2002									
Jan. 1	500	20	10,000	–	–	–	500	20	10,000
Jan. 10	300	24	7,200	–	-	–	500	20	10,000
							300	24	7,200
Jan. 15	–	–	–	700	22	15,400	100		1,800
Jan. 20	400	28	11,200	–	–	–	500		13,000
Jan. 25	–	–	–	300	26	7,800	200		5,200
Jan. 27	500	22	11,000	–	–	–	700		16,200
Jan. 31	–	–	–	200	25	5,000	500		11,200

Average price for different issues has been calculated as follows:

Jan. 15	700 units = 20 + 24/2 = Rs 22 per unit
Jan. 25	300 units = 24 + 28/2 = Rs 26 per unit
Jan. 31	200 units = 28 + 22/2 = Rs 25 per unit

Weighted Average

Under this method, issue of materials is priced at the average cost price of the materials in hand, a new average being computed whenever materials are received. In this method, total quantities and total costs are considered while computing the average price and not the total of rates divided by total number of rates as in simple average. The weighted average is calculated each time a purchase is made. The quantity bought is added to the stock in hand, and the revised balance is then divided into the new cash value

of the stock. The effect of early price is thus eliminated. This method avoids fluctuations in price and reduces the number of calculations to be made, as each issue is charged at the same price until a fresh purchase necessitates the computation of a new average. It gives an acceptable figure for stock values.

Advantages

The following are the advantages of the weighted average method:

1. The method is logical and consistent as it absorbs cost while determining the average for pricing material issues.
2. The changes in the prices of materials do not much affect the materials issues and stock.
3. The method follows the concept of total stock and total valuation.
4. Both cost of materials issued and in stock tend to reflect actual costs.

Disadvantages

However, the weighted average method also has the following disadvantages:

1. Simplicity and convenience are lost when there is too much change in the prices of materials.
2. An average price is not based on actual price incurred, and therefore is not realistic. It follows only arithmetical convenience.

Example 4.5

Prepare a store ledger account on the basis of information given in Example 4.3 by following the weighted average method.

Solution

	Receipts			*Issue*			*Stocks*		
Date	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*
2002									
Jan. 1	500	20	10,000	–	–	–	500	20	10,000
Jan. 10	300	24	7,200	–	–	–	800	21.50	17,200
Jan. 15	–	–	–	700	21.50	15,050	100		2,150
Jan. 20	400	28	11,200	–	–	–	500	26.70	13,350
Jan. 25	–	–	–	300	26.70	8,010	200		5,340
Jan. 27	500	22	11,000	–	–	–	700	23.34	16,340
Jan. 31	–	–	–	200	23.34	4,668	500		11,672

Periodic Simple Average

In cost accounting, where job costs may be prepared infrequently, say monthly, or bimonthly, it may be necessary to price materials issued by taking the average price ruling during that period. If it is calculated monthly, the average of the unit prices of all the receipts during the month is adopted as the rate for pricing issues during the month. Only a simple calculation has to be done at the end of the accounting period. The opening stock is not considered for computing periodic simple average because it has not been purchased during the current period and would have been included in the previous year's calculations. However, purchases made during the current year and closing stock are taken into account while computing this average. Basically, this method follows the principle of simple average price, but a period is set for which the average is calculated. Taking the above example, the total receipts and issue of the materials would be shown as follows:

Receipts			Issues		
Qty	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*
1,700	94	39,400	1,200	23.50	28,200

$$\text{The periodic simple average} = \frac{\text{Total prices of the materials}}{\text{Total no. of prices}}$$

$$= \frac{94}{4} = \text{Rs } 23.50$$

Closing stock = Units 1700 – 1200 = 500

= Rs 39,400 – 28,200 = Rs 11,200.

The above rate, i.e., Rs 23.50 per unit will be used for pricing the materials issued during the period.

Periodic Weighted Average

This method is quite similar to the weighted average price method with only one difference that in this method average price is not calculated at the time of every new receipt of materials but only periodically. Periodic weighted average is calculated by dividing the total value of the materals purchased during a given period, by the total quantity purchased during the same period. Opening stock-its value and quantity both—are not considered while computing this average. In the above example, the periodic weighted average will be computed as follows:

Receipts			Issues		
Qty	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*
Total 1,700		39,400	1200	23.18	27,816

Closing stock quantity = 500

Amount = Rs 11,584

Periodic weighted average

$$= \frac{\text{Total cost of materials purchased}}{\text{Total quantity purchased}}$$

$$= \frac{39,400}{1,700}$$

$$= 23.18$$

Moving Simple Average

Under this method periodic simple average prices are further averaged. In this way moving average is obtained by dividing periodic average prices (of different periods by the number of periods taken. The periods chosen cover the period in which the material is issued. The following example explains this method.

Months	*Periodic average price (Rs)*	*Moving average price (Rs)*
January	2.55	
February	2.65	

Months	*Periodic average price (Rs)*	*Moving average price (Rs)*
March	2.72	
April	2.95	
May	3.15	
June	3.25	2.88
July	3.40	3.02
August	3.50	3.16
September	3.68	3.32
October	3.80	3.46
November	3.90	3.59
December	4.15	3.74

In the above example, moving average has been obtained for a six month period.

The moving simple average method will give prices to be used for materials issues which are below the periodic average prices. This will be true when prices are showing an upward trend. In periods of falling prices, the resulting issue prices under the moving average method will be greater than the periodic average prices. This influences the value of closing stock which may be under-valued or over-valued.

Moving Weighted Average

This method finds the materials issues price by dividing the total of the periodic weighted average prices for a number of periods by the total number of such periods. This is similar to the moving simple average method.

Standard Price

This method charges materials units into the factory at a predetermined budgeted, or estimated price reflecting a normal or an expected future price. A standard price is fixed for each class of materials in advance after making proper investigations. Receipts and issues of materials are recorded in quantities only on the materials ledgers, thereby simplifying the record-keeping. The difference between actual price and standard price is transferred to a purchase price variance which reveals to what extent actual costs are different from standard materials cost. Materials are charged into cost of goods sold at the standard price avoiding inconsistencies in different actual cost methods.

This method helps in knowing the purchase efficiency. If the total actual cost is less than the standard price, there will be favourable purchasing efficiency and vice-versa. This method is simple to operate and provides stability in costing system. However, standard price does not often reflect actual or expected cost, but only a generalised target. The stock value need not show actual cost incurrence and therefore does not necessarily conform to acceptable principles of stock valuation.

Inflated Price

This price includes carrying costs, cost of contingencies and also the losses arising out of evaporation, shrinkage, etc. This method aims to cover/recover the full cost of materials purchased.

Replacement Price or Market Price

Under this method materials issues are priced at replacement price on the date the issue is made. The replacement cost (market price) is the cost of securing the same type of material at the current moment in time. This method has the following advantages:

Advantages

1. The replacement cost approach matches current revenue against current cost and is therefore useful in measuring the operating results of a business firm correctly and accurately.

2. The use of replacement cost brings out clearly the difference between holding gains and operating gains and financial statement users will have a better understanding of the financial statement. If replacement cost is not used, the profit resulting due to holding of materials and inventory is taxed and therefore, impairs the capital of a business firm.

3. The replacement price if used, will disclose good or bad buying made by the purchase department of the firm.

4. The replacement cost approach helps in determining a selling price for the product which is competitive and realistic.

5. In case the prices of materials have decreased, the materials should be charged to the production at the current replacement price and the resulting loss should be taken into consideration in the accounts of the firm.

Disadvantages

However, this method has certain disadvantages. Firstly, the objectivity is lost in accepting the replacement cost as the basis of materials pricing. The "replacement" concept is a relative one and in the absence of market for the materials, no equitable replacement price is determinable. This increases the subjectivity in selection of a current replacement price. Secondly, this is not based on actual cost, i.e., cost incurred, and therefore may add confusion and complications in cost accounting. Thirdly, this method is workable only when market prices are available and reflect current cost of replacing the materials.

Example 4.6

The following are the transactions in respect of purchase and issue of components forming part of an assembly of a product manufactured by a firm which requires to update its cost of production, very often for bidding tenders and finalising cost plus contracts.

Date	*Quantity (in Nos)*		*Particulars*
2001 January	5	1,000	purchased at Rs 1.20 each
	11	2,000	issued
February	1	1,500	purchased Rs 1.30 each
	18	2,400	issued
	26	1,000	issued
March	8	1,000	purchased at Rs 1.40 each
	17	1,500	purchased at Rs 1.30 each
	28	2,000	issued

The stock on January 1, 2001 was 5,000 Nos valued at Rs 1.10 each. State the method you would adopt in pricing the issue of components giving reasons. What value would be place on stocks as on

March 31 which happens to be the financial year-end and how would you treat the difference in value if any, on the stock account? *(ICWA Inter)*

Solution

Stores Ledger

	Receipts			*Issues*			*Balance*		
Date	*Qty*	*Rate*	*Value*	*Qty*	*Rate*	*Value*	*Qty*	*Rate*	*Value*
Jan. 1							5,000	1.10	5,500
5	1,000	1.20	1,200				6,000		6,700
11				1,000	1.20	1,200			
				1,000	1.10	1,100	4,000		4400
Feb. 1	1,500	1.30	1,950				5,500		6,350
18				1,500	1.30	1,950			
				900	1.10	990	3100		3410
26				1,000	1.10	1,100	2,100		2.310
Mar. 8	1,000	1.40	1,400				3,100		3,710
17	1,500	1.30	1,950				4,600		5660
28				1,500	1.30	1,950			
				500	1.40	700	2,600		3,010
31							2,600		3,010

Note: The closing stock consists of 500 units @ Rs 1.40 = Rs 700

2,100 units @ Rs 1.10 = Rs 2,310

2,600 Rs 3,010

The stores ledger shows that the value of closing stock based on actual cost is Rs 3,010. The last purchase effected on March 17 @ Rs 1.30 per unit represents the current market price. On this basis, the value of stock as on March 31 works out to Rs 3,380. This is higher than cost. Moreover in cost books stocks are shown at cost and not at market value. Hence, no adjustment is otherwise necessary.

Example 4.7

From the records of an oil distributing company, the following summarised information is available for the month of March 1996.

Sales of the month: Rs 19,25,000

Opening Stock as on 1.3.1996: 1.25,000 litres @ Rs 6.50 per litre

Purchases (including freight and insurance):

March 5	150,000 litres @ Rs 7.10 per litre
March 27	100,000 litres @ Rs 7.00 per litre

Closing stock as on 31.3.96: 1,30,000 litres.

General administrative expenses for the month: Rs 45,000

On the basis of the above information, work out the following using FIFO and LIFO methods of inventory valuation assuming that pricing of issues is being done at the end of the month after all receipts during the month:

(a) Value of closing stock as on 31.3.96
(b) Cost of goods sold during March 1996
(c) Profit or loss for March 1996

(ICWA Inter)

Solution

(A) FIFO METHOD OF PRICING ISSUES

Stores Ledger

Date	Particulars	Receipts			Issues			Balance		
		Qty litre	Rate Rs per litre	Value Rs	Qty litres	Rate Rs per litre	Value Rs	Qty litres	Rate Rs per litre	Value Rs
1.3.96	Balance b/d							1,25,000	6.50	8,12,500
5.3.96	Purchases	1,50,000	7.10	10,65,000				2,75,000		18,77,500
27.3.96	Purchases	1,00,000	7.00	7,00,000				3,75,000		25,77,500
	Issues (3,75,000 – 1,30,000 = 2,45,000 units)				1,25,000	6.50	8,12,500	2,50,000		17,65,000
					1,20,000	7.10	8,52,000	1,30,000		9,13,000
		2,50,000		17,65,000	2,45,000		16,64,500			

(B) LIFO METHOD OF PRICING ISSUES

Stores Ledger

Date	Particulars	Receipts			Issues			Balance		
		Qty litres	Rate per litre Rs	Value Rs	Qty litres	Rate per litre Rs	Value Rs	Qty litres	Rate per litre Rs	Value Rs
1.3.96	Balance b/d							1,25,000	6.50	8,12,500
5.3.96	Purchases	1,50,000	7.10	10,65,000				2,75,000		18,77,500
27.3.96	Purchases	1,00,000	7.00	7,00,000				3,75,000		25,77,500
	Issues				1,00,000	7.00	7,00,000			
					1,45,000	7.10	10,29,500	1,30,000		8,48,000
		2,50,000		17,65,000	2,45,000		17,29,500			

Closing stock, cost of goods sold, profit under FIFO

(a)	Value of closing stock		Rs 9,13,000
(b)	Cost of goods sold (8,12,500 + 8,52,000)		Rs 16,64,500
(c)	Profit		
	Sales		Rs 19,25,000
Less:	Cost of goods sold		Rs (16,64,500)
	General administration expenses Rs		(45,000)
	Profit		Rs 2,15,500

Closing stock, cost of goods sold, profit under LIFO

(a)	Value of closing stock		Rs 848,000
(b)	Cost of goods sold (7,00,000 + 10,29,500)		Rs 17,29,500
(c)	Profit:		
	Sales		Rs 19,25,000
Less:	Cost of goods sold	17,29,500	
	General administration expenses	45,000	17,74,500
	Profit		Rs 1,50,500

Example 4.8

From the following details of stores receipts and issues of material "EXA" in a manufacturing unit, prepare the Stock Ledger using "Weighted Average" method of valuing the issues:

Nov. 1 Opening stock 2,000 units @ Rs 5 each.
Nov. 3 Issued 1,500 units to Production.
Nov. 4 Received 4,500 units @ Rs 6.00 each.
Nov. 8 Issued 1,600 units to Production.
Nov. 9 Returned to stores 100 units by Production Department (from the issues of November, 3).
Nov. 16 Received 2,400 units @ Rs 6.50 each.
Nov. 19 Returned to the supplier 200 units out of the quantity received on November, 4.
Nov. 20 Received 1,000 units @ Rs 7.00 each.
Nov. 24 Issued to Production 2,100 units.
Nov. 27 Received 1,200 units @ Rs 7.50 each.
Nov. 29 Issued to Production 2,800 units.
(use rates upto two decimal places).

(ICWA Inter.)

Solution

Stock Ledger: Material "EXE"
(Weighted Average Method)

Date	*Reference*	*Receipts*			*Issues*			*Balance*		
		Qty Units	*Rate Rs*	*Amount Rs*	*Qty Units*	*Rate Rs*	*Amount Rs*	*Qty Units*	*Rate Rs*	*Amount Rs*
Nov. 1	Opening Balance							2,000	5.00	10,000
3	Issues to Production				1,500	5.00	7,500	500	5.00	2,500
4	Receipts	4,500	6.00	27,000				5,000	5.90	29,500
8	Issues to Production				1,600	5.90	9,440	3,400	5.90	20,060
9	Returns by Production	100	5.00	500				3,500	5.87	20,560
16	Receipts	2,400	6.50	15,600				5,900	6.13	36,160
19	Returns to Supplier				200	6.00	1200	5,700	6.13	34,960
20	Receipts	1,000	7.00	7,000				6,700	6.26	41,960
24	Issues to Production				2900	6.26	13,446	4,600	6.26	28,814
27	Receipts	1,200	7.50	9,000				5,800	6.52	37,814
29	Issues to Production				2,800	6.52	18,256	3,000	6.52	19,558

Value of Closing Stock: Rs 19,558

Example 4.9

The Stock Ledger Account for Material X in a manufacturing concern reveals the following data for the quarter ended Sept. 30, 2002.

	Receipts		*Issues*	
	Quantity Units	*Price Rs*	*Quantity Units*	*Price Rs*
July 1 Balance b/d	1,600	2.00	–	–
July 9	3,000	2.20	–	–
July 13	–	–	1,200	2,556
Aug. 5	–	–	900	1,917
Aug. 17	3,600	2.40	–	–
Aug. 24	–	–	1,800	4,122
Sept. 11	2,500	2.50	–	–
Sept. 27	–	–	2,100	4,971
Sept. 29	–	–	700	1,656

Physical verification on Sept. 30, 2002 revealed an actual stock of 3,800 units. You are required to:

(a) Indicate the method of pricing employed above.

(b) Complete the above account by making entries you would consider necessary including adjustments, if any, and giving explanations for such adjustments.

(ICWA Inter.)

