PREFACE

In the curricular structure introduced by this University for students of Post-Graduate degree programme, the opportunity to pursue Post-Graduate course in any Subject introduced by this University is equally available to all learners. Instead of being guided by any presumption about ability level, it would perhaps stand to reason if receptivity of a learner is judged in the course of the learning process. That would be entirely in keeping with the objectives of open education which does not believe in artificial differentiation.

Keeping this in view, study materials of the Post-Graduate level in different subjects are being prepared on the basis of a well laid-out syllabus. The course structure combines the best elements in the approved syllabi of Central and State Universities in respective subjects. It has been so designed as to be upgradable with the addition of new information as well as results of fresh thinking and analysis.

The accepted methodology of distance education has been followed in the preparation of these study materials. Cooperation in every form of experienced scholars is indispensable for a work of this kind. We, therefore, owe an enormous debt of gratitude to everyone whose tireless efforts went into the writing, editing and devising of a proper lay-out of the materials. Practically speaking, their role amounts to an involvement in 'invisible teaching'. For, whoever makes use of these study materials would virtually derive the benefit of learning under their collective care without each being seen by the other.

The more a learner would seriously pursue these study materials, the easier it will be for him or her to reach out to larger horizons of a subject. Care has also been taken to make the language lucid and presentation attractive so that they may be rated as quality self-learning materials. If anything remains still obscure or difficult to follow, arrangements are there to come to terms with them through the counselling sessions regularly available at the network of study centres set up by the University.

Needless to add, a great deal of these efforts is still experimental—in fact, pioneering in certain areas. Naturally, there is every possibility of some lapse or deficiency here and there. However, these do admit of rectification and further improvement in due course. On the whole, therefore, these study materials are expected to evoke wider appreciation the more they receive serious attention of all concerned.

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Vice-Chancellor

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NETAJI SUBHAS OPEN UNIVERSITY

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Module 1

Module 2

Unit 1 □ Basics of Cost and Management Accounting

Structure

1.1 Introduction

Information is one of the bases of all decision making. Today's managers have to take quick decisions on a variety of issues most of which may be newer ones, particularly so in the context of globalization. Information is also needed by various interested external parties like creditors, investors, customers, etc. All these call for appropriate and relevant information. An accounting system is regarded as one of the basic sources of information generation. But Financial Accounting is designed to serve the needs mainly of external users. The deficiency, *inter alia,* of financial accounting in satisfying the information needs of management may be traced to be the major force behind evolution of Cost Accounting. Cost Accounting is specialized to deal with the cost and priced data of the products and services. It again leaves aside other information-needs of the management. For example, management has to take decisions

about the capital structure (composition of debt and equity), the sources of finance, the rates of dividend to be declared, the investments to be made, etc. So, limitations of cost accounting have led to the development of another branch of accounting termed as Management Accounting.

1.2 Cost Accounting

Cost Accounting is a process of determining costs of products and services. Naturally, it involves identification of the items of costs at the point at which they are incurred or committed to be incurred; it may also require arrangements for accumulation, classification and summarization of different cost items so identified for their meaningful interpretation. The term 'Cost Accounting' has been defined in the Terminology of the Chartered Institute of Management Accountants (CIMA, formerly named as the Institute of Cost & Management Accountants) of England as "that part of management accounting which establishes budgets and standard costs and actual costs of operations, processes, departments or products and the analysis of variances, profitability or social use of funds". The earlier definition of 'cost accounting' given by the erstwhile Institute of Cost and Management Accountants, London, reads 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." Clearly, over time, the scope of cost accounting has been widened. Gradually, it has stepped into the area of Management Accounting.

1.3 Objectives of Cost Accounting

Cost Accounting serves many useful purposes. So, Cost Accounting aims at achievement of those objectives. Some such important objectives are enumerated below :

i) Ascertainment of costs of products, processes, operations, services, departments or any part of them is the prime objective of cost accounting. Such data may again serve the purposes of cost management and pricing.

ii) It provides cost data which are very much used for planning and control purposes. Budgetory control and standard costing are two important tools for this purpose.

iii) It provides cost information required for long term and short term decisions.

iv) It provides a basis for measuring profitability.

1.4 Cost Accounting vs. Financial Accounting

There are certain differences between the two in different aspects. These are stated below :

i) While Financial Accounting primarily aims at serving the users external to the business unit, Cost Accounting provides information mainly for internal consumption.

ii) Basic statements of accounts in Financial Accounting are Profit and Loss Account, Balance Sheet and Cash Flow Statement which are prepared following certain principles (Generally Accepted Accounting Principles or GAAP) and provisions of statutes like the Companies Act and the Income Tax Act. In Cost Accounting various statements showing as ascertainment etc. of costs may be prepared product-wise, department/operation-wise with/for shorter and longer periods, depending on needs on the management.

iii) In case of Financial Accounting, the object of accounting (about which accounting is done) is the whole of a unit or its branch; it does not climb down the level of a product, process, a particular service or a component part of them. Cost Accounting, on the other hand, helps us in ascertaining costs on individual basis (cost per head), time basis (cost per hour) or on location basis (cost of holding a class), etc. So, Cost Accounting is suitable for micro level application.

iv) Financial Accounts are finalized at periodical intervals more or less regularly—yearly, half-yearly or quarterly. But Cost Accounting allows preparation of reports and statements for a period of any desired duration—monthly, weekly, daily or even hourly.

v) Financial Accounting records only those events and transactions which are measurable in monetary terms. The scope of Cost Accounting is much wider in the sense that it makes use of any measurement unit considered suitable; sometimes composite units like man-days, per head per Kilometer, etc, are also used.

vi) Financial statements (The Profit and Loss Account and the Balance Sheet) are the final products of Financial Accounting. They convey the results of past operations and the present financial position. They do not carry any information about the future and hence Financial Accounting is of very limited use for control purposes. Such statements may vary from organisation to organisation in the absence of standerdised forms. It is, therefore, more useful to the management for various decision-making, policy determination and control actions. But Cost Accounting facilitates cost management and control.

vii) Financial Accounting is adopted independently and is universal in its application. The need for Cost Accounting is not universal. It performs only a supplementary role. Though records are maintained separately for Cost Accounting, an organization can not depend only on Cost Accounting. We can not think of an organization adopting Cost Accounting without having installed any system of Financial Accounting; but the reverse is feasible.

viii) Financial Accounting is a continuous process while Cost Accounting may be intermittent in its application and may, therefore, lack in antecedent relationship.

1.5 Cost Accounting vs. Management Accounting

Before making any attempt to compare and distinguish between Cost Accounting and Management Accounting, it is necessary to have an idea about Management Accounting. In non-technical term, Management Accounting is a kind of accounting meant for the management. Of the many definitions given by many authors, only two are presented here to have a preliminary idea about Management Accounting. The first one given by the Institute of Cost and Management Accountants, London, defines it as 'the application of professional knowledge and skill in the preparation of accounting information in such a way as to assist management in the formulation of policies and in the planning and control of the operation of the undertakings'. The other definition has been given by the National Association of Accountants, U.S.A. It defines Management Accounting as 'the process of identification, measurement, accumulation, analysis, preparation, interpretation, and communication of financial information used by management to plan, evaluate and control within organization and to assure appropriate use of and accountability for its resources. Management Accounting also comprises the preparation of financial reports for non-management groups, such as shareholders, creditors, regulatory agencies, and tax authorities'. The latter definition is more comprehensive.

Some of the Cost Accounting techniques (marginal costing, standard costing, budgetary control, etc.) are also used in Management Accounting. Accordingly Management Accounting is regarded as an extension over Cost Accounting. Nevertheless, the following distinctions between the two may be worth noting :

i) While determination and control of costs are the prime objectives of cost accounting, supply of appropriate information relevant to managerial decision-making is the basic objective of Management Accounting.

ii) In Cost Accounting, control function works with pre-determined standards and attempts to rectify mistakes in work performance and also to improve the work

efficiency. Management Accounting, on the other hand, mainly deals with the various aspects of productivity, profitability, financing, investment, etc. It also keeps a constant vigil on the correctness of the standards themselves, revises them when necessary and attempts to improve them.

iii) Cost Accounting focuses on operation of the current period but the main focus of Management Accounting is the future operation.