Solution

(a) The verification of the value of issues applied in the problem shows that Weighted Average Method of pricing has been followed. For example, the issue price of 1200 units of July 13 will be

$$\text{Rs } 2.13 \left(\frac{\text{Rs } 2556}{1200 \text{ units}} \right)$$ which is the weighted average price of purchases made on July 9 and July 1 opening stock, calculated as follows:

$$\text{Weighted average price} = \frac{(1600 \text{ units} \times \text{Rs } 2) + (3000 \text{ units} \times \text{Rs } 2.20)}{1600 \text{ units} + 3000 \text{ units}}$$

$$= \frac{\text{Rs } 9800}{4600 \text{ units}}$$

$$= \text{Rs } 2.13$$

(b) The complete Stores Ledger account giving the transactions as stated in the problem together with the necessary adjustments is given below:

Stores Ledger Account (Weighted Average Method)

Date		*Receipts*			*Issues*			*Balance*		
		Qty Rs	*Rate* Rs	*Amount* Rs	*Qty* Rs	*Rate* Rs	*Amount* Rs	*Qty*	*Rate*	*Amount*
July	1	1600	2.00	3,200				1,600	2.00	3,200
	9	3,000	2.20	6.600				4,600	2.13	9,800
	13				1200	2.13	2,556	3,400	2.13	7,244
Aug.	5				900	2.13	1,917	2,500	2.13	5,327
	17	3,600	2.40	8,640				6,100	2.29	13,967
	24				1800	2.29	4,122	4,300	2.29	9,845
Sept.	11	2,500	2.50	6,250				6,800	2.37	16,095
	27				2100	2.37	4,971	4,700	2.37	11,124
	29				700	2.37	1,656	4,000	2.37	9,468
	30				*200	2.37	473	3,800	2.37	8,995

Closing Stock: 3,800 units, value of closing stock = Rs 8,995

* Shortage of 200 units has been charged at the weighted average price of the goods in stock. Closing stock 3800 units × Rs. 2.37 = Rs = Rs 9006. Since the figures of issue prices have been taken directly as given in the question, there is a minor difference in the value of closing stock.

Example 4.10

The following transactions in respect of maerial Y occurred during the six months ended 30th June, 2000.

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

Required:
The chief accountant argues that the value of closing stock remains the same, no matter which method of pricing of material issues is used. Do you agree? Why or why not? Detailed stores ledgers are not required.

(CA Inter)

Solution
In the given problem the total number of units purchased from January to May 2000 is 1,900 and the same have also been issued during this period. Thus, there was no stock at the end of May, 2000 which could become opening stock for the next month. In June, 2000; only a single purchase and a single issue of material was made. The closing stock is of 200 units. In this situation, stock of 200 units at the end of June, 2000 will be valued at Rs 20 per unit irrespective of the pricing method of material issues. Hence, one would agree with the argument of the Chief Accountant.

However, this will not be true with the value of closing stock at the end of each month. Moreover, the value of closing stock at the end of June, 2000 would have been different under different pricing methods if there were several purchases at different prices and several issues during the month.

Example 4.11

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

Invoice	*Rs*
200 units Part No. A 32 @ Rs. 5	1,000.00
Less 20% Discount	200.00
	800.00
Add Excise Duty @ 15%	120.00
	920.00
Add Packing Charges (5 non-returnable boxes)	50.00
	970.00

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

(C.A. Inter Nov. 1995)

Solution

Computation of Purchase Price per Unit

	Rs
(a) Net Cost of 200 units after trade discount	800
Less Packing Charges	50
Total Cost for 200 units	850
Cost per unit = $\frac{\text{Rs } 850}{200}$ = Rs 4.25	

Example 4.12

ABC Limited provides you the following information. Calculate the cost of goods sold and ending inventory, applying the LIFO method of pricing raw materials under the Perpetual and Periodical Inventory Control Systems.

Date		*Particulars*	*Units*	*Per unit cost (Rs)*
January	1	Opening Stock	200	10
	10	Purchases	400	12
	12	Withdrawals	500	–
	16	Purchases	300	11
	19	Issues	200	–
	30	Receipts	100	15

Also explain in brief the reasons for a difference in profit, if any.

(B. Com. Hons Delhi 1996)

Solution

Computation of Cost of Goods Sold & Ending Inventory

Particulars	*Under Perpetual Inventory Method*		*Under Periodic Inventory Method*	
	Units × Rate = Amount	*Rs*	*Units × Rate = Amount*	*Rs*
(i) Cost of Goods sold/withdrawn or issued:				
On 12th Jan.	400 × 12 = 4,800		100 × 15 = 1,500	
	100 × 10 = 1,000		300 × 11 = 3,300	
			300 × 12 = 3,600	
		5,800	700	Rs. 8,400
On 19th Jan.	200 × 11 = 2,200			
	Total Rs 8,000			
(ii) Ending Inventory	100 × 10 = 1,000		100 × 12 = 1,200	
	100 × 11 = 1,100		200 × 10 = 2,000	
	100 × 15 = 1,500			
	300	Rs 3,600	300	Rs 3,200

Reasons for Difference in Profits. The cost of good sold/issued/withdrawn is more under Periodic Inventory System as compared to Perpetual Inventory System. Hence the profit under the former will be less as compared to the later. Alternatively, it can be so said that less the amount of ending inventory, less will be the profits.

Example 4.13

The particulars relating to 1,200 kg of a certain raw material purchased by a company during June, were as follows:

(a) Lot prices quoted by supplier and accepted by the company for placing the purchase order

Lot up to 1,000 kg	@ Rs 22 per kg	F.O.R.
Between 1,000 – 1,500 kg	@ Rs 20 per kg	Supplier's
Between 1,500 – 2,000 kg	@ Rs 18 per kg	Factory

(b) Trade discount 20%
(c) Additional charge for containers @ Rs 10 per drum of 25 kg
(d) Credit allowed on return of containers @ Rs 8 per drum.
(e) Sales Tax at 10% on raw material and 5% on drums.
(f) Total freight paid by the purchaser Rs 240.
(g) Insurance at 2.5% (on Net Invoice Value) paid by the purchaser.
(h) Stores overhead applied at 5% on total purchase cost of material.

The entire quantity was received and issued to production. The containers are returned in due course. Draw up a suitable statement to show:

(a) Total cost of material purchased; and
(b) Unit cost of material issued to production

(ICWA Inter.)

Solution

Statement of Total and Per Unit Cost of Materials

Particulars	*Total amount* Rs	*Per unit* Rs
Raw material 1200 kg at Rs 20 per kg	24,000.00	20.00
Less: Trade discount @ Rs 20% thereof	4,800.00	4.00
	19,200.00	16.00
Add: Charge for containers	480.00	0.40
48 drums* @ Rs 10 each (*1200 kg ÷ 25 kg per drum)	19,680.00	16.40
Sales tax:		
10% on Rs 19,200 (raw material)	1,920.00	1.60
5% on Rs 480 (drums)	240.00	0.02
Net Invoice Value	21,624.00	18.02
Freight paid	240.00	0.20
Insurance at 2.5% on Rs 21,624	540.00	0.45
	22,404.60	18.67
Less: Credit for containers 48 in number @ Rs 8 each	384.00	0.32

Particulars	*Total amount* Rs	*Per unit* Rs
	22,020.60	18.35
	1,101.03	0.92
Stores overhead charges at 5%		
Total	23,121.63	19.27

Example 4.14

The following are the particulars regarding receipts and issues of certain material:

Opening stock	1,000 kg @ Rs 9.00 per kg
Purchased	5,000 kg @ Rs 8.50 per kg
Issued	600 kg
Issued	3,750 kg
Issued	650 kg
Purchased	2,500 kg @ Rs 8 per kg

The credit balance of price variance account, before transfer to costing profit and loss account, was Rs 500.

Calculate the standard rate at which the above issues should be made, and determine the value of closing stock.

Solution

The standard price at which the materials were issued in the last period was Rs 9. This gave a profit of Rs 500.

Therefore, this time, materials should be valued at a lower standard price as compared to last period. The standard price for this period should therefore be:

$$\frac{\text{Rs } 9{,}000 - \text{Rs } 500}{1{,}000} = \frac{\text{Rs } 8{,}500}{1{,}000} = \text{Rs } 8.50 \text{ per kg}$$

Value of the Closing Stocks:

Opening stock	1,000	per kg @ Rs 9	Rs 9,000
Purchases	5,000	kg @ Rs 8.50	42,500
Purchases	2,500	kg @ Rs 8	20,000
	8,500		71,500
Less: Issues	5,000	@ Rs 8.50	42,500
Balance	3,500	units	RS 29,000

The value of stock at standard price is Rs 29,750 (3500 × 8.50). The stock therefore will be valued at Rs 29,750 and Rs 750 will be debited to the price variance account.

Example 4.15

The annual accounts of a trading company are to be made up to December 31 but it was not possible to carry out a stock-taking until January 5 at which date the stock was valued at cost at Rs 68,567. The following transactions took place between 1st and 5th January:

	Rs
Goods received	4,600
Goods returned	200
Sales	10,500
Returns by customer	625

The rate of gross profit is 25% of cost.

Prepare a statement to show the valuation of stock as at 31st December.

Solution

Statement Showing the Valuation of Stock

		Rs	*Rs*
Stock as at 5th January			68,567
Add:	Goods returned		200
	Cost of goods sold:	10,500	
	Sales		
Less:	Gross profit $\left(\frac{25}{125} \times 10{,}500\right)$	2,100	
			8,400
			77,167
Less:	Goods received	4,600	
	Returns by customers	625	
			5,225
	Valuation of Stock on 31st December		71,942

PRICING OF MATERIALS RETURNED TO VENDOR

A business firm may return materials to a supplier. In the financial books, purchase returns are valued at the price at which they are purchased. In cost accounting the following rules are generally applicable as to the valuation of such purchase returns.

1. In case the firm is following the FIFO method, the materials returned to the supplier would be valued at the price of the oldest goods in stock on the date on which the materials are returned.

2. The materials returned would be valued at the price of the latest units received and still in stock, if the firm is following the LIFO method.

3. Purchase returns would be valued at average price if the firm is following the average price method. The Quantity and value of materials returned are shown generally in the issues column. Alternatively, they may be shown in the receipts column in red ink.

Example

200 units were received from A @ Rs 4 per unit

200 units were received from B @ Rs 5 per unit

50 units received from A were returned to him.

In the first situation (when the firm is following FIFO method), assume 300 units were issued to production. In this, 50 units will be valued @ Rs 5 per unit. However, if only 100 units were issued to production, then 50 units will be valued @ Rs 4 per unit under FIFO method.

In the second situation (LIFO method), if 300 units have already been issued to production, 50 units will be valued @ Rs 4 per unit. However, if only 100 units have been issued to production, then 50 units returned to A will be valued @ Rs 5 per unit.

In the third situation, when the firm is following average price method, units returned will be valued in terms of average price (simple or weighted average as the case may be). Simple average or weighted average price will be calculated in the manner as explained earlier in this chapter.

PRICING OF MATERIALS RETURNED TO STOREROOM

When materials are returned from requisitioning departments to the storeroom for credit, the problem arises as to the proper method of handling such returns in stock ledger sheets. The following rules apply in this regard.

1. In case the firm is following the LIFO or FIFO method, the returned materials should be recorded at a price at which they have been originally issued and those units will be issued at the old price on the next requisition which is received. Alternatively, they may be treated as new purchases and retaining the original pricing, they can be given a position after the last purchase received.
2. If the firm is following the average price method, the returned materials should be recorded at the price originally issued, but a new average cost should be computed as if the goods returned were a new purchase.
3. Materials returned can be recorded at the current issue price also. That is, materials returned are priced at a price at which materials have been issued on the date of returns from the stores department. In this way, in this method, the issue price of materials (on the date of returns) is used to price materials returned to storeroom. In this method, there is no need to search original issue price of the materials returned and thus, this method saves time and clerical work.

The quantity and value of materials returned to the storeroom should be shown in the Issues column in red ink or alternatively they may be shown in the Receipts column.

SELECTION OF A MATERIALS PRICING METHOD

The various methods which are in use have advantages and disadvantages from the viewpoint of both convenience and accounting aspects. The factors which should be taken into consideration while deciding materials pricing methods are as follows:

1. Customs and practices within the industry or group of companies: This produces more comparable figures.
2. Frequency of price fluctuations and frequency of materials purchases.
3. Relative value of materials cost to total cost of products or jobs manufactured.
4. Range of price fluctuations.
5. Relative rate of stock turnover.
6. Quantities of materials to be purchased at any one time.
7. The effect of the different pricing methods on tax liability.
8. The accuracy with which materials issues can be computed.
9. Cost of clerical work involved in maintaining records.
10. The possibility of using different methods for various classes of items in the inventory.
11. The relationship of selling prices to the costs that are matched with those prices.

Costing materials present important, often complex and sometimes highly controversial questions concerning the valuation of materials used in production and the value of inventory remaining to be consumed at a future period. The different methods of materials pricing are difficult to compare adequately; this is a complex task. Some industries prefer the use of market prices for charging materials into production; market prices are the prices prevailing at the time the materials are used. These are the prices which would have to be paid if the materials were purchased at the time. This approach to materials costing has been gaining popularity over the recent years. This method reflects the current position, the current cost and the efficiency of purchasing done by a firm. In periods of rising prices, lowest material cost will flow into production under FIFO, highest materials cost under LIFO, and average costing will produce a material cost figure which is between FIFO and LIFO figures. In a period of falling prices the reverse situation will be found i.e., FIFO will show the highest cost of materials used, LIFO the lowest cost of materials used, and average costing will show a cost figure between FIFO and LIFO figures.

It is true that no one best method can be suggested, which is applicable to all situations; pricing methods may vary within the same company. It must be emphasised that whatever method is adopted, it must be consistently used from period to period. The most appropriate method is the one which produces accurate and meaningful cost figures for purposes of control and analysis and matching costs against revenue produced in order to determine the net operating income.

THEORY QUESTIONS

1. What are the methods of pricing materials issues? When do you advocate pricing the issues at cost price based on last-in, first-out? *(CA Inter)*
2. State the various methods of pricing the issue of materials or stores. State the method to be adopted for the issue of materials for an industry where their cost is fluctuating constantly. *(B .Com. Delhi)*
3. Explain the following two methods of pricing issue of materials and also the circumstance under which these methods are used.
   (i) FIFO
   (ii) LIFO
   (ICWA Inter)
4. Describe the following methods of valuing materials issued to production and discuss the advantage and disadvantage of each?
   (i) First-in, First-out; (ii) Weighted Average; (iii) Replacement Price.
   (CA Inter)
5. Explain the FIFO methods of valuation of materials issues. Discuss the effects of rising prices and falling prices on these two methods of pricing of materials issues.
   (CA Inter)
6. What factors have to be considered for adopting a method for the pricing of materials? In the light of these and relevant factors, give a comparative description of LIFO and FIFO.
   (B. Com. (Hons) Delhi 2000)
7. What are the conditions that favour the adoption of the Last-in, First-out system of materials pricing ? Explain its working and indicate its advantages and limitations. *(CA Inter.)*
8. Give the advantages and disadvantages of the actual cost basis of pricing of material issues.
   (B. Com. (Hons), Delhi)

9. Under conditions of rising prices, which of the following two methods of pricing material issues would you recommend and why?
   (i) FIFO
   (ii) LIFO

   (B. Com. (Hons), Delhi)
10. Briefly contrast the effects of using first-in, first-out with the last-in, first-out methods of pricing material issues from stores. *(B. Com. (Hons), Delhi)*
11. Write short notes on:
   (i) LIFO vs FIFO
   (ii) Bill of Materials
   (iii) Prepetual Inventory System.

SELF-EVALUATION QUESTIONS

1. Which method of materials pricing best approximates specific identification of the actual flow of costs and units in most manufacturing situations
   (a) Average cost (b) FIFO
   (c) LIFO (d) Base stock
2. Alpha company was using FIFO (and not LIFO) for materials pricing and its value of inventory was found lower. Assuming no opening inventory, what direction did the purchase prices move during the period?
   (a) Up (b) Down
   (c) Steady (d) Cannot be determined
3. A materials pricing method in which the oldest cost incurred rarely have an effect on the closing inventory valuation is
   (a) FIFO (b) LIFO
   (c) Simple average (d) Weighted average
4. Alpha company has been using LIFO method of materials pricing for 15 years. Its 2002 closing inventory was Rs 15,000 but it would have been Rs 26,000 if FIFO had been used. Thus, if FIFO had been used, this company's net income before taxes would have been
   (a) Rs 11,000 less over 15-year period
   (b) Rs 11,000 greater over 15-year period
   (c) Rs 11,000 greater in 2002
   (d) Rs 11,000 less in 2002

PROBLEMS

1. You are presented with the following information by Sphix Engineering Co. relating to the first week of September, 2002
   Materials—The transactions in connection with the materials are as follows

	Receipts		*Issues*
Days	*Units*	*Rate per unit (Rs)*	*Units*
1st	40	15.00	
2nd	20	16.50	
3rd			30
4th	50	14.30	
5th			20
6th			40

Calculate the cost of materials issued under FIFO method and Weighted Average Method of issue of materials.

Ans:

	Cost of materials issued		*Stock*	
	Units	*Amt Rs*	*Units*	*Amt Rs*
FIFO	90	1359	20	286
Weighted Average	90	1350	20	295

2. Show the stores ledger entries as they would appear when using
   (a) the weighted average method
   (b) the LIFO method of pricing issues, in connection with the following transactions:

April	*Unit*	*Value*
1. Balance in hand	300	600
2. Purchased	200	440
4. Issued	150	
6. Purchased	200	460
11. Issued	150	
19. Issued	200	
20. Purchased	200	480
27. Issued	250	

In a period of rising prices such as above what are the effects of each method?

Ans: (a) 150 units Rs 342 (b) 150 units Rs 300. *(ICWA, Inter)*

3. Explain the following two methods of pricing of materials issues and also the circumstances under which these methods are used—LIFO and FIFO. Draw a stores ledger card, recording the following transactions that took place in a month under the above two methods:

2002

Jan.	1	Opening stock	200 pieces @ Rs 2 each
Jan.	5	Purchases	100 pieces @ Rs 2.20 each
Jan.	10	Purchases	150 pieces @ Rs 2.40 each
Jan.	20	Purchases	180 pieces @ Rs 2.50 each
Jan.	22	Issues	150 pieces
Jan.	25	Issues	100 pieces
Jan.	27	Issues	100 pieces
Jan.	28	Issues	200 pieces

(ICWA, Inter)

Ans: LIFO closing stock 80 units, Rs 172
FIFO closing stock 80 units, Rs 200

4. The Fair Deal Granary was not maintaining a perpetual inventory system for its stocks unit recently. Only physical inventory was taken at the end of each month. The physical inventory at the end of December 2001 showed 200 bags of fine rice at Rs 212.25 per bag. The following purchases were made in January 2002.

3rd	400 bags at Rs 218.00 per bag
10th	900 bags at Rs 223.50 per bag
15th	400 bags at Rs 220.00 per bag
28th	700 bags at Rs 213.00 per bag
30th	300 bags at Rs 224.00 per bag

On 31st January, 2002 the physical stock was 1,200 bags. You are required to calculate the value of the stock on 31st January 2002 according to First-in, First-out, Last-in, First-out and Average Cost Method.

(ICWA Inter)

5. Oil India is a bulk distributor of high octane petrol. A periodic inventory of petrol on hand is taken when the books are closed at the end of each month. The following information is taken for the month of June 2002.

	Rs
Sales	9.45,000
General administrative cost	25,000
Opening stock 1,00,000 litres @ Rs 30 per litre	
Purchase (including freight in)	
June 1 2,00,000 litres @ Rs 28.50 per litre	
June 30 1,00,000 litres @ Rs 30.30 per litre	
Closing stock June 30	1,30,000 litres

Compute the following data by the first-in first-out, weighted average and last-in first-out method of inventory costing:

(a) Value of inventory June 30
(b) Amount of the cost of goods sold for June
(c) Profit or loss for June

(ICWA Inter.)

Ans:

Method	*Value of inventory*	*Cost of goods*	*Profit or loss (Rs)*
FIFO	38,85,000	78,45,000	13,55,000
Weighted Average	39,00,000	78,30,000	13,70,000
LIFO	39,30,000	72,00,000	14,00,000

6. A consignment consisted of two chemicals A and B. The invoices gave the following data:

Chemical A—4,000 lb @ Rs 2.50 per lb...	Rs	10,000
Chemical B—3,200 lb @ Rs 3.25 per lb...	Rs	10,400
Sales tax	Rs	816
Railway freight	Rs	384
Total cost	Rs	21,600

A shortage of 200 lb in A and 128 lb in B was noticed due to breakage. What stock rate would you adopt for pricing issues assuming a provision of 5% towards further deterioration?

Ans: Material A Rs 2.94
Material B Rs 3.76

7. The stores ledger of a manufacturing Company reveals the following entries of a particular material.

Date	*Receipts*			*Issues*		
	Quantity in units	*Rate Rs*	*Amount Rs*	*Quantity in units*	*Rate Rs*	*Amount Rs*
2002						
January						
2	4,000	1.80	7,200			
5	2,000	1.75	3,500			
18				10,000		19,500
February						
5				5,000		9750
14	3,000	1.85	5,550			
18	3,000	1.90	5,700			
20				10,000		19,200

Opening stock as on 1.1.2002 was 20,000 units valued at Rs 40,000, Closing stock as per physical verification on 28.2.2002 was 6,950 units.

Work out the method of pricing the issue which you consider to have been adopted for the issue of the material and show the working of the issue rates (correct to 2 places of decimal). Complete the account of the material and work out the value of the closing stock as on 28.2.2002 on the basis of valuation adopted and also under any other method of valuation, you are familiar with.

(ICWA Inter.)

Ans: Closing Stock

Weighted Average 6950 units	Rs	13404
FIFO 6950 units	Rs	12912.50

In the given question weighted average rate method has been used in preparing the Stores Ledger of the Company.

8. The purchases and issues of material X in the month of January 2001 is as follows:

January	3	Purchases 800 units @ Rs 20 per unit
January	8	Purchases 700 units @ Rs 18 per unit
January	9	Issue 600 units
January	11	Issue 800 units
January	17	Purchase 800 units @ Rs 20 per unit
January	25	Purchase 500 units @ Rs 25 per unit
January	31	Issue 1000 units

The standard price per unit of material is Rs 20 fixed for the year 2001. Show the stores ledger account and determine the price variance for the month of January.

Ans: Closing stock at cost 400 units Rs 9100
Closing stock at standard price of Rs 20 will be Rs 8000
Material price variance Rs 9100–8000
= Rs 1100 (Adverse).

9. On January 1, Mr. G started a small business buying and selling a special yarn. He invested his savings of Rs 4,00,000 in the business and during the next six months, the following transactions occurred:

Yarn Purchases			*Yarn Sales*		
Date of receipt	*Quantity boxes*	*Total cost (Rs)*	*Date of despatch*	*Quantity boxes*	*Total value (Rs)*
January 13	200	7200	February 10	500	25,000
February 8	400	15200	April 20	600	27,000
March 11	600	24000	June 25	400	15,200
April 12	400	14000			
June 15	500	14000			

The yarn is stored in premises Mr G. has rented and the closing stock of yarn counted on 30th June was 500 boxes.

Other expenses incurred and paid in cash during the six months period amounted to Rs 2300.

Required:

(a) Calculate the value of the material issues during the six month period and the value of closing stock at the end of June, using the following methods of pricing:
  (i) FIFO
  (ii) LIFO, and
  (iii) Weighted average

(b) Calculate and discuss the effect each of the three methods of material pricing will have on the reported profit of the business, and examine the performance of the business during the first six month period.

(ICMA, U.K., Adapted)

Ans: (a)

(i) FIFO — Closing stock Rs 14,000 (500 × Rs 28)
Cost of sales (including stock loss)
= Rs 60,400

(ii) LIFO — Closing stock = Rs 19600
Cost of sales = Rs 54800

(iii) Weighted Average Method:
Closing stock = Rs 16486
Cost of sales = Rs 57914

(b) Profit calculations:

	FIFO (Rs)	*LIFO (Rs)*	*Weighted Average (Rs)*
Sales	67,200	67,200	67,200
Cost of sales & stock loss	(60,400)	(54,800)	(57,914)
Other expenses	(2,300)	(2,300)	(2,300)
	4,500	10100	6986

Comment: (i) The large purchase at the highest purchase price is in March. This purchase could have been delayed until April so as to take advantage of the lower price.

(ii) The stock loss has cost over Rs 3000. This should be investigated. A materials control procedure should be implemented.

Labour Costs: Accounting and Control

INTRODUCTION

Proper control and accounting for labour costs is one of the most important objectives of all business firms. Cost accounting for labour has three primary objectives:

1. Determining labour costs in the cost of product or service.
2. Reporting labour costs for planning and control.
3. Reporting labour costs for decision-making.

For a manufacturing business firm engaged in producing a specific product, labour costs are accumulated and charged to the product as they are produced. Similarly, in a service (not-for-profit) organisation, total cost as well as the cost of different functions (services) are to be determined. This helps the organisation to know what it costs them to provide a service or perform some activities.

The second objective is to provide management with labour cost information for effective planning of the labour force in the organisation and for, adequate control of labour costs. The control process of labour cost involves a comparison of actual labour costs with standard labour cost. The differences between the two are then analysed and possible reasons are determined so that management can take suitable action to control the labour cost expenditure in future periods.

Labour cost information is used for decision-making purposes also. Many managerial decisions, such as pricing decisions, expansion of business, dropping a product line, replacement of plant and equipment, entering into a new market, etc. require information about current actual labour costs and emerging trends therein.

DIRECT LABOUR AND INDIRECT LABOUR

Direct Labour

Direct labour consists of the wages paid to labour which convert raw materials into some form of finished output. Direct Labour cost comprises the wages which can be identified with, and allocated to cost

units. Examples of some direct labour functions in a manufacturing enterprise would be assembly line workers, moulders, operators, samplers and finishers.

Indirect Labour

Indirect labour is the labour which is not engaged in converting raw materials into finished output. The indirect labour cost is the cost which "cannot be allocated* but which can be apportioned to, or absorbed by, cost centres or cost units." Indirect labour includes, among others, formen, inspectors, watchmen, supervisors, factory clerks, store-keepers and time-keepers. In fact, after charging to departments and to products all labour costs which can, as a practical matter, be charged directly, the indirect labour costs remain.

ORGANISATION FOR LABOUR CONTROL

The significant portion of labour costs in the total cost of production points out its importance and need for effective control over labour and labour-related costs. The following departments/functions contribute to the efficient utilisation of labour and adequate control over labour costs.

1. Personnel Department
2. Engineering Department
3. Time-keeping Department
4. Payroll Department
5. Cost Accounting Department

Personnel Department

The main function of the personnel department is to provide an efficient labour force. The personnel manager/director with the help of department heads is responsible for the execution of the policies formulated by board of directors regarding employment, discharge, classification of employees, wages and wage systems. Hiring of employees may be for replacement or for expansion. Replacement hiring starts when a department head or a foreman sends an employee requisition (see Fig. 5.1) to the personnel department.

The personnel department prepares an Employee's Record Card on engaging a new worker. This will show full personal details of the employee, particulars of previous employment, medical category and wage rate. Normally, spaces are also provided for subsequent recording of transfers and promotions, wage rate revisions, details of attendance, merit and conduct reports, sickness and accidents and the date and reason for leaving (see Fig. 5.2).

Engineering Department

The engineering department maintains control over working conditions and production methods for each job and department or process by performing the following functions:

1. Preparation of plans and specifications for each job scheduled for production.
2. Supervision of production activities with production departments.

* The term "allocation" means the allotment of whole items of cost centres or cost units.

Employee Requisition

Requisition No. _____
Date _____
Department _____

Report to _____
(Supervisor or Foreman's Name)
on _____

Number of employees requested	Job Specification Description No.

Requisitioned by _____ Approved by _____

Fig. 5.1 Employee Requisition

Employee's Record Card

Front

Particulars	Employment Record			
Home address Date employed Date of birth Married/Single Height Weight General physique (Category)	Date	Department	Grade	Employment

Previous Employment	Wage Rate Record					
	Date	Rate	Particulars	Date	Rate	Particulars

References:
Notes:

Fig. 5.2(a) Employee's Record Card (Front Side)

Back

Time-keeping and Merit					Training, Progress and Conduct	
Year	Days lost		Overtime hours	Lost time hours	Merit and notes	Date	Particulars
	Sickness	Others					

Date left:
Reason for leaving:
General remarks:

Fig. 5.2(b) Employee's Record Card (Back Side)

3. Inspection of parts and jobs at successive stages of production and at the completion of production.
4. Initiation and supervision of research and experiment work.
5. Safety and efficient working conditions.

Time-keeping Department

The first step in accounting for labour cost is to prepare an accurate record of the time spent by each employee. Time-keeping in labour costing and control is important because of the following reasons:

1. It accumulates the total number of hours worked by each employee so that his earnings can be calculated.
2. Absence of a time-keeping arrangement will create frustration among those employees who are punctual or bound by the attendance rules.
3. Certain benefits like pension and gratuity, leave with pay, provident fund, salary, promotion are linked with continuity of service of employees. Attendance records, in this regard, can be helpful and useful to employees.
4. Overhead costs being indirect costs are apportioned to different products on some equitable basis. Time-keeping is necessary if apportionment is to be done on the basis of labour hours.
5. Time-keeping records and attendance details may be used by the firm for analysis proposes and by researchers, government authorities, etc.

Clock Card

The most common form of attendance record is the clock card on which the employee punches the time at which he comes in and leaves the factory. Each week, a new card is prepared for each employee on the payroll. At the end of the week, the cards are collected and transferred to the payroll department for calculation of gross earnings.

Daily Time Report

No. _____
Name _____
Nature of Work _____

Job No.	Time on		Time off		Time worked	
	Hours	Minutes	Hours	Minutes	Hours	Minutes
561	8	00	12	00	4	00
357	12	30	1	30	1	00
816	1	30	2	15	0	45
548	2	15	3	00	0	45
751	3	00	4	30	1	30

Foreman

Fig. 5.3 Daily Time Report

Clock cards provide a record of the total hours, employees were available on jobs. However, this card does not reveal as to how employees spend their time which is an important question to be solved before entries can be made in the cost records. This information is supplied by time tickets or daily labour summaries (see Fig. 5.3) on which time-keepers record the daily activities of direct labour; time spent on

specific orders, time spent on indirect labour operations such as machine maintenance, or idle time waiting for reassignment or machine set-up.

Disc Method

A second method of recording time is by using a metal disc which contains an identification number for each employee. A board containing hooks to which employees' discs are attached is kept near the entrance to the plant. On arrival, the employee removes his disc and places it in a box, or alternatively hooks it on a second board against his number. The box is removed at starting time, and the time-keeper becomes aware of late arrivals by requiring the workers concerned to report to him before starting. The time-keeper will record in an Attendance Register any late arrivals and workers leaving early. He will also detail the absentees each day.

Attendance Records

The simplest form of attendance records is a manual register which each employee signs into on arrival and departure, noting his times in and out. This type of time-keeping record is subject to limitations and many abuses by employees. In a business firm where a large number of workers are employed, and if the worker records his own time, it provides very little check upon late arrivals. The disadvantages of manual registers and time registers are the hold-ups that occur when each worker has to sign his name in turn, and the amount of clerical work involved in the posting of entries to individual attendance records.

Time-booking

Time-booking like time-keeping is equally important. Time-booking means recording the time spent by a worker on each job, process or operation. Time-booking fulfils the following purposes:

1. To determine amount of labour cost which can be obtained through time-booking is required.
2. To determine the quantity and value of work done.
3. To determine earnings like wages, bonus which depend on the time taken by a worker in performing job or jobs in a factory.

Recording work time can be done by any one of the following methods:

Job Ticket

Job tickets are given to all workers where time for commencing the job is recorded as well as the time when the job has been completed. After completing one job, the worker is given another job ticket for the next job to be completed by him.

Labour Cost Card

This card is meant for a job which involves many operations or stages of completion. Instead of giving one card to each worker, only one card is passed on to all workers and time taken on the job is recorded by each one of them. This card disclose the aggregate labour cost of the job or the product.

Weekly Time Sheets

A sheet is given to each worker to record time on a weekly basis, However, weekly time sheets should be filled up without much delay or on each day failing which some inaccuracies are bound to occur on the time sheets.

Daily Time Sheets

Each worker records the time spent by him on the work during the day for which a sheet is provided to each worker. Since time is recorded on a daily basis, accuracy is built up on the time shees. However, daily time sheets are generally not used. This could be used for maintenance and repairmen who have to do different jobs in different departments.

Time and Job Card

This cord records the attendance time of workers and work time of a worker on a single sheet.

Payroll Department

Preparation of the payroll from clock cards, job or time tickets, or time sheets is done by the payroll department. The payroll department (tabulation) is an intermediate function between the time-keeping (accumulation) and the cost accounting (analysis) department. The following are the functions of the payroll department:

1. To compute employee wages.
2. To pay employees and for prompt and accurate reporting of wages and salaries to employees.
3. To prepare departmental payroll summaries.
4. To maintain individual employee payroll records.
5. To calculate payroll taxes, deductions and other related payroll liabilities.
6. Compilation of labour statistics for management.

The responsibilities of the payroll department in controlling and accounting for labour costs are as follows:

1. To maintain a record of the job classification, department and wage rate for each employee.
2. To verify and to summarise the time of each worker as shown on the daily time cards.
3. To compute the wages earned by each worker.
4. To prepare the payroll for each department showing the total amount earned for the period by each employee.
5. To compute the payroll deductions under the Acts.
6. To compute the payroll deductions authorised by the employee for union dues, charitable donation, saving bonds, and health and accidental insurance.
7. To maintain a permanent payroll record for each employee.
8. To distribute salary and wage payments.

Cost Accounting Department

The cost accounting department is responsible for the accumulation and classification of all cost data of which labour costs are one of the most important elements. On the basis of the labour summary or the time or job cards, the cost department records direct labour cost on the appropriate cost sheets or production reports and indirect costs on the departmental expense sheets.