1.6 Methods of Costing

One of the prime objectives of Cost Accounting, as stated earlier, is ascertainment of costs for goods produced or services rendered. But the method of ascertaining costs is not same for all the products or services. Different methods are used to suit the varying nature of the products or the production processes involved. Actually, the process of identification of costs gets complicated or becomes different in different situations. For a meaningful and desired interpretation of the costs so identified for producing goods or rendering services, the modes of presenting the costs are also varied. However, the principle of ascertaining costs i.e., aggregating different items of costs relevant to production remains the same in each case. So, different methods of costing depending on the differences in the process of collating the costs and presenting them have been evolved. All such methods can broadly be grouped into three :

A. Job Costing,

B. Process Costing, and

C. Farm Costing.

There are again three different approaches behind the above three methods. These are :

i) Product approach,

ii) Period approach, and

iii) Activity approach.

In *product approach*, primary cost object is product as in the case of Job Costing where costs are ascertained for each job (representing a product or a group of similar products) separately. In *period approach*, emphasis on ascertaining costs is on period; periodical costs are ascertained first, which are then distributed over the volume of productions during the period. The third approach i.e., *activity approach* puts emphasis on the different *activities* involved in the production process; the activity costs are then compiled to arrive at product cost. The system of costing which focuses on activities is popularly known as **Activity Based Costing**.

While product approach is followed in Job Costing, period approach is found to be suitable in both the methods of Process Costing and Farm Costing. Activity Based Costing can also be used in Job Costing as well as in Process Costing.

1.6.1 Job Costing

In some cases goods are produced or services are rendered on the basis of the specific orders of the customers. It is needless to mention that product specifications (volume, design, etc.) may vary from customer to customer. The basic objectives in such cases are determining costs and profit or loss for each of the jobs undertaken. This method is very popular in use in industries like tailoring, printing, ship-building, house-building, machine-tools repairing, carpentry, research projects, etc. This method of costing, however, has the following two variants :

a) *Batch Costing* : A batch refers to a group of similar products. In some cases, production operation is run for producing goods in batches either on the basis of the orders received or on the basis of an assessment of customers' demand for the goods. Each batch is treated as a job and costs are incurred and ascertained for each job separately. Unit cost of a product is computed by dividing the cost for a batch by the number of products in the batch. Batch Costing is used in toy making industry, pharmaceutical industry, bakeries, biscuits industry, electronic goods manufacturing, readymade garments manufacturing, etc.

b) *Contract Costing* : This method is applied for ascertaining cost of each contract entered into with the customers for manufacturing goods according to the specifications of the customers. The basic features of this type of contracts are : performance of the contract usually takes longer time, involves huge amount, and the nature of the jobs demands operations to be carried out at the place of the customer as in the case of civil contracts, etc. As the costing operation terminates with the completion of the contract, it is also termed as Terminal Costing.

1.6.2 Process Costing

In some cases manufacturing operations involve passing through a number of distinct stages or processes and very often the operations at these processes are carried out continuously without any break for a long period of time. Costs are not directly identifiable with each unit of product. Therefore, the costs of each process are computed and then accumulated by charging the cost of transfer to the transferee-process. Unit cost of the product is arrived at by applying method of averaging at the final stage.

This method of costing is suitably applied in industries like chemicals, paper, textiles, rubbers, steel, food processing, soap, paints, cement, mining, etc.

Process Costing also has a number of variants. These are :

a) *Output / Single Output / Unit Costing* : This method is used when production process is continuous and individual items of identical products are produced simultaneously. Unit cost of output is computed by dividing the total cost of production by the total number of units produced. This method is suitable for use in brick-fields, paper mills, steel works, flour mills, etc.

b) *Departmental Costing* : When a product passes through a number of departments and gets completed using manufacturing services in each department, the cost of the products is ascertained by aggregating the proportionate cost of services of all these departments. The cost of services in a department can be computed by first ascertaining the total cost of the department and then dividing the total cost by the total number of productions in the department.

c) *Operation Costing* : A process may sometimes be further broken down into a number of distinct operations costs of which may be separately ascertained. The method of ascertaining costs of operations is similar to that of Departmental Costing. This method is applied in industries which are involved in mass production of repetitive nature and products are standarised.

d) *Operating Costing* : This method is specifically applied in industries which provide services instead of producing goods. Such industries include transport, hospitals, educational institutions, canteen, telephone booth, etc. It is also termed as Service Costing or Function Costing. Following this method, cost of providing a service is ascertained, which is divided by the number of units of services rendered to get the unit cost. The peculiar feature of operating cost is that it requires composite unit (a combination of two cost-units) for expression. Some of the examples of composite units are : passenger-k.m., bed-days, Ton-k.m., Kilowatt-hour, etc.