WAGE SYSTEMS

An important aspect of labour cost control is a wage system designed primarily for exercising management control over labour. The following objectives should be considered in the selection of a wage system:

1. Acceptance by employees to avert slowdowns and work stoppages.
2. Provision for flexibility.
3. Provision for economy in administration.
4. Supplying of labour statistics for use in industrial relations and for trade associations, government agencies, and competitors.
5. Stabilisation of labour turnover.
6. Minimising of absenteeism.
7. Provision for incentive plans.

Basically there are two wage systems to pay for labour: (i) straight time which is by hour, day, or week, and (ii) piece work, which is by the unit of product.

Straight Time

Under the time basis, the worker is paid at an hourly, daily or weekly rate and his remuneration depends upon the time for which he is employed and not upon his production. If a worker works for an overtime, the wage agreement usually provides that all hours worked in excess of an agreed number are paid for at a higher rate. The time basis wage system for direct labour is found in those industries where:

1. The speed of production cannot be influenced by the energy or dexterity of the worker.
2. The quality of work is of paramount importance.
3. It is difficult to measure the work done by the employee.

From the point of view of the worker, the straight time method has both advantages and disadvantages. Workers have feelings of security and certainty which appeal to them. They can depend upon a definite wage or salary regardless of the amount of work completed or the efficiency of their work, provided it is above the minimum requirements. However, this wage system does not give proper recognition or reward to efficient workers whose productivity is above the average of the other workers. There is little incentive to achieve better or superior performance.

From the employer's view-point, time wage systems are easy to compute and understand and provide economy in time-keeping and payroll recording. But on the other hand, constant supervision is required, otherwise considerable wasted time may be paid for. Among the workers, the inefficient workers receive the same wages as the efficient workers, thus tending to cause dissatisfaction and frustration among the workers and increasing the labour cost per unit produced.

The time basis is still the most popular wage system for workers, such as clerks, accountants, stenographers, factory helpers, members of the supervisory staff and officers whose work cannot be standardised and measured satisfactorily. This is preferred by skilled and efficient workers with whom the quality of work is a more important factor than volume of production.

Piece Work

Under this method, a fixed rate is paid for each unit produced, job performed or number of operations completed, and the worker's wages thus depend upon his output and not upon the time he spends in the factory.

Piece-rates are of advantage to management in the following respects:

1. Managerial superivision is not much needed for production, since each worker assumes responsibility for his own time output.
2. Higher production reduces overhead costs per unit of output.
3. Labour costs can be computed in advance of produetion with the aid of fixed rate unit or job.
4. Labour control becomes easier by isolating workers whose work is inefficient and below the minimum standard requirements.

Piece work has some limitations too. It attaches more premium to quantity than the quality of work. It has the tendency of increasing imperfections, spoiled work, and detectives and higher depreciation costs result because of considerable wear and tear of plant and machinery. Also, this system does not maintain a regular wage for the employee.

To avoid the limitations of straight or simple piece work system, a guarantee is normally provided in the system that the employee's wages shall not fall below a certain minimum figure. This is known as "Piece-rates with guaranteed day rate". Under this method the worker receives a straight piece-rate for the number of pieces produced, provided that his total wage is greater than his earnings on a time rate basis. When the piece-rate earnings fall below this level, the time rate earnings are paid instead. An alternative form of the methods is the guaranteed time rate (per hour, day or week), plus a piece-rate payment for output above a stated minimum. Labour cost per piece decreases with increasing production until piece-rate earnings exceed the guarantee, therefore, the labour cost per piece remains constant.

INCENTIVE WAGE PLANS

The basic purpose of an incentive wage is to induce a worker to produce more so that the can earn a higher wage and, at the same time, unit costs can be reduced. Incentive wage plans aim to ensure greater output, to help control over labour costs by minimisation of total cost for a given volume of production and to have a basis for reward from hours served to work accomplished.

Incentive wage scheme has the following objectives:

1. Un-interrupted and higher production without any dispute between the labour and management.
2. Stability in labour turnover.
3. Reducing labour absenteeism.
4. Developing cooperation, mutual trust, attitude of team work among workers and between workers and supervisory staff.
5. Control of labour cost and reduction in labour cost unit of output.
6. Improving administrative efficiency.
7. Accurate budgeting through reliable labour cost information.
8. Generating workers' satisfaction by avoiding work stoppages, slow down, and by providing incentive schemes.

The following are the essentials (desirable characteristics) of a successful incentive wage plan:

1. A wage incentive system should be based upon standards of performance—time and motion studies, job evaluation, and merit rating.
2. The incentive plan should be understood by all employees before installation (or hiring).
3. All direct labour tasks should be on an incentive basis.
4. Only standard or acceptable quality production should be considered while determining the bonus.
5. Once the standard is set, it should not be changed unless the method changes.

6. The incentive programme must be fairly and intelligently administered.
7. It is highly desirable that indirect personnel share in the incentive plan.
8. A high reward should be paid for performance above standard.
9. Individual incentives should be used wherever it is possible to do so.
10. Minimum wage should be guaranteed to every worker.
11. The views of both employers and employees should be considered while designing incentive schemes.
12. The cost of establishing and operating the incentive plans should be reasonable.
13. The incentive plans should help in standard cost and budgetory control programmes.

Incentive wage plans involve wage rates based upon various combinations of output and time and are known as "differential piece-rates" and "bonus plans" as well. Generally, the following types of incentive plans are used:

1. Taylor Differential Piece-rate System
2. Merrick Differential Piece-rate System
3. Gantt Task Bonus Plan
4. Premium Bonus Plans (Halsey, Halsey-Weir, Rowan, Bedaux, Emersion, etc.)

Toylor Differential Piece-rate System

Under this system there are two wage rates, a low one for output below standard and a higher one for above standard performance. The system aims to discourage below average workers by providing no guaranteed hourly wage and by setting low piece-rates for low level production, and a high rate resulting in high earnings if an efficient level of production is attained. For example, in a factory, workers earn Rs 240 per eight hour day and that production averages 12 units per hour per worker or Rs 2.50 per unit. The Taylor system might suggest a pay of Rs 2 per unit if the worker averaged 14 units or less per hour, but Rs. 3 per unit to workers averaging 15 units or more per hour. The main advantages of the Taylor system are that it provides a strong incentive to the efficient worker, and is simple to understand and operate. But the incentive level may be set so high that it cannot attract most workers.

Merrick Differential Piece-rate System

This is an improvement over the Taylor system and depends on using three rates instead of two as in the Taylor system. Normal piece-rates are paid on output, when it does not exceed 83% of the standard output. 110% of normal piece-rate are paid when the output is between 83% and 100%, and 120% of the normal piece-rate is paid if the output is above 100%.

The Merrick system is useful to highly efficient workers as it provides incentives for higher production. Similarly, it takes into account the less efficient worker who can at least achieve 83% of the standard output. This minimum output is probably achievable by all workers.

Gantt Task and Bonus Plan

This system combines a guaranteed time-rate with a bonus and piece rate plan using the differential piece-rate principle. Remuneration under the plan is computed as follows:

Output	*Payment*
1. Output below standard (high task)	Time-rate (guaranteed)
2. Output at standard	Bonus @ 20% on the time-rate
3. Output above standard	High piece-rate on worker's whole output

This plan provides incentives and opportunities to those who reach high level production. At the same time it provides security and encouragement to less skilled workers. It is simple to understand and workers are also satisfied in that they receive the total reward for their efforts. A limitation of the plan is the tendency on the part of trade unions to demand a high fixed guaranteed time-rate. But the incentive element of the plan would be lost in case too high a rate is fixed.

Premium Bonus Plans

Under the time-rates basis, any additional production above normal levels benefits the employer, whereas with the piece-rates system the benefit goes to the employee (apart from indirect benefits to the employer). Bonus plans have been developed to produce a compromise, in that any savings are shared between employer and employee. The following are the principal schemes under premium bonus plans.

Halsey Premium Plan

The principle of the Halsey scheme is that the worker receives a fixed proportion of any time which he can save by completing the job in less than the allowed time. The most common fixed proportion is 50% but this can be varied. This plan ensures that the employee receives time wages until he produces in less than standard time. For above standard production, savings are shared with the employer with the result that the rate of increase happens to be lower for the employee. The cost per unit decreases when production exceeds standard.

Halsey-Weir Plan

This plan is also known as the Wier Premium Scheme and is based on a $33\frac{1}{3}:66\frac{2}{3}$ sharing plan. Under this scheme the total emoluments of a worker are the aggregate of guaranteed hourly wages for actual time worked, plus the amount of bonus at the rate fo $33\frac{1}{3}\%$ of the time saved. Bonus is allowed at the same hourly rate at which he shall be paid for actual time worked.

Rowan Plan

This scheme is similar to the Halsey plan in that a standard time is fixed for the completion of a job and the bonus is paid in respect of the time saved. But a ceiling is applied to the size of the bonus. The bonus hours are calculated as a proportion of the time taken which the time saved bears to the time allowed, and is paid for at time-work rates. The bonus may be computed as follows:

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

Bedaux Point Plan

Under the Bedaux point plan a guaranteed hourly rate is paid until standard production is attained, and a premium or additional wage is paid for units in excess of standard. Instead of being paid as piece-rate, an hour's work is converted to points by dividing a standard hour's production in units into 60 minutes. In other words, if 10 units are standard, then each unit is 6 points and if 15 units are standard then each units is 4 points. At standard performance the worker produces a point per minute and for the first 60 points produced in an hour, the worker receives the hourly rate. For excess production, it is common practice to pay the worker 75% of the rate, and the foremen, supervisors and other indirect labour personnel receive 25% of the rate.

Emerson Efficiency Plan

Under the Emerson plan a minimum daily wage is guaranteed and a standard time is determined for each job or operation. During each payroll period a record is kept of the hours worked and the units produced, and the efficiency of each employee is then determined by dividing actual hours into the standard time for the units produced. For example, if the standard is 10 units per hour and a worker produces 320 units in an 80-hour week, the standard time for his output is 32 hours and he has worked at 80% efficiency. Below 67% efficiency, the worker is paid his hourly rate, and from 67% upto 100% efficiency, step bonus rates apply. Above 100% efficiency, an additional bonus of 1% of the hourly rate is paid for each 1% increase in efficiency.

Groups Bonus Schemes

Where a group of workers is collectively responsible for manufacturing a product, it may not be possible to adopt individual incentive schemes. The production of the workers as a whole is measured, and the total bonus determined by one of the individual incentive schemes capable of group application. The computed bonus can then be shared equally, or between workers of different skills in differing specified proportions. A group bonus scheme has the following objectives:

1. Developing collective interest and team spirit among all workers and employees.
2. Developing interest among foremen and supervisors to improve performance.
3. Reducing spoilage in materials consumption.
4. Reducing idle time.
5. Achieving maximum production at minimum cost.
6. Motivating workers to produce more to get bonus on the basis of term performance.

Group bonus schemes may be employed:

1. where individual output cannot be measured, but that of a group of worker can, e.g., on a production line.
2. where output depends less upon the efforts of particular individuals, and more upon the combined efforts of a group, department, or even of the whole undertaking; or
3. where the management wishes to encourage a team spirit.

The following types of group bonus schemes are in common use:

Budgeted Expenditure Bonus

In this scheme the value of bonus depends upon savings in actual expenditure as compared with the budget. This scheme can be applied to indirect workers and staff besides direct workers.

Cost Efficiency Bonus

This bonus is allowed for savings in specific costs, e.g., labour cost or materials cost.

Priestman System

This is a system used in foundries in which a production standard is fixed every month for the entire work. Where production exceeds the standard, workers receive during the following month additional pay equal to the percentage in output over standard. Where production does not exceed standard, no bonus is paid though time rates are guaranteed.

Towne Gain-sharing System

This method introduced by H.R. Towne in the USA is based on the principle that bonus consists of half the reduction in labour cost below standard. The bonus is divided between foremen and operatives, but as it is generally paid half-yearly it tends to be ineffectual as an incentive to individual effort. The payment to foremen and supervisory staff, however, encourages them to reduce labour costs.

In India, payment of bonus under the Payment of Bonus Act 1965 is compulsory, although the amount of bonus may vary from company. A minimum bonus of 8.33% is payable whether a company has earned profit or not. The amount of minimum bonus is generally treated as an item of direct labour cost. However, the amount exceeding the minimum bonus is an appropriation of profit. Bonus linked with productivity is treated as an item of overhead cost.

Profit Sharing and Co-partnership

Profit sharing schemes are schemes in which there is an agreement between the employer and his workers whereby he pays them in addition to wages, a predetermined share of the profits of undertaking. Co-partnership or co-ownership confers upon employees the opportunity to share in the capital of the business and to receive that part of the profits that accrue to their share of ownership. Both profit sharing and co-partnership schemes recognise the contribution of employees in the profit of the business firm.

These schemes, however, suffer from the following limitations:

1. Lazy and inefficient workers share equally with hard-working and efficient workers.
2. When the share is paid to the workers in cash they tend to regard it merely as a bonus, and not as a share of the result achieved jointly by themselves and their employers.
3. It is difficult to determine the share of profits to be given to each worker and there may be a certain amount of distrust about declared profits also.
4. The additional earnings under these plans are relatively small and may appear to the workers totally insignificant.
5. The share of profits to be paid to workers may be reduced by bad management.
6. Distribution of the benefit under schemes is done normally once in a year. Therefore, employees do not have much interest in it.
7. Sometimes, this scheme is restricted to employees who have a specified number of years of service in the factory. Thus, this creates dissatisfaction among the newer and younger employees who also have contributed to the profits of the year.
8. The workers share in the good years, but do not bear their share of losses incurred in other years.

Bonus Schemes for Indirect Workers

Indirect work cannot be measured as accurately as the direct work. If only direct workers are paid on incentive scheme, this may create considerable disappointment among indirect workers. Therefore, incentive schemes may be introduced for indirect workers as well, either to increase the efficiency of the services they provide to direct labour or to induce formen and supervisory staff to increase department efficiency and so reduce costs.

WORK STUDY

The successful operation of incentive wage schemes depends on making a proper work study. Work study is the study of job, methods and equipment to ensure that the best way to do the job has been followed by a worker. Work study consists of two complementary techniques or methods: (i) methods study, and (ii) work measurement.

Method Study

Method study is done to improve methods of production and to achieve the most effective use of materials, manpower and plant. The following stages are involved in methods study:

1. First of all, work for the purpose of methods study should be selected. Generally, methods study is done in jobs which involve complexity and costly operations.
2. After selecting a particular job or work, details about the work should be gathered, such as purpose, location, sequence, relationship with the other work, methods of working, operators and facilities, etc.
3. After studing the relevant details of a work, an improved method should be developed for effectiveness, efficiency and operational simplicity. Unnecessary operations, activities should be avoided. An improved method might change the location and sequence of work, production methods, layout.
4. The method so developed should be used for the job or work for which it has been designed.
5. Follow-up is necessary to enquire as to whether the improved method is being implemented in practice and to find out deviations, if any.

Methods study ensures efficient and maximum use of resources like material, labour, plant facilities; it improves the production methods by reducing/eliminating the work content and unnecessary methods: and it attains the maximum production which is good for the firm as well as the workers.

Work Measurement

Work measurement aims at determining the effective time required to perform the work. The ineffective, wasteful or avoidable time is separated from effective required time to complete the work. The effective time so established in work measurement can be used for the following purposes:

1. Incentive wage schemes which require time taken for completing a work.
2. Improving utilisation of men, machines and materials.
3. Assisting in production control.
4. Setting labour standards.
5. Achieving the objectives of cost control and cost reduction.

The following stages are involved in work measurement:

1. Selection of the work.
2. Measuring the actual time taken in the work done.
3. The total time so established for a job should be adjusted for fatigue, time taken in setting the tools, idleness involved in the work itself, etc.

The standard time is further considered to know the time sayed under incentive schemes and to determine the wage rate at the incentive level. This is explained with the help of the following example:

	Minutes per job
Time before incentive schemes	50
Allowances 10%	5
Basic or standard time	55
Time saved under incentive conditions (20%)	11
Time under incentive conditions	44

JOB EVALUATION AND MERIT RATING

Job Evaluation

Job evaluation is the technique of analysis and assessment of jobs to determine their relative value within the firm so that a fair wage and salary structure can be established for the various job positions. In other words, job evaluation aims at providing a rational and equitable basis for differential salaries and wages for different classes of workers. Following are the objectives (or benefits) of job evaluation:

1. It aims at developing a systematic and rational wage structure as well as job structure.
2. It aims at establishing consistency between the wage and salary structure adopted within the firm and that of other firms within the industry or geographical area.
3. Controversies and disputes relating to salary between the employers and employees can be settled by designing job evaluation techniques within the firm which can satisfy employers and employees both.
4. Wage and salary structure established on the basis of job evaluation will be fair, reliable and satisfying to the employees. Employees' skills, efforts, competence are properly considered in determining wage rates.
5. Stability and fairness in the wage and salary structure are very useful for the administration which can formulate business policies and plans as workers cooperation is fully ensured.
6. Job evaluation discloses characteristics and conditions relating to different jobs and these job requirements are very helpful at the time of recruiting the workers. The employment department can appoint only those workers who are found suitable in terms of such job requirements.

Methods of Job Evaluation

Methods of job evaluation can be listed as follows:

Point Ranking Method

Under this method each job is analysed in terms of job factors. Job factors may consist of elements like skill, effort, working conditions, hazards, responsibility. However, different job factors may emerge in different jobs. After specifying job factors, each of them is assigned weightage or points depending on its value for the job. For example, in a particular job, education may be given the higher point as compared to supervision, if the job requires a high degree of education. Finally, the jobs are ranked in the order of points or weights secured by them. Grades are further developed for these different weightages

so that wages rates or wage structure can be suitably designed for them. For example, the following wage scales can be worked out depending on the weights grade.

Weights or points	*Grade*	*Salary scale (Rs)*
50–100	I	10000–15000
151–200	II	15000–20000
201–250	III	20000–30000
251–300	IV	30000–40000
301–350	V	40000–50000
351–400	VI	50000–60000
401–450	VII	60000–80000
451–500	VIII	80000–100000

This method is theoretically sound and objective, but it is difficult to operate. The relative weights and points of different job factors need to be developed very carefully and in an objective manner.

Ranking Method

The ranking method only requires that different jobs in an organisation should be rearranged in an order which can be done either from the lowest to the highest or in the reverse. Before doing ordering of jobs, all jobs should be properly studied in terms of job requirements, worker's qualification, responsibilites, working conditions, etc. Finally, wage scales are determined in terms of ranks.

This method is very simple to operate, less costly and easy to understand. However, this method may be useful for small organisations only, where jobs are few and well defined. But in a large organisation where jobs are complex and highly involved, this method cannot be beneficial.

Grading Method

This methods is an improvement over the ranking method. Under this method, a hypothetical scale or standard of job values is determined and each job after being analysed in terms of a predetermined grade, is given a grade or class. Predetermined grades or yardsticks are formulated after examining existing jobs in the enterprise. The grades or the class should be established after making an investigation of job factors, such as complexity in the job, supervision, responsibility, education, etc.

This method is simple, less costly and administratively feasible. It attempts at applying a rational basis for grading jobs.

Merit Rating

Merit rating is the comparative evaluation and analysis of the individual merits of the employees. It analyses the differences in performance between employees who are working on similar jobs and would therefore earn the same wages. In this task, merit rating accomplishes more than job evaluation. Merit rating has the following objectives:

1. To evaluate the merit of an employee for the purpose of promotion, increment, reward and other benefits.
2. To establish and develop a wage system and incentive scheme.
3. To determine the suitability of an employee for a particular job.
4. To analyse the merits (or demerits) of a worker and help him in developing his capability and competence for the job.

The characteristics and factors that are considered in merit appraisal of the workers are the following:

1. Cooperation
2. Quality of work done
3. Attendance and regularity
4. Education, skill, experience
5. Character and integrity
6. Initiative

Merit rating is beneficial to the business enterprise and the workers. It increases the output, improves labour-management relations and encourages workers to have fair competition among themselves. However, merit rating has the following drawbacks;

1. The rating of employees may be subjective and this creates dissatisfaction among them.
2. Evaluators or raters tend to give much premium to past ratings of an employee who might have improved himself in the course of time.
3. Rates may be influenced by raters' own attitudes and self-made rating factors which are not consistent with the merit rating process. Incentives schemes may not be introduced advantageously if merit rating is inaccurate, unreliable and subjective.

Differences between job Evaluation and Merit Rating

Job evaluation and merit rating differ on the following counts:

1. Job evaluation is the assessment of the relative worth of jobs within a business enterprise and merit rating is the assessment of the relative worth of an empolyee with respect to a job. In other words, job evaluation rates the jobs, but merit rating rates employees on their jobs.
2. Job evaluation helps in establishing a rational wage and salary structure. But merit rating helps in fixing fair wages for each worker in terms of his competence and performance.
3. Job evaluation brings uniformity in wage and salary rates. But merit rating aims at providing a fair rate of pay for different workers on the basis of their performances.

TIME AND MOTION STUDY

Time study determines the time spent on each element of a job. The total time taken by all elements (stages) of a job is called the standard time. This standard time is the time which should be taken by an average employee to complete a job under standard (normal) working conditions.

Motion study implies dividing the work into fundamental elements or basic operations of a job or a process for the purpose of eliminating unnecessary (defective) elements or operations in a job. After investigating all movements in a job, process, or operation, it finds out the most scientific and systematic method of performing the operation or completing the job. Thus, time study fixes the standard time for a job or process, and motion study eliminates wasteful motions or the movement of a worker on the job. Both are complementary to each other.

Objectives

Following are the objectives of time and motion study:

1. Eliminating unnecessary motions, fatigue and improving human efforts.
2. Improving method, procedure, techniques, process relating to a job.
3. Utilising effectively materials, machines, human resources and other facilities.
4. Improving working environment, layout and design of plant and equipment.

Benefits

Time and motion study is quite beneficial to the management in the following respects:

1. Proper and fuller utilisations of materials, plant, labour and other resources.
2. Help in assessment of labour requirements.
3. Setting of labour cost standards and control of the labour cost.
4. Determination of fair wage rates and effective wage incentive schemes.
5. Preparation of labour budgets.
6. Standardising jobs, equipments, methods by determining the best method of operating in the time set.
7. Improvement in work methods by comparing the time taken to complete the same type of work under different possible methods.
8. Proper planning and effective cost control.

LABOUR TURNOVER

Labour turnover is the rate at which employees leave employment at a factory and is normally measured as the ratio of the number of persons leaving in a period to the average number on the payroll. For example, if 100 persons leave a company in a year and the average number on the payroll is 500, labour turnover is expressed as 20% p.a. In this calculation all persons who leave must be included, whether they leave voluntarily or are dismissed and irrespective of whether they are replaced. There are three methods of measurement of labour turnover.

1. $\dfrac{\text{All employees leaving}}{\text{Average number employed}} \times 100$

2. $\dfrac{\text{Number of replacements in a period}}{\text{Average number employed}} \times 100$

3. $\dfrac{\text{All employees leaving plus new employees}}{\text{Average number employed}} \times 100$

Among the three methods, the first method is to be preferred, as it is more appropriately a long-term indicator. This formula is more satisfactory as management is primarily concerned with the loss of labour, after money has been spent on training. The effects of a high or low turnover rate should then be analysed, e.g., on training costs, on production efficiency and employee morale.

Causes of Labour Turnover

Labour turnover is caused by many factors which may be listed as follows:

Avoidable Causes

These causes may be eliminated by taking suitable measures by the business firm. Avoidable causes are the following:

1. Low wages and earnings.
2. Unsatisfactory working conditions.
3. Bad relations among workers and between workers and supervisor.
4. Existance of rival trade unions in the organisation.
5. Unsuitability of job.
6. Lack of conveyance, accommodation, medical, educational facilities, recreational amenities, etc.

Unavoidable Causes

Sometimes, workers have to leave the organistaion because of management requirements and actions. These are known as unavoidable causes and may be described as follows:

1. Termination of service due to misbehaviour, indiscipline, etc.
2. Retrenchment or lay off due to shortage of resources, low demand, seasonal nature of business.

Personal Causes

Sometimes workers leave the organisation at their own will and management can do nothing in this regard. These are known as personal factors which are the following:

1. Change for better job
2. Death
3. Retirement due to old age and ill health
4. Family troubles and constraints
5. Change for a better place, environment.

Cost of Labour Turnover

The cost of labour turnover consists of two elements:

1. Preventive costs
2. Replacement costs

Preventive Costs

Preventive costs include all those costs which are incurred to prevent workers from leaving the organisation and keeping them satisfied. Preventive costs may broadly be of the following types:

1. Personnel administration A part of personnel administration costs may be incurred to establish a good relationship between the management and the employees and to remove workers' grievances. These costs are known as preventive costs.

2. Medical and health care The costs incurred for providing medical benefits to the workers and their families are included in the labour turnover costs.

3. Welfare measures Welfare measures include facilities like sports, educational facilities, transport, housing, cooperative stores, canteens. The availability of those facilities prevent workers from leaving the organisation and keep them satisfied.

4. Wage and retirement benefits These include facilities like pension, provident fund, gratuity, bonus, incentive schemes. If an organisation has provided these benefits, the rate of labour turnover will be appreciably reduced.

Replacement Costs

Replacement costs include the costs which are incurred for the recruitment and training of new workers. Also, they cover costs which arise as a result of wastages, losses, lower production because of less competent and inexperienced new employees. Broadly, they include the following items:

1. Personnel department expenses The personnel department has to recruit new workeres in case of high labour turnover and therefore the costs of the personal department goes up.

2. Cost of training of new workers New workers are first to be given necessary trainings before they are given regular jobs. Also, production time is lost during the training of the workers.

3. Inefficiency of new workers New employees are comparatively less efficient and therefore, production is adversely affected.

4. Delay in getting new workers It takes times to find new workers who will be suitable for the jobs. In the meantime, existing employees may be given overtime which is again a burden on the orgainsation.

5. Cost of breakages of tools and equipments New workers, being inexperienced break more tools than the old experienced workers. Sometimes, machine break-down may occur and hamper production.

6. Costs of spoilage and defectives More spoilage and defectives are likely to occur due to mishandling and carelessness of the new workers. The greater the spoilage and defectives, the larger will be the cost of production.

Measures to Reduce Labour Turnover

Turnover can rarely be traced to one single cause and is usually the result of a combination of a number of causes. The management after knowing the reasons for labour turnover should frame suitable policies and take action to reduce the turnover rate. An appropriate Labour Turnover Accounting can be adopted to manage labour turnover efficiently and effectively. Labour turnover accounting implies the identification, measurement and monitoring of labour turnover data. More specifically, this would include the regular cost measurement of labour turnover and the implementation of a labour turnover cost control programme. Knowledge about the true costs of labour turnover will stimulate management to take appropriate action to reduce its cost.

Job enrichment, "human relations" traning for managers, and effective communication throughout the company are vital in reducing labour turnover. Job enrichment means that jobs should, wherever possible, be restructured so that employees have opportunities to increase their skill, use their initiative and assume more responsibility for their work.

Managers should be given traning in "human relations" and "management". Any improvement in personnel relations between management and employees will not only bring out improvement in industrial relations within the company but will also reduce the rate of labour turnover.

Furthermore, effective communication throughout the business firm will help control the high rate of labour turnover. There is great need to provide people with information on the affairs of the enterprise where they are working and on matters affecting their working conditions and future employment prospects.

TREATMENT OF LABOUR COST-RELATED ITEMS

Overtime

Overtime is the time put in by employees and work done by them beyond normal hours of work. According to the Factories Act 1948, every worker is to be paid overtime at a higher rate, generally at double the normal wage rate, if he is required to work for more than 8 hours a day. In case the Factories Act is not applicable in some situations, it is the practice to pay to workers for overtime work at higher rate. The excess over normal wage rate is called overtime premium. In cost accounting, the overtime premium is separated from regular earnings and consideration must be given to the reasons for the overtime payment to decide as to how they should be treated in cost accounts.

Treatment of Overtime Premium

The treatment of overtime premium is decided in terms of factors and reasons which has caused overtime work. They are explained as follows:

1. Accepting rush orders which can not be finished in regular working hours and therefore, overtime work becomes necessary. In this case, since the overtime work is due to one particular order, the overtime premium should be charged to that particular order or job. Also, payment for such overtime work should be recovered from the customer who has given such an order. That is, the contract price for the job would include the overtime premium factor.
2. Scheduling more production than can be completed in normal working hours. For example, a company with a normal capacity of 8000 units to be completed in 800 labour hours decides to produce 10,000 units which require 1000 labour hours, 200 overtime hours are necessary. Such overtime work may be caused due to temporary higher demand, higher seasonal demand or due to company's own decision for additional production. In this case, the overtime premium will be charged to each of 10000 units completed during the period. Overtime premium cannot be charged to only 2000 units that have to be completed after regular working hours.
3. Overtime work may become necessary because of abnormal circumstances, i.e. factors which are beyond the control of management, such as fire, flood, etc. In this case, the overtime premium is transferred to Costing Profit and Loss A/c and is not charged to the units or jobs completed.
4. Overtime work may be caused due to fault, delay of another department in the organisation. In this case, the overtime premium is charged to the department which is at fault or is responsible for the delay.

Overtime payments made to workers engaged in direct labour are treated as direct labour cost and charged to the jobs or units completed. Overtime payments made to indirect labour are the part of factory overheads, overtime payments made to the staff of administrative departments are treated as administrative overheads and overtime payments made to the staff of selling and distribution departments are treated as selling and distribution overheads.

Idle Time

Where workers are remunerated on a time basis some difference between the time for which they are paid and that which they actually spend upon production is bound to arise. This difference is known as idle time, and represents the time for which the employer must pay but from which he obtains no direct advantage. Idle time does not include holidays, leave, etc. Idle time may be normal or abnormal.

Normal Idle Time

Normal idle time is that idle time which is unavoidable, of normal nature and is inherent in a production or work environment. Normal idle time is caused by factors such as:

1. Time lost in moving from one job to another.
2. Time lost in waiting for materials or instructions.
3. Time taken in getting from the gate of the factory to the department in which the worker is engaged and the reverse journey at the end of the day.
4. Temporary absences from duty because of minor accidents, personal needs, tea-breaks, etc.

The wastage of time due to the above factors cannot be avoided and therefore idle time must be accepted as implied in production. Under the above situations idle time will be of normal variety and constitute a legitimate charge to factory overhead. Thus, payment made for idle time is part of the cost of a product or job.

Abnormal Idle Time

Abnormal idle time is that time which is not caused by or connected with the usual routine of manufacture. The time wasted may represent abnormal idle time. The loss (or expenses) incurred and caused by abnormal conditions, cannot be regarded as part of the cost of the product and should be transferred to the costing profit and loss account. Examples of abnormal idle time would be:

1. Time lost through the break down of machinery due to the inefficiency of the works engineers or to the failure of the power supply.
2. Time lost through lack of materials occasioned by the slackness of the store-keeper in notifying the buying department of his requirements.
3. Bottlenecks in production, resulting in a temporary absence of parts for further processing.
4. Strike, lock-out, fire, wind, water damage, etc.

Fringe Benefits

An employee's salary or wage normally consists of basic wages, dearness allowance, house rent allowance, city compensatory allowance, etc. Besides the salary, workers are provided some indirect cash or fringe benefits, such as vacation and holiday pay, workmen's compensation insurance, pension costs, hospitalisation benefits, group insurance, sick pay, overtime and night shift premium, profit sharing bonus. These indirect benefits constitute fringe benefits. They tend to improve employee morale, loyalty and stability. The cost of these benefits are treated as a direct charge to production by using a supplemental wage rate. Alternatively, they are treated as factory overhead.

Shift Premium

Payment of higher hourly rates for evening and night shifts is a common feature. Treatment of shift premium follows the same reasoning as overtime premium. Where shift premium is needed to meet the

requirements of a particular order or job, the additional cost should be charged to the job concerned and is accordingly excluded from production overhead. When shift premium is incurred in order to increase the output as a whole, the premium element should be separated from direct wages and treated as a production overhead. In this case similar operations should carry the same cost, regardless of when they were performed and should be spread over all units manufactured.

Holiday and Vacation Pay

Most employees are entitled to statutory holidays or compulsory holiday such as Independence day, Republic day, etc. Payments which are made to an employee while he is absent on vacation and holidays, are accrued monthly and spread out over the year's production. The total amount is charged to the full year's overhead expense. In this way no single period is forced to carry the whole burden. This should not be treated otherwise because the number of holidays vary from month to month. If the expenses are apportioned monthly on the month's production, the cost of production in a particular month would be too heavy as compared with the costs in other months, when there are no holidays.

Alternatively, an inflated rate of direct wages can be used to absorb both the normal weekly wages and the appropriate part of holidays.

Learner's or Apprentices' Wages

In many plants new workers receive some preliminary training before they can become economically productive. Apprentices generally take more time than skilled workers to perform a given task and they are likely to cause more scrap. On the other hand, they are paid a lower rate per hour. The wages of workers under training who cannot normally make any real contribution to production, should be treated as production overhead and should be charged to the annual output through inclusion in the factory overhead rates.

In case of unusual training programmes due to the opening of a new plant or the activities of a second or third shift, a case can be made for treating the training cost as development or starting load cost and deferring a portion of the cost over a considerable period of time or over the life of the contract.

Attendance Bonuses

Sometimes workers who perform the full number of shifts in a working week, or who lose no time over a stated period, are entitled to an attendance bonus. Such bonuses are part of wages and sometimes are treated as direct wages and charged by means of an inflated direct wages rate. Alternatively, they may be treated as a production overhead. In process or contracting industries, they may properly be charged direct to the process concerned.