In some cases, production process involves assembling a number of components produced separately. While job costing may be suitable for determining cost of production of some such components, process costing may be applicable for others. Determining cost of production of the final product in such a case involves use of both the job and process costing. This combined method of costing is, therefore, termed as **'Composite or Multiple Costing'**. It is applied in industries engaged in complex production like manufacturing cycles, motor-cars, aeroplanes, radios, televisions, computers, etc.

The basic distinction between job costing and process costing lies in the presence or absence of the likeness in the goods produced. In situation where job costing is used the produced goods are generally not alike while process costing is used by

industries which are engaged in mass production and naturally the produced goods are all alike. So, in job costing costs are determined for each individual unit or batch of goods produced. Unit cost in process costing is determined by means of averaging.

1.6.3 Farm Costing

The above methods (either job costing or process costing) of ascertaining costs cannot be suitably applied for ascertaining cost of production of farm produces. Farm Costing may be defined as the method of costing that may be used for ascertainment of farm costs. Since the nature of the farm produces and also the processes involved in raising crops / live stocks have peculiar differences from those of the industrial products, there is a necessity for a different method of costing. Some of the points of peculiarities of farm productions are—utilisation of live stocks; using outputs of a farm as inputs in the same farm even for raising the same crop; exchange transaction; notional transaction; too much dependence on nature; lacking scope for standardization in input use, output, production process, determining accounting periods, etc.

1.7 Techniques of Costing

As distinguished from the methods of costing indicating the means of 'collating and presenting' cost, the techniques of costing refer to the principles to be followed in ascertaining costs of products, jobs or processes. Accordingly, different costing techniques may be used in each of the different costing methods. While choosing a particular method the main considerations are the nature of the product, production method, size of the concern, etc., the objectives or purposes of cost ascertainment primarily guide the choice of a technique. The different techniques of costing which are in common use are :

a) Absorption Costing,
b) Marginal Costing,
c) Standard Costing,
d) Uniform Costing,
e) Life Cycle Costing and
f) Target Costing.

These are discussed below in brief.

a) *Absorption Costing* : Under this technique all the costs that are incurred are charged to products, jobs or processes. Since full costs after they are incurred are absorbed in the job, product or process, it is also termed as *full costing, total costing* or *historical costing*.

b) *Marginal Costing* : Under this technique total cost that is incurred is segregated into fixed and variable parts and the latter part only is considered to be relevant for ascertaining product cost. Excess of revenue (out of sale of product) over its variable or marginal cost is termed as contribution. Contributions from all the products form a 'Contribution pool' which is used to absorb the fixed costs. Marginal costing is very much useful in many decision making situations. Since this technique recognizes only the direct or variable cost, it is also termed as *direct costing* or *variable costing*.

c) *Standard Costing* : Standard Costing makes use of standard costs of each of the elements of a product for comparison with the actual costs of the corresponding elements. Such comparison helps in identifying the deviations (called variances) which call for remedial actions. That way it is very useful for control purposes.

d) *Uniform Costing* : It is not a technique used for ascertaining cost. It rather refers to the uniform use of any costing method, principle and technique by a number of undertakings. Accordingly, application or adoption of marginal costing technique by a number of undertakings may be considered to be a case of Uniform Costing. Since it facilitates comparability uniform costing ensures inter-firm as well as intra-firm comparison at both the national and international level.

e) *Life Cycle Costing* : It is a technique to consider total cost of a product during its entire economic or useful life. Contrary to the techniques of costing as discussed above, which consider only cost of manufacturing, a share of the costs of administration and marketing as product costs, lifecycle costing recognizes pre-manufacturing (designing, developing, etc.) and post-selling costs (after-sale servicing, disposal stage costs) as parts of product cost. Another distinguishing feature is that the total cost throughout the product life-cycle is spread over the total productions during the entire period of the life-cycle. That way, it may so happen that the actual cost of the current productions during a specified period may be more or less than the attributed cost of the said productions. It is claimed that cost control and product pricing are facilitated under life-cycle costing technique owing to its emphasis on individual product and its life-cycle.

f) *Target Costing* : It is a technique to plan (rather than determining) product cost so as to keep it at the target level. Target level of cost, actually termed as 'target cost', is, however, determined by subtracting target profit margin from the target price. In other words,

Target Cost = Target price – Target profit.

Target price is estimated on the basis of the value of the product to the customer as perceived by the company. It is worth mentioning that this is done during market research stage i.e., well before the product designing and manufacturing stages. Target profit is usually based on long-run profit analysis (return on sales). Once the target cost is set for a product, steps (value engineering) are taken to set target costs for each component of the product.

Target cost is, thus, not an actual cost; it is rather a pre-determined cost used as standard based on market forces. It helps a company to direct its all-out efforts to keep the actual cost commensurate with the target cost.

1.8 Advantages of Cost Accounting

Enterprises introducing costing system can derive a number of advantages. Some such advantages are mentioned below :

i) *Source of Cost Information* : Cost accounting analyses costs in all possible and necessary ways and keeps records of such cost information. Cost information is very much essential to the management for determining costs of products, processes, departments, etc.

ii) *Determining Selling Prices* : Determining selling prices of products is common to all business enterprises and in majority of the cases it is determined by adding desired profit to the product cost. So cost accounting may be of great help in providing cost information for the purpose.

iii) *Making Rational Decisions* : The management of an enterprise has to make various decisions like whether to manufacture a component part or buy it from outside supplier, whether to replace a manual method by a mechanical one, whether to discontinue production of a loosing product line, etc. In all such situations cost accounting provides relevant information to evaluate the available alternatives, which enables the management to make comparison and take suitable decisions.

iv) *Minimising Wastages and Losses* : Cost accounting through the control techniques helps in identifying the loopholes, which ultimately leads to minimizing wastages and avoiding losses. For example, it may help to identify the poor quality of materials leading to huge wastage of materials or it may also identify the idle time of labour by proper time keeping and time booking.

v) *Inter-and Intra-firm Comparisons* : Cost data available from the cost accounting system facilitate both the inter-firm and intra-firm comparisons.

vi) *Capacity Utilisation* : Cost accounting helps to identify the idle capacities, if any, for reasons like shortage of market demand, non-availability of raw materials or skilled labour, etc.. It helps management in taking steps to make up for the deficiencies in optimum utilization of available resources.

vii) *Aid to Financial Accounting* : Making data relating to closing stocks readily available at any time, cost accounting facilitates preparation of prompt and more reliable interim final accounts as and when desired.

viii) *Beneficial to Employees* : Employees get benefited from more reliable wage payment system provided by cost accounting; their representatives can participate in wage negotiations more confidently by being equipped with cost data.

ix) *Help to Government* : Cost data available from cost accounting system may be very useful to Government in taking various policy decisions regarding import, export, excise duty, taxation, etc.

1.9 Limitations of Cost Accounting

Cost accounting is not an unmixed blessing. Its oft-quoted limitations are :

i) *Expensive* : Cost accounting involves extra workload, maintaining additional records, etc.; all these lead to additional costs which small enterprises cannot afford.

ii) *Complexity* : Cost accounting is often criticized as a complex system as it involves complex steps in collection, classification, allocation, apportionment, etc. of costs.

iii) *Lacking Universal Application* : There are a number of methods and techniques of costing. Suitability of application of each such method and technique depends on the nature of the business enterprise and also of the production process. There is no single method or technique which is universally applicable to all the enterprises. On the other hand, application of wrong method or technique may give misleading result.

1.10 Need for Costing

Despite the demonstrated advantages of having a costing system in an enterprise, cost accounting has not been introduced in most of the enterprises. This apathy is attributed to two major factors : (i) Cost of Costing, and (ii) Assured market.

i) *Cost of Costing* : It is very often argued that the cost of installation and running a cost accounting system outweighs the benefits that may be derived from it. But this is mostly not acceptable. Because the cost of wastage and inefficiency avoided, reduction in costs of all sorts, etc. arising out of an effective cost accounting system connot be ignored. However, it needs special mention that application of cost accounting principles in different aspects of an enterprise wherever cost accounting system is introduced, should be guided by proper spirit and sense and not by the letter. For example, it is always wiser to distribute the cost of thread used in a tailoring shop as an indirect cost by a process of averaging which avoids elaborate process and therefore disproportionate costs of identifying it as a direct cost. The former method does not involve any application of cost accounting principle which the latter method does. So, cost of costing may be kept within justifiable limits if it is judiciously applied and then definitely it will not stand on the way of introduction of a costing system.