Leave with Pay

In a factory, workers are entitled to annual leave with full pay for some days in a year. Besides, medical leave, casual leave, earned leave, special leave, etc. are also available. It is not generally treated as a direct charge to a product or job but as factory overhead and recovered through departmental overhead rates. Alternatively, an inflated rate of direct wages cost can be applied to absorb both normal wages and an appropriate portion of leave with pay.

Employer's Contribution to Insurance

The Employer's share of insurance for the employees engaged in manufacturing is treated as production overhead. When a contractor's employees tend to remain on one job for many weeks at a time, it is possible to treat the contributions as a direct charge to the contract concerned. In the case of process workers too, it is frequently possible to charge insurance contributions direct to the process. Also, an inflated direct labour rate can be employed so as to absorb the contributions, but this practice is rarely followed.

Casual Workers

Casual workers should be issued clock cards to show the number of hours worked. If casual workers are engaged on specific production or jobs, they should be treated as direct charge to the specific production. If these workers are performing indirect work, it should be treated as overhead expense. Due care should be exercised by the wage department in making payment to casual workers. The clock cards should be properly signed by the foremen and forwarded to the wages department for payment.

Out-Workers

In some trades, for example, in knit wear and in manufacturing lampshades certain work is performed by workers in their own homes. In such cases there is no need to maintain time records as the workers are paid according to the work they complete. However, control should be exercised over out-workers in the following respects.

1. Issue of materials to out-workers and its comparison with the finished output.
2. Inspection of the output and rejection of the defective work.
3. Return of the output within the agreed time so as to fulfil customer's orders and contracts.

Outside Workers

Outside workers are employees working outside the factory on building sites or moving from place to place on small installations or repair work. If these employees report to the factory first for instructions, their arrival times can be recorded. But if they go direct to the site, it may be necessary for them to complete their own time sheets with some supervision or check on the times. For example, a foreman may travel from site to site or the customer may be asked to sign the time sheet which will form the basis of a charge to him. Where a large number of workers are engaged upon a site for a long period, e.g., on a civil engineering contract, it is usual for time recording clocks to be installed at the site. When casual workers are engaged for outside work, a head office clerk should attend to pay these workers. Alternatively, the foreman may be issued a petty cash fund from which to make the payments.

Example 5.1

XYZ Ltd. employs its workers for a single shift of 8 hours for 25 days in a month. The company has recently fixed the standard output for a mass production item and introduced an incentive scheme to boost output. Details of wages payable to the workers are as follows:

(i) Basic wages/piece work wages @ Rs 2 per unit subject to a guaranteed minimum wages of Rs 60 per day.

(ii) Dearness allowance at Rs 40 per day.

(iii) Incentive bonus:

Standard output per day per worker: 40 units;

Incentive bonus up to 80% efficiency: Nil;

Incentive bonus for efficiency above 80%: Rs 50 for every 1% increase above 80%.

The details of performance of four workers for the month of April 1998 are as follows:

Worker	*No. of days worked*	*Output (units)*
A	25	820
B	18	500
C	25	910
D	24	780

Calculate the total earnings of each of the workers. *(I.C.W.A. Inter Dec. 1998)*

Solution

Statement of Total Earnings of Each Worker

Worker	*Days Worked*	*Output*	*Basic Wages* Rs	*Dearness Allowance* Rs	*Incentive* Rs	*Total Earnings* Rs
A	25	820 units	1,640	1000	100	2740
B	18	500 units	1,080	720	—	1,800
C	25	910 units	1,820	1,000	550	3,370
D	24	780 units	1,560	960	50	2,570

Working Notes:

(1) The worker B has been allowed of guaranteed minimum wages @ Rs 60 per 18 days, since piece work wage is only Rs 1,000 (i.e. 500 × Rs 2)

(2) Incentive has been computed as follows:

Workers	*Efficiency*	*Incentive @ Rs 50 for each 1% increase in efficiency above 80%*
A	$\frac{820}{25 \times 40} = 82\%$	100
B	$\frac{500}{18 \times 40} = 69\%$	—
C	$\frac{910}{25 \times 40} = 91\%$	550
D	$\frac{780}{24 \times 40} = 81\%$	50

Example 5.2

A worker produced 200 units in a week's time. The guaranteed weekly wage payment for 45 hours is Rs 81. The expected time to produce one unit is 15 minutes which is raised further by 20% under the

incentive scheme. What will be the earnings per hour of that worker under Halsey (50% sharing) and Rowan bonus schemes?

(C.A. Inter 1995)

Solution

Earning per hour under Halsey (50% sharing) Bonus Scheme

$$\text{Time allowed for actual Weekly Production} = 200 \text{ units} \times 18 \text{ minutes} = \frac{3600 \text{ minutes}}{60 \text{ minutes}}$$

(Refer WN 1) = 60 hours

Time Saved = Time Allowed – Actual Time taken

= 60 hours – 45 hours = 15 hours

Total Earnings = (Hours Worked × Rate per hour) + 1/2 × (Time Saved × Rate per hour)

(Refer WN 2) = 45 hours × Rs 1.80 + 1/2 × 15 hours × Rs 1.80

= Rs 81 + Rs 13.50 = Rs 94.50

$$\text{Earning per Hour} = \frac{\text{Rs } 94.50}{45 \text{ hours}} = \text{Rs } 2.10 \text{ per hour}$$

Earnings per hour under Rowan Bonus Scheme

$$\text{Total Earnings} = \text{Hours Worked} \times \text{Rate per Hour} + \left(\frac{\text{Times Saved}}{\text{Time Allowed}} \times \text{Time Taken} \times \text{Rate per Hour} \right)$$

$$= 45 \text{ hours} \times \text{Rs } 1.80 + \left(\frac{15 \text{ hours}}{60 \text{ hours}} \times 45 \text{ hours} \times \text{Rs } 1.80 \right)$$

= Rs 81 + Rs 20.25 = Rs 101.25

$$\text{Earnings per hour} = \frac{\text{Rs } 101.25}{45 \text{ hours}} = \text{Rs } 2.25 \text{ per hour.}$$

Working Notes

1. Expected time to produce one unit under incentive scheme = 15 × 3 minutes (20%) = 18 minutes
2. Wage rate per hour (Rs 81/45 hours) = Rs 1.80

Example 5.3

Calculate the earnings of workers *A*, *B* and *C* under Straight Piece Rate System and Merrick's Multiple Piece Rate System from the following particulars:

Normal Rate per Hour	Rs 5.40
Standard Time per Unit	1 Minute

Output per day is as follows:

Worker *A*—390 Units

Worker *B*—450 Units

Worker *C*—600 Units

(C.A. Inter May 1998)

Working hours per day are 8.

Solution

Basic Calculations

1. *Computation of Normal Wage Rate per unit*

Normal Rate per hour	Rs 5.40
Standard Output per hour	60 units
Normal Wage rate per unit (Rs 5.40/60 units)	Re 0.09 per unit

2. *Efficiency Level*

Workers:	*A*	*B*	*C*
Actual Output per day (units)	390	450	600
Standard Output per day (units)	480	480	480
Efficiency Level achieved: $\left(\frac{\text{Actual Output in units}}{\text{Standard Output in units}} \times 100\right)$	$\frac{390}{480} \times 100$ = 81.25%	$\frac{450}{480} \times 100$ = 93.75%	$\frac{600}{480} \times 100$ = 125%

Statement of Earnings of Workers Under Straight Piece Rate System

Worker *A*	= 390 units × Re 0.09 = Rs 35.10
Worker *B*	= 450 units × Re 0.09 = Rs 40.50
Worker *C*	= 600 units × Re 0.09 = Rs 54.00

Statement of Earnings of Workers Under Merrick's Multiple Piece Rate System

Workers	*A*	*B*	*C*
Efficiency Level	81.25%	93.75%	125%
Applicable Wage Rate per unit (See. Working Note)	Re 0.09p	Re 0.099p	Re 0.108
Earnings (Rs)	390 units × 0.09p = 35.10	450 units × 0.099p = 44.55	600 units × 0.108 = 64.80

*** Working Note:**

Usual applicable wage rates are:

(a) upto 83% Efficiency = Ordinary Piece Rate
(b) 83% to 100% = 110% of Ordinary Piece Rate
(c) Over 100% = 120% of Ordinary Piece Rate

Example 5.4

Calculate the earnings of a worker under (i) Halsey Plan and (ii) Rowan Plan from the following particulars:

(1) Hourly rate of wages guaranteed 0.50 paise per hour.

(2) Standard time for producing one dozen articles – 3 hours.
(3) Actual time taken by the worker to produce 20 dozen articles – 48 hours.

(C.A. Inter Nov. 1998)

Solution

(i) *Computation of Earnings of a Worker under Halsey Plan*

Earnings = Hrs. worked × Rate per hour + 1/2 Time saved × Rate per hour
= 48 hrs. × 0.50 paise + 1/2 × 12 hrs. × 0.50 paise
= Rs 24 + Rs 3 = Rs 27

(ii) *Computation of Earnings of a worker under Rowan Plan*

$$\text{Earning} = \text{Hrs. worked} \times \text{Rate per hour} + \left(\frac{\text{Time saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Rate per hour}\right)$$

$$= 48 \text{ hrs.} \times 0.50 \text{ paise} + \left[\frac{12}{60} \text{ hrs.} \times 48 \text{ hrs.} \times 0.50 \text{ paise}\right]$$

= Rs 24 + Rs 4.80 = Rs 28.80

Working Notes:

1. *Time allowed to produce 20 dozen articles*

Standard time allowed for producing one dozen articles	3 hours
Standard time allowed for producing 20 dozen articles	3 × 20 = 60 hours

2. *Time saved*

Standard time to produce 20 dozen articles	60 hours
Actual time taken by the worker to produce 20 dozen articles	48 hours
Time saved	12 hours

Example 5.5

From the following particulars, you are required to work out the earnings of a worker for a week under
(i) straight piece rate,
(ii) differential piece rate,
(iii) Halsey Premium scheme (50% sharing), and
(iv) Rowan Premium scheme:

Weekly working hours	48
Hourly wage rate (Rs)	7.50
Piece rate per unit (Rs)	3.00
Normal time taken per piece	24 minutes
Normal output per week	120 pieces
Actual output for the week	150 pieces
Differential piece rate	80% of piece rate when output is below normal and 120% of piece rate when output above normal.

(I.C.W.A. Inter June 1999)

Solution

Computation of Workers' weekly earning under Different Wage Plans

(i) *Straight Piece Rate*

= Weekly Output × Piece Rate per unit

Earnings = 150 units × Rs 3 = Rs 450

(ii) *Differential Piece Rate*

$$\text{Efficiency level achieved} = \frac{150 \text{ pieces}}{120 \text{ pieces}} \times 100 = 125\%$$

The efficiency Level achieved is more than 80%. Hence, a high differential piece rate (i.e. at 120%) is applicable i.e. (Rs 3 × 120%) = Rs 3.60 per piece

Earnings = 150 pieces × Rs 3.60 = Rs 540

(iii) *Halsey Premium Scheme (50% sharing)*

Standard Hours for Actual Production = (48/120) × 150 = 60 hours

Time Saved = 60 hours – 48 hours = 12 hours

Earnings = Hours Worked × Rate per hour + 1/2 of time saved × Rate per hr.

= 48 × Rs 7.50 + 1/2 × 12 × 7.50 = Rs 360 + Rs 45

= Rs 405

(iv) *Rowan Premium Scheme*

$$\text{Earnings} = \text{Hours Worked} \times \text{Rate per hour} + \frac{\text{Time Saved}}{\text{Time Allowed}} \times \text{Time Taken} \times \text{Rate per hr.}$$

= 48 × Rs 7.50 + 12/60 × 48 × Rs 7.50

= Rs 360 + 72 = Rs 432

Example 5.6

In a manufacturing unit, a multiple piece rate plan is operated as under:

(i) Basic piece rate up to 85% efficiency;

(ii) 115% basic piece rate between 90% and 100% efficiency;

(iii) 125% basic piece rate above 100% efficiency.

The workers are eligible for a "Guaranteed Day Rate" which is equal to 75% efficiency and the piece rate is Rs 2.00 per piece.

Compute the labour cost per piece at 5% intervals between 65% and 125% efficiency, assuming that at 100% efficiency 60 pieces are produced per day.

(I.C.W.A. Inter Dec. 1997)

Solution

Computation of Labour Cost Per Piece

Efficiency %	*Output per day (units)*	*Piece Wage @ Rs 2 per piece*	*Guaranteed Time wages per day Rs*	*15% Additional piece wage Rs*	*25% Additional piece wage Rs*	*Total Labour Cost Rs*	*Labour Cost per piece Rs*
65	39	78	90	–	–	90.00	2.31
70	42	84	90	–	–	90.00	2.14
75	45	90	90	–	–	90.00	2.00

(Contd)

80	48	96	–	–	–	96.00	2.00
85	51	102	–	–	–	102.00	2.00
90	54	108	–	16.20	–	124.20	2.30
95	57	114	–	17.10	–	131.10	2.30
100	60	120	–	18.00	–	138.00	2.30
105	63	126	–	–	31.50	157.50	2.50
110	66	132	–	–	33.00	165.00	2.50
115	69	138	–	–	34.50	172.50	2.50
120	72	144	–	–	36.00	180.00	2.50
125	75	150	–	–	37.50	187.50	2.50

Working Notes:

1. The guaranteed time wage is payable at 75% efficiency. Hence, the time wages of Rs 90 per day is payable for efficiency up to 75%.
2. Normal piece wages are payable at 80% and 85% efficiency levels.
3. At efficiency levels between 90% and 100%, additional 15% of the piece wages have been allowed.
4. At efficiency levels above 100%, additional 25% of the piece wages have been allowed.

Example 5.7

A job can be executed either through workman *A* or *B*. A takes 32 hours to complete the job while *B* finishes it in 30 hours. The standard time to finish the job is 40 hours.

The hourly wage rate is same for both the workers. In addition workman *A* is entitled to receive bonus according to Halsey plan (50% sharing) while *B* is paid bonus as per Rowan plan. The works overheads are absorbed on the job at Rs 7.50 per labour hour worked. The factory cost of the job comes to Rs 2,600 irrespective of the workman engaged.

Find out the hourly wage rate and cost of raw materials input. Also show cost against each element of cost included in factory cost.

(C.A. Inter Nov. 1997)

Solution

Basic Calculations

1. *Computation of Time saved and Wages*

Workman	*A*	*B*
Standard Time (Hrs.)	40	40
Actual Time (Hrs.)	32	30
Time Saved (Hrs.)	08	10
Wages paid @ Rs x per Hr. (Rs)	$32x$	$30x$

2. *Computation of Bonus*

	Halsey Plan	Rowan Plan
Time saved (Hrs.)	8	10
Bonus (Rs)	$\frac{8 \text{ Hrs.} \times \text{Rs } x}{2} = 4x$	$\frac{10 \text{ Hrs.}}{40 \text{ Hrs.}} \times 30 \text{ Hrs.} \times \text{Rs } x = 7.5x$

3. *Computation of Total Wages*
   Workman *A*: $32x + 4x$ = Rs $36x$
   Workman *B*: $30x + 7.5x$ = Rs $37.5x$
4. *Computation of Factory Cost of the Job*

Workman	*A*	*B*
	Rs	Rs
Material	y	y
Wages (as per above)	$36x$	$37.5x$
Works Overhead	240	225
Factory Cost	2,600	2,600

From the above, the following simultaneous equation can be made out:

$$36x + y + 240 = 2{,}600 \quad \text{(i)}$$

$$37.5x + y + 225 = 2{,}600 \quad \text{(ii)}$$

On subtracting (i) from (ii) we get the following results.

$$1.5x - 15 = 0$$

or $$1.5x = 15$$

or $$x = \text{Rs } 10 \text{ per hour.}$$

On substituting the value of x in equation (i)

$$36 \times 10 + y + 240 = 2{,}600$$

or $$y' = 2{,}600 - 360 - 240$$

or $$y = \text{Rs } 2{,}000$$

The wage rate per hour is Rs 10 and the cost of raw material input is Rs 2,000 for the job.

Example 5.8

In a factory Ram and Sham produce the same product using the same input of same material and at the same normal wage rate.

Bonus is paid to both of them in the form of normal time wage rate adjusted by the proportion which time saved bears to the standard time for the completion of the product. The time allotted to the product is fifty hours. Ram takes thirty hours and Sham takes forty hours to produce the product. The Factory Cost of the product for Ram is Rs 3,100 and for Sham Rs 3,280. The Factory Overhead Rate is Rs 12 per man hour.

Calculate (i) Normal Wage Rate; (ii) Cost of material used for the product; and (iii) the input of material if the unit material cost is Rs 16. *(B.Com. Hons Delhi 1997)*

Solution Let x be the cost of material and y be the normal rate of wages per hour

Factory Cost of Workman Ram

	Rs
Material	x
Wages	$30y$
Bonus ($30y \times 20/50$)	$12y$
Overheads	360
Factory Cost	$x + 42y + \text{Rs } 360$

Factory Cost of Workman Sham

Material	x
Wages	$40y$
Bonus ($40y \times 10/50$)	$8y$
Overheads	480
	$x + 48y + 480$

The following two equations can be made

$$x + 42y + 360 = \text{Rs } 3{,}100 \quad \text{(i)}$$

$$x + 48y + 480 = \text{Rs } 3{,}280 \quad \text{(ii)}$$

On subtracting equation (i) from equation (ii)

$$6y + 120 = 180$$

or $$6y = 180 - 120$$

$$y = 60/6 = 10$$

On substituting the value of y in equation (i)

$$x + 420 + 360 = 3{,}100$$

or $$x = 3{,}100 - 780$$

or $$x = 2{,}320$$

Thus:

(i) Normal Wage Rate is Rs 10 per hour

(ii) Cost of material used for the product is Rs 2,320

(iii) Input of material is 2,320/16 = 145 units.

Example 5.9

An article passes through five hand operations as follows:

Operation No.	*Time per article*	*Grade of worker*	*Wage rate per hour*
1	15 minutes	*A*	Re 0.65
2	25 minutes	*B*	Re 0.50
3	10 minutes	*C*	Re 0.40
4	30 minutes	*D*	Re 0.35
5	20 minutes	*E*	Re 0.30

The factory works 40 hours a week and the production target is 600 dozens per week. Prepare a statement showing for each operation and in total the number of operators required, the labour cost per dozen and the total labour cost per week to produce the total targeted output.

(C.A. Inter May 1996)

Solution *Statement of Number of Operators Required and Labour Cost*

Operation No.	*No. of Operators required* (see Working Note)*	*Labour Cost of 600 dozens per week*	*Labour Cost per dozen*
		Rs	*Rs*
1	45	1,170 ($45 \times 40 \times 0.65$ p)	1.95 (Rs 1,170/600)
2	75	1,500 ($75 \times 40 \times 0.50$ p)	2.50 (Rs 1.500/600)
3	30	480	0.80

(Contd)

		$(30 \times 40 \times 0.40p)$	(Rs 480/600)
4	90	1,260	2.10
		$(90 \times 40 \times 0.35p)$	(Rs 1,260/600)
5	60	720	1.20
		$(60 \times 40 \times 0.30p)$	(Rs 720/600)
	300	5,130	8.55

Working Note:

Operation No.	*No. of operators required*
1	$\frac{600 \text{ dozens} \times 12}{40} \times \frac{15}{60} = 45$
2	$\frac{600 \text{ dozens} \times 12}{40} \times \frac{25}{60} = 75$
3	$\frac{600 \text{ dozens} \times 12}{40} \times \frac{10}{60} = 30$
4	$\frac{600 \text{ dozens} \times 12}{40} \times \frac{30}{60} = 90$
5	$\frac{600 \text{ dozens} \times 12}{40} \times \frac{20}{60} = 60$

Example 5.10

A company has its factories at two locations. Rowan plan is in use at location *A* and Halsey plan at location *B*. Standard time and basic rate of wages are same for a job which is similar and is carried out on similar machinery. Time allowed is 60 hours.

Job at location '*A*' is completed in 36 hours while at *B*, it has taken 48 hours. Conversion costs at respective places are Rs 1,224 and Rs 1,500. Overheads account for Rs 20 per hour.

Required:

(a) To find out the normal wage rate, and

(b) To compare respective conversion costs. *(C.A. Inter June 1995)*

Solution

Let Rs x per hour be the normal wage rate

$\therefore$ Wages at location *A* will be Rs 36 x and Rs 48 x for location *B*.

Time allowed is 60 hours

Hence, for time saved, bonus will be payable as under

Location A

$$\text{Bonus under Rowan Scheme} = \frac{\text{Time saved}}{\text{Time allowed}} \times \text{Hrs worked} \times \text{Rate}$$

$$= \frac{24}{60} \times 36 \times x = \text{Rs } 14.4x$$

Total wages Rs 36 x + Rs 14.4 x = Rs 50.4 x

Overheads @ Rs 20 per hour worked Rs 720

Hence, total Conversion cost is $50.4x + 720 = Rs\ 1,224$ (given)

OR $x = 10$.

Location B

Bonus under Halsey plan = 50% of Time saved × Rate per hour

= 50% of $12 \times x = Rs\ 6x$

Total Wages $= 48x + Rs\ 6x = Rs\ 54x$

Overheads Rs 20 per hour = Rs 960

Total Conversion Cost is $54x + 960 = Rs\ 1,500$

OR $x = Rs\ 10$.

Comparative Conversion Cost

Particulars	*A (Rowan)*	*B (Halsey)*
Wages @ Rs 10 per hour	Rs 360	Rs 480
Bonus	Rs 144	Rs 60
Overheads	Rs 720	Rs 960
	Rs 1,224	Rs 1,500

Example 5.11

The standard hours of job *X* is 100 hours. The job has been completed by Amar in 60 hours, Akbar in 70 hours and Anthony in 95 hours. The bonus system applicable to the job is as follows:

Percentage of time saved to time allowed	*Bonus*
Saving upto 10%	10% of time saved
From 11% to 20%	15% of time saved
From 21% to 40%	20% of time saved
From 41% to 100%	25% of time saved

The rate of pay is Rs 10 per hour. Calculate the total earnings of each worker and also the rate of earnings per hour. *(CA Inter.)*

Solution

Statement of Total Earnings and Rate of Earnings per Hour

	Workers		
Particulars	*Amar*	*Akbar*	*Anthony*
Standard hours of Job	100 hours	100 hours	100 hours
Time taken on the Job (i)	60 hours	70 hours	95 hours
Time saved	40 hours	30 hours	5 hours
Percentage of time saved to time allowed:	40%	30%	5%
Bonus (as percentage of time saved)	20%	20%	10%
Bonus hours (WN 1) (ii)	8	6	0.50
Total hours to be paid (i) + (ii)	68	76	95.5
Total earning @ Rs 10 per hour	Rs 680	Rs 760	Rs 955
Rate of earning per hour	Rs 11.33	Rs 10.857	Rs 10.052

Working Notes:

1. Computation of Bonus hours as percentage of time saved:

Amar	40 hours × 20%	= 8 hours
Akbar	30 hours × 20%	= 6 hours
Anthony	5 hours × 10%	= 0.5 hours

2. Computation of Rate of Earning per hour:

$$= \frac{\text{Total earnings}}{\text{Total time taken on the job}}$$

$$\text{Amar} = \frac{\text{Rs } 680}{60 \text{ hours}} = \text{Rs } 11.33$$

$$\text{Akbar} = \frac{\text{Rs } 760}{70 \text{ hours}} = \text{Rs } 10.857$$

$$\text{Anthony} = \frac{\text{Rs } 955}{95 \text{ hours}} = \text{Rs } 10.052$$

Example 5.12

Calculate total monthly remuneration of three workers *A*, *B* and *C* from the following data:

(a) Standard production per month per worker – 1,000 units. Actual production during month A-850 units, B-750 units, C-950 units.

(b) Piecework rate Rs 10 per unit (actual production).

(c) Additional production bonus is Rs 10 for each percentage or actual production exceeding 80%. *(ICWA Inter)*

(d) Dearness pay fixed Rs 50 per month.

Solution

Standard production	1,000 units
A's actual production	850 units

A's production efficiency $\frac{850}{1{,}000} \times 100 = 85\%$

B's actual production 750 units

B's production efficiency $\frac{750 \times 100}{1000} = 75\%$

C's actual production 950 units

C's production efficiency $\frac{950 \times 100}{1000} = 95\%$

A will be entitled to a bonus of Rs 10 × 5 = Rs 50

C will be entitled to a bonus of Rs 10 × 15 = Rs 150

B will get no bonus as his production efficiency is below 80%

The earnings of the workers will be as follows:

	A	*B*	*C*
Piece wage @ Rs 10 per unit produced	8500	7500	9500
Bonus	50	—	150
Dearness pay	50	50	50
	8600	7550	9700

Example 5.13

A worker, whose day-work wages are Rs 25 per hour, received production bonus under the Rowan Scheme. He carried out the following work in a 48-hour week:

Job 1—1,500 items at 4 hours per 1,000
Job 2—1,800 items at 3 hours per 1,000
Job 3—9,000 items at 6 hours per 1,000
Job 4—1,500 items for which no 'standard time' was fixed and it was arranged that the worker would be paid a bonus time of 25 per cent. Actual time on the job was 4 hours.
Job 5—2,000 items at 8 hours per 1,000, this job was estimated to be half-finished.

Job No. 2 was carried out on a machine running at 90 per cent efficiency and an extra allowance of 1/9th of actual time was given to compensate the worker.

4 hours were lost due to power cut. Calculate the earnings of the worker, clearly stating your assumptions for the treatment given by you for the hours lost due to power-cut.

(ICWA Inter,)

Solution

Computation of Time Saved

			Hours
Time allowed			
Job 1	1,500 items at 4 hours per 1,000		6.00
Job 2	1,800 items at 3 hours per 1,000	5.40	
	Add: extra allowance 1/9th	0.60	6.00
Job 3	9,000 items at 6 hours per 1,000		54.00
Job 4	1,500 items actual time 4 hours + bonus of 25%		5.00
Job 5	1,000 items (Half of 2,000 items) at 8 hours per 1,000		8.00
			79.00

Time taken: Gross 48 hours

Less: Loss of hours due to power cut 4 hours. Net hours 48 – 4 = 44 hours

Time saved = 79 hours – 44 hours = 35.00 hrs

(ii) Total Earnings = Earnings as per normal day wage + Bonus for time saved under Rowan Scheme

Rate

$$= \left(48 \text{ hours} \times 25 + \frac{\text{Time saved}}{\text{Time allowed}} \times \text{Time taken}\right) \times \text{Rate per hr}$$

$$= \left(48 \text{ hours} \times 25 + \frac{35}{79} \times 44 \text{ hours}\right) \times 25$$

= Rs 1687.34

Note: It has been presumed that worker is entitled to bonus on lost time due to power cut.

Example 5.14

Following are the particulars for April, 2002 relating to four employees working in Department 'M' of a factory, exclusively for Job. No. 120.

Name	*Designation*	*Wages (Rs)*	*Per*
A	Foreman	8000	month
B	Mechanic	150	day
C	Machine operator	120	day
D	Workman	100	day

The normal working hours per week of six days are 48, or 8 hours per day. Sundays are paid holidays. (There were no other holidays during the month).

Provident Fund contribution was 8% of monthly wages by employee.

Provident Fund contribution was 8% of monthly wages by employer.

Employee State Insurance Contribution was 3% of monthly wages by employee and 5% of monthly wages by employer.

From the foregoing data, calculate:

(a) Net wages payable by the employer for the month;
(b) The total amount of Provident Fund contribution to be deposited by employer:
(c) Employee State Insurance contribution to be deposited by employer;
(d) Total labour cost to the employer for the month of April, chargeable to the job; and
(e) The total cost of the job requiring materials is valued at Rs 60,000 and overheads at 50% of prime cost. *(ICWA Inter.)*

Solution

(a) Calculation of Net Wages Payable for the Month

	Rs	
Gross wages for April, 2002		
A Foreman (a) Rs 8000 p.m.	8000	
B Mechanic (a) Rs 150 per day × 30 days	4500	
C Machine Operator @ Rs 120 per day × 30 days	3600	
D Workman (a) Rs 100 per day × 30 days	3000	
		19100.00
Less: Deductions		
(i) Provident Fund Contribution @ 8% of Rs 19100 by employees	1528	
(ii) ESI Contribution @ 3% of Rs 19100 by employees	573	
		2101.00
		16999.00
Net Wages Payable		

(b) Employer's share of Provident Fund of (8% of Rs 19100)	Rs 1528
Employee's share of Provident Fund (8% of Rs 19100)	1528
Total amount of Provident Fund contribution to be deposited by employer (both contributions)	3056
(c) Employer's share of ESI (5% of Rs 19100)	955
Employee's share of ESI (3% of Rs 19100)	573
ESI contribution to be deposited by employer (both contributions)	1528

(d) Total labour cost to employer

Total gross wage	19100
Add: Employer's contribution towards P.F.	1528
Employer's contribution towards ESI	955
	21583

(e) Total cost of job

Material	Rs 60,000
Labour cost as per (d) above	21,583
Prime cost	81,583
Overheads at 50% of Prime cost	40791
Total cost of the job	1,22,374

Example 5.15

During audit of accounts of *G.* Company, your assistant found errors in the calculation of the wages of factory workers and he wants you to verify his work.

He has extracted the following information:

(i) The contract provides that the minimum wage for a worker is his base rate. It is also paid for downtimes (i.e., the machine is under repair or the worker is without work. The standard work week is 40 hours. For overtime production, workers are paid 150 percent of base rates.

(ii) Straight Piece Work—The worker is paid at the rate of 20 paise per piece.

(iii) Percentage Bonus Plan—Standard quantities of production per hour are established by the engineering department. The workers' average hourly production, determined from his total hours worked and his production, is divided by the standard quantity of production to determine his efficiency ratio. The efficiency ratio is then applied to his base rate to determine his hourly earnings for the period.

(iv) Emerson Efficiency Plan-A minimum wages is paid for production upto $66\frac{2}{3}\%$ of standard output or efficiency. When the workers production exceeds $66\frac{2}{3}\%$ of the standard output he is paid bonus as per the following table:

Efficiency Level	*Bonus*
Upto $66\frac{2}{3}\%$	Nil
Above $66\frac{2}{3}\%$ to 79%	10%
80% – 99%	20%
100% – 125%	45%

Your assistant has produced the following schedule pertaining to certain workers of a weekly pay roll:

Workers	*Wage Incentive Plan*	*Total Hours*	*Down Time Hours*	*Units Produced*	*Standard Units*	*Base Rate*	*Gross Wages as per Book*
						Rs	*Rs*
Rajesh	Straight piece work	40	5	400	—	1.80	85
Mohan*	Straight piece work	46	—	455	—	1.80	95
John	Straight piece work	44	—	425	—	1.80	85
Harish	Percentage bonus plan	40	4	250	200	2.20	120
Mahesh	Emerson	40	—	240	300	2.10	93
Anil	Emerson (40 hours production)	40	—	600	500	2.00	126

* Total hours of Mohan include 6 overtime hours.

Prepare a schedule showing whether the above computation of workers' wages are correct or not. Give details. *(C.A. Inter May 1999)*

Solution

Minimum Wages
(Gross Wages and Wages to be paid)

Workers	*Wage Incentive Plan*	*Minimum Wages*	*Gross Wages computed as per incentive Plan*	*Gross Wages as per book*	*Wages to be paid*
		(Rs)	*(Rs)*	*(Rs)*	*(Rs)*
Rajesh (WN 1)	Straight piece work	72.00	80.00	85	80.00
Mohan (WN 2)	Straight piece work	88.20	91.00	95	91.00
John (WN 3)	Straight piece work	82.80	85.00	85	85.00
Harish (WN 4)	Percentage bonus plan	88.00	110.00	120	110.00
Mahesh (WN 5)	Emerson	84.00	100.80	93	100.80
Anil (WN 6)	Emerson	80.00	116.00	126	116.00

Working Notes:

1. Minimum Wages for Rajesh = Total Normal Hours × Rate per Hour
   = 40 hours × Rs 1.80 = Rs 72

   Gross wages (Computed) as per incentive plan = No. of units × Rate per unit
   = 400 units × Rs 0.20 = Rs 80
2. Minimum Wages for Mohan = Total Normal Hours × Rate per Hour + Overtime Hours × Overtime Rate per Hour
   = 40 hours × Rs 1.80 + 6 hours × Rs 2.70
   = Rs 72 + Rs 16.20 = Rs 88.20

   Gross wages (computed) as per incentive plan = 455 units × Rs 0.20 = Rs 91.00
3. Minimum Wages for John = 40 hours × Rs 1.80 + 4 hours × Rs 2.70
   = Rs 72 + Rs 10.80 = Rs 82.80

Gross Wages (computed) as per incentive plan = 425 units × Rs 0.20 = Rs 85

4. Minimum Wages for Harish = 40 hours × Rs 2.20 = Rs 88

Efficiency of Worker $= \frac{\text{Actual Production per hour}}{\text{Standard Production per hour}} \times 100$

$= \frac{(250 \text{ units}/40 \text{ hours})}{(200 \text{ units}/40 \text{ hours})} \times 100 = 125\%$

Hourly rate = Rate per hour × Efficiency of worker

Gross Wages Computed = Rs 2.20 × 125% = Rs 2.75

(as per percentage bonus plan) = 40 hours × Rs 2.75 = Rs 110

5. Minimum wages for Mahesh = 40 hours × Rs 2.10 = Rs 84

Efficiency of worker $= \frac{(240 \text{ units}/40 \text{ hours})}{(300 \text{ units}/40 \text{ hours})} \times 100 = 80\%$

Bonus (as per Emerson's plan) = Total Minimum Wages × Bonus Percentage
= Rs 84 × 20% = Rs 16.80

Gross Wages as per Emerson's Efficiency plan = Minimum wages + Bonus
= Rs 84 + Rs 16.80 = Rs 100.80

6. Minimum Wages for Anil = 40 hours × Rs 2 = Rs 80

Efficiency of worker $= \frac{600}{500} \times 100 = 120\%$

Bonus as per Emerson's plan = Rs 80 × 45% = Rs 36

Gross wages as per Emerson's Efficiency plan = Rs 80 + Rs 36 = Rs 116

Example 5.16

The Cost Accountant of Tirupati Electronics Ltd. has computed labour turnover rates for the quarter ending 31st March, 1998 as 10%, 5% and 3% respectively under 'Flux Method', Replacement Method', and 'Separation Method'. If the number of workers replaced during that quarter is 30, find out the number of (a) workers recruited and joined and (b) workers left and discharged.

(B. Com. Hons Delhi 1998)

Solution Computation of Labour Turnover Rate

1. Replacement Method $= \frac{\text{Number of replacements}}{\text{Average number of workers}}$

= Putting the values in formula

$$\frac{5}{100} = \frac{30}{\text{Av. No. of workers}}$$

Hence, average number of workers $= \frac{30 \times 100}{5} = 600$

2. Separation Method

$$\frac{\text{No. of Separations}}{\text{Average Number of workers}}$$

or $$= \frac{3}{100} = \frac{X}{600}$$

$$X = 18$$

3. Flux Method

$$= \frac{\text{Number of Separations + Number of Additions}}{\text{Average number of workers}}$$

$$= \frac{10}{100} = \frac{18 + \text{No. of Additions}}{600}$$

$$= \text{No. of Additions} = \frac{600 - 1800}{100} = \frac{4200}{100}$$

$$= 42$$

Hence, the number of Additions = 42

From the above, the following information as desired by the question can be computed.

(a) Workers recruited and joined = 42
(b) Workers left and discharged = 18

Example 5.17

The management of Sunshine Ltd. wants to have an idea of the profit lost/foregone as a result of labour turnover last year.

Last year sales amounted to Rs 66,00,000 and the *P/V* Ratio was 20%. The total number of actual hours worked by the direct labour force was 3.45 lakhs. As a result of the delays by the Personal Department in filling vacancies due to labour turnover, 75,000 potentially productive hours were lost. The actual direct labour hours included 30,000 hours attributable to training new recruits, out of which half of the hours were unproductive. The costs incurred consequent on labour turnover revealed on analysis the following:

	Rs
Settlement cost due to leaving	27,420
Recruitment costs	18,725
Selection costs	12,750
Training costs	16,105

Assuming that the potential production lost due to labour turnover could have been sold at prevailing prices, ascertain the profit foregone/lost last year on account of labour turnover.

(C.A. Inter May 1998)

Solution

Basic Calculations

(i) Actual Productive Hours = Actual Hrs. Worked – Unproductive Training Hrs.
= 3,45,000 hrs. – 15,000 Hrs. = 3,30,000

(ii) Sales per Productive Hour = Total Sales/Actual Productive Hrs.
= Rs 66,00,000/3,30,000 hrs. = Rs 20

(iii) Potential Productive Hours Lost = 75,000 hrs.

(iv) Sales Foregone = 75,000 hrs. × Rs 20 = Rs 15,00,000

(v) Contribution Foregone = Sales Foregone × *P/V Ratio*
= Rs 15,00,000 × 20% = Rs 3,00,000

M/s Sunshine Ltd.
Statement of Profit Foregone as a Result of Labour Turnover

		Rs
Contribution Foregone (See note (v) above)		3,00,000
Add: Settlement Cost due to leaving	27,420	
Recruitment Costs	18,725	
Selection Costs	12,750	
Training Costs	16,105	
		75,000
Total Profit Foregone		3,75,000

Example 5.18

From the following information calculate Labour turnover rate:

No. of workers as on 01.01.2000 = 7,600

No. of workers as on 31.12.2000 = 8,400

During the year, 80 workers left while 320 workers were discharged. 1,500 workers were recruited during the year of these, 300 workers were recruited because of exits and the rest were recruited in accordance with expansion plans.

(C.A. Inter May 2001)

Solution

Labour turnover rate:

It comprises of computation of labour turnover by using following methods:

(i) *Separation Method:*

$$= \frac{\text{No. of workers left + No. of workers discharged}}{\text{Average number of workers}} \times 100$$

$$= \frac{(80 + 320)}{(7,600 + 8,400) \div 2} \times 100$$

$$= \frac{400}{8,000} \times 100 = 5\%$$

(ii) *Replacement Method:*

$$= \frac{\text{No. of workers replaced}}{\text{Average number of workers}} \times 100$$

$$= \frac{300}{8{,}000} \times 100 = 3.75\%$$

(iii) *New Recruitment:*

$$= \frac{\text{No. of workers newly recruited}}{\text{Average number of workers}} \times 100$$

$$= \frac{1{,}200}{8{,}000} \times 100 = 15\%$$

Flux Method:

$$= \frac{\text{No. of separations} + \text{No. of workers recruited}}{\text{Average number of workers}} \times 100$$

$$= \frac{(400 + 1500)}{(7{,}600 + 8{,}400) \div 2} \times 100$$

$$= \frac{1{,}900}{8{,}000} \times 100 = 23.75\%$$

THEORY QUESTIONS

1. Describe the various methods of recording time. *(CA Inter)*
2. What are the merits and demerits of time rate and piece-rate systems of wage payment? State the situations in which each system is effective and useful. *(CA Inter)*
3. What are the reasons for booking workers on idle time in a factory? How is idle time controlled and treated in cost accounts? *(CA Inter)*
4. Discuss individual bonus systems, group bonus systems and bonus systems for indirect workers.
5. List the characteristics desirable in any Incentive Wages Plan.
6. Distinguish between systems of wage payments known as Taylor's Differential Piece-Rate and Emerson's Efficiency system.
7. What is labour turnover? How will you measure it. What are its causes and effects on labour costs? *(CA Inter, ICWA Inter)*
8. What is idle time? Indicate the different categories into which idle time can be classified and state which of them can be effectively controlled and how? *(ICWA Inter)*
9. A company is considering installing a workers' profit sharing scheme in lieu of an individual bonus scheme. You are required to specify the disadvantages of the former. *(ICWA Inter)*
10. (a) Describe the treatment of payments to labour for overtime work and in respect of holiday with pay in cost accounts. *(B. Com., Delhi)*
    (b) Distinguish between Taylor's differential piece-rate and the Emerson Efficiency Plan system of incentive wage payments. *(B. Com. Delhi)*

11. Explain the purpose of time keeping and time booking and state what detailed records are normally maintained under each. Do you feel any need for reconciliation of these two. What is the benefit you expect if such reconciliation is carried out? *(ICWA Inter)*
12. Write a short essay on. "Time and Motion Study", stating the benefits to be derived by management from such study. *(ICWA Inter)*
13. How are payments to workers in respect of overtime work and set-up time treated in cost accounts? *(B. Com. (Hons), Delhi 1997)*
14. What is idle time? Explain the causes leading to idle time and its treatment in cost accounts. *(B. Com. (Hons), Delhi 1998)*
15. Explain the nature and significance of 'Labour Turnover'. *(B. Com. (Hons) Delhi 1999)*
16. State the purposes served by Time Keeping and Time booking records of a factory. *(B. Com. (Hons), Delhi 2000)*
17. What are the effects of labour turnover on cost of production. *(B. Com. (Hons), Delhi 2000)*
18. Enumerate the causes of labour turnover. What is the impact of high labour turnover on the cost of production. *(B. Com. (Hons), Delhi 2001)*
19. "High wages do not necessarily mean high labour cost," Elucidate. *(ICWA Inter)*
20. How is payroll accounting function organised in a manufacturing establishment? *(B. Com. (Hons), Delhi)*
21. Explain what is meant by group bonus and state the objectives of introducing a group bonus schemes. *(CA Inter)*
22. What do you understand by overtime premium? What is the effect of overtime payment on productivity and cost? Discuss the treatment of overtime premium in cost accounts and suggest a procedure for control of overtime. *(CA Inter)*
23. What do you understand by time and motion study? Explain how standard time is set under time study. State how time and motion study is useful to management. *(CA Inter)*
24. Define job evaluation and distinguish it from merit rating. Explain the method and objectives of job evaluation. *(CA Inter)*
25. What do you understand by 'idle time'? Distinguish between 'Normal' and 'Abnormal idle time'. How would you deal with each one of them in cost accounts? Give a suitable example to clarify your answer. *(B. Com. (Hons), Delhi)*
26. How will you treat the following in cost accounts:
    (i) Interest on capital
    (ii) Leave wages
    (iii) Research and development cost
    (iv) Audit fees *(B. Com. (Hons), Delhi)*

PROBLEMS

1. There are two piece-workers, Rakhal and Upendra, who are paid Rs 5 for each piece work executed, which costs Rs 15 per piece in materials.
   In a working day of 8 hours, Rakhal can complete 4 pieces and Upendra only 3. If the overhead charges be Rs 1.50 per hour show which of the two piece workers is more useful to the factory. *(ICWA Inter)*

   Ans: Rakhal's cost of production is Rs 23 per unit. Upendra's cost of production is Rs 24 per unit. Rakhal's employment will be useful as his cost is lesser than that of Upendra's cost.

2. From the following data, prepare a statement showing the cost per day of 8 hours of engaging a particular type of labour
   (a) Monthly salary (basic + dearness allowance) Rs 2000
   (b) Leave salary payable to the workman 5% of salary
   (c) Employer's contribution to P.F. 8% of salary (items a and b)
   (d) Employer's contribution to State insurance $2\frac{1}{2}$% of salary (item a + b)
   (e) Prorata to labour expenditure on amenities Rs 179.5 per head per month
   (f) No. of working hoursin a month 200 *(ICWA, Inter)*

   Ans: Rs 100
3. A work measurement study was carried out in a firm for 10 hours and the following information was generated:

Units produced	350
Idle time	15 per cent
Performance rating	120 per cent
Allowance time	10% of standard time

   What is the standard time for task? *(CA Inter)*

   Ans: Standard time for one unit, 1.94 minutes.
4. An employee working under a bonus scheme saves in a job for which the standard time is 60 hours. Calculate the rate per hour worked and wages payable to a worker if incentive bonus of 10% on the hourly rate is payable when standard time (namely, 100% efficiency) is achieved, and a further incentive bonus of 1% on hourly rate for each 1% in excess of that 100% efficiency is payable.
   Assume that the normal rate payment is Rs 5 per hours. *(CA Inter)*

   Ans. Hourly Rate Rs 6.50, total wayes payable Rs 325.
5. Calculate the standard labour hour rate for workman of Grade III from the following data:

Basic Pay	Rs 2000 p.m.
D.A.	Rs 1500 p.m.
Fringe benefits	Rs 1000 p.m.
Numbers of working days per year	300

   Leave Rules
   30 days P.L. with full pay
   20 days S.L. with half pay
   Usually, sick leave is fully availed of. What should be the labour cost per hour, if no sick leave is availed of during the year? *(ICWA, Inter)*

   Ans: Standard labour hour rate:
   (i) When sick leave is availed Rs 26.25
   (ii) When sick leave is not availed Rs 25.00
6. In a factory bonus system, bonus hours are credited to the employee in the proportion of time taken, which time saved bears to time allowed. Jobs are carried forward from one week to another. No overtime is worked and payment is made in full for all units worked on including those subsequently rejected.
   From the following information you are required to calculate for each employee:
   (a) bonus hours and amount of bonus earned
   (b) total wages cost
   (c) wages cost of each good unit produced.

	A (Rs)	*B* (Rs)	*C* (Rs)
Basic wage rate per hour	25	40	30

(Contd.)

	(Rs)	(Rs)	(Rs)
Units produced	2500	2200	3600
Time allowed per 100 units	2 hrs, 36 min.	3 hrs	1 hr, 30 min.
Time taken	52 hrs	75 hrs	48 hrs
Rejects	100 units	40 units	400 units

(ICWA Inter)

Ans:

	A	*B*	*C*
Bonus hours	13	—	6
Bonus earned	Rs 260	—	Rs 160
Total wages cost	Rs 1560	Rs 3000	Rs 1600

Wages cost per unit Re 0.65, Rs 1.39, Re .50 of good output.

7. Two fitters, a labourer, and a boy undertake a work on piece work basis for Rs 600. This time spent by each of them is 220 ordinary working hours and the rates of pay are: for the two fitters Rs. 75 each per hour, for labourer Rs. 25 per hours and for the boy Rs. 25 per hour.
   Ascertain the amount of the piece-work premium and show the amount of it which each worker will receive when it is divided proportionately to the time wages paid, and show in each case the percentage the premium bears to the wages payments of ordinary rates.
   To the amount paid for working up add cost of materials Rs 1,20,000 proportion of "oncost" Rs 45,000, of selling expenses Rs 30,000 and for carriage charges Rs 20,000 and give the total cost.
   To return the manufacturer 20% on the total cost, at what price must he sell, and what will be the profit, if profit at 20% is expected on the selling price?
   Ans: (i) Selling Price Rs 3,30,000 in case of profit of 20% on cost.
   (ii) Selling Price will be Rs 3,43,750, if profit is 20% on selling price i.e., 25% on cost.
8. Milling section of a factory engages 25 direct workers. During the month of June, 2002 they were paid for 4800 normal attendance hours at an average rate of Rs 1.50 per hour. In addition, they also worked for 400 overtime hours at double pay. The overtime was necessitated by abnormal circumstances in April, 2002. For the purpose of reckoning labour cost, 40% for fringe benefits are to be added to gross wages. From the following particulars (a) work out the total labour cost and (b) allocate it to different cost elements etc.
   (a) Hours booked to jobs 4200
   (b) Allowed idle time 121/2%
   (c) There was no incidence of abnormal idle time. Actual idle time was exactly in accordance with standard set for the purpose. *(ICWA Inter)*
   Ans: Total labour cost for 5200 hours, Rs 11760, Allocation of labour cost: Jobs Rs 8820, Factory Overhead Rs 1260, costing P. and L. a/c Rs 1680.
9. Ever-ready Tools Ltd. has two factories, Factory No. 1 employs 130 and Factory No. 2 employs 150 direct workers. Both the factories work 40 hours per week and 50 weeks in a year. Overhead rates are as under:

Factory No. 1	Rs 25 per hour
Factory No. 2	Rs 20 per hour

   Current expenses are as under:

Factory No. 1	Rs 70,000
Factory No. 2	Rs 50,000

   Analyse these figures and state probable causes of discrepancy. *(CA Inter)*
   Ans: Factory 1 under recovery Rs 5,00,000
   Factory 2 over recovery Rs 10,00,000
10. A company's basic wage rate is Rs 3 per hour and its overtime rates are:
    Evenings: Time and one-third

Weekends: Double time

During the previous year the following hours were worked:

	Hours
Normal time	2,20,000
Time plus one-third	20,000
Double time	10,000

The following time has been worked on three jobs

	Job X	*Job Y*	*Job Z*
	hr.	hr.	hr.
Normal time	3,000	5,000	4,000
Evening overtime	300	600	1,050
Weekend overtime	100	50	300

You are required to calculate the labour cost chargeable to each job in each of the following circumstances:

(a) Where overtime is worked regularly throughout the year as company policy due to labour shortage

(b) Where overtime is worked irregularly to meet the spasmodic production requirements.

(c) Where overtime is worked specifically at the customer's request to expedite delivery.

Ans:

	Job X (Rs)	*Job Y (Rs)*	*Job Z (Rs)*
Situation (a)	10880	18080	17120
Situation (b)	10200	16950	16050
Situation (c)	10800	17700	18000

11. The management of a company are worried about their increasing labour turnover in the factory and before analysing the causes and taking remedial steps, they want to have an idea of the profit foregone as a result of labour turnover in the last year.

Last year sales amounted to Rs 83,03,300 and the profit volume ratio was 20 per cent. The total number of actual hours worked by the Direct Labour Force was 4.45 lakhs. As a result of the delays by the Personnel Department in filling vacancies due to labour turnover 1,00,000 potentially productive hours were lost. The actual direct labour hours included 30,000 hours attributable to training new recruits, out of which half of the hours were unproductive.

The costs incurred consequent on labour turnover revealed on analysis the following.

	(Rs)
Settlement costs due to leaving	43,820
Recruitment costs	26,740
Selection costs	12,750
Training costs	30,490

Assuming that the potential production lost as a consequence of labour turnover could have been sold at prevailing prices, find the profit foregone last year on account of labour turnover. *(CA Inter, Nov. 2001)*