ii) *Assured Market* : The other reason for not introducing a cost accounting system may be that most of the business units in India are operating in assured markets i.e., it is so assumed that there is no risk of running the business in losses. But whatsoever assured may be the market of a business that must be a short run phenomenon. Because, as the time passes by every business must have to face competition when reducing the selling price appears to be unavoidable to it. But the decision to lower the selling price rests to a great extent on the cost structure of the product. A complete idea about the cost structure, in turn, necessitates the introduction of a costing system. This is equally true even in case of a monopoly business.

1.11 Installation of a Costing System

Installation of a costing system in an organization requires consideration of the following factors :

i) *Nature of the organization* : No two organizations may be similar in all respects. Naturally, the demands of different business units for specific features in a costing system to suit their needs are also different. It needs mention that there is also no single costing system which may suit all the business units. So, having identified the particular objectives of the organization for installation of a costing system, an appropriate system of costing should be selected for adoption so as to suit the peculiar nature of the organization.

ii) *Technical aspects* : All technical aspects of the organization like products being produced, production process involved, nature of raw materials used with the degree of spoilage, etc. are to be studied very carefully for selecting a proper method of costing to be adopted.

iii) *Maintenance of records* : One of the common objectives of introducing a costing system is cost control. It necessarily involves maintenance of detailed records on costs to be incurred for different functions of production, administration and selling. As maintenance of records involves cost, care should be taken to maintain so much of detailed information as may be necessary for complete cost analysis. For the purpose, different forms to be used by workers, foremen, etc. are to be standardized as far as practicable. For authenticity of the records, every entry in such forms should be countersigned by an authorized person.

iv) *Timely reporting* : Decisions are based on information. Mere maintenance of records, as stated above, is not enough; it will be effective only when these are communicated to the appropriate person/s for proper analysis and decision-making. So, arrangements should be made to ensure that right information is reported to the right person at right time.

v) *Accounting aspect* : Costing system can be introduced maintaining separate set of books i.e., in addition to those maintained under financial accounting system. In that case there may be some duplication of accounting activities. To avoid such duplication an integrated system of maintaining books of accounts can be arranged. In the former case (maintaining separate set of books), however, arrangements are to be made for reconciliation between profits determined under two different sets of books.

1.12 Questions

(a) *Long answer type*

1. What do you mean by method and technique of costing? How can you differentiate between the two? What different methods and techniques of costing are available? Explain any one method and one technique of your choice.
2. What are the advantages of introducing a costing system in a manufacturing firm? Is there any limitation of a costing system? As a Cost Accountant of a manufacturing firm what steps would you take to introduce a costing system?

(b) *Short answer type*

3. Distinguish between :
   (i) Operation Costing and Operating Costing,
   (ii) Absorption Costing and Marginal Costing,
   (iii) Farm Costing and Industrial Costing.

4. How is cost information useful for?
   (i) Making decisions,
   (ii) Determining selling price,
   (iii) Controlling costs?

(c) ***Objective type***

5. Suggest a suitable method of costing for the following :
   (i) Drugs manufacturing (ii) Hospital (iii) Toy making (iv) Telephone (v) Steel (vi) Railways (vii) Collieries (viii) Printing (ix) Cigarettes (x) Ship building.
6. State whether the following statements are true or false :
   (i) External reporting is the main function of Financial Accounting.
   (ii) Cost accounting helps only in controlling costs.
   (iii) Basic documents for writing up books under Financial accounts and Cost accounts are the same.
   (iv) Cost accounting helps Financial accounting in valuation of inventories.
   (v) Target cost is not an actual cost.

1.13 Select Readings

Banerjee, B., *Cost Accounting*, World Press Pvt. Ltd.

Prasad, N. K., *Cost Accounting*, Book Syndicate

Wheldon's *Cost Accounting*, ELBS

Horngren, T., *Cost Accounting*—A Managerial Emphasis, Prentice Hall.

1.14 Hints for Solution (for objective type question)

5. (i) Process (ii) Operating (iii) Batch (iv) Operating (v) Process (vi) Operating (vii) Single (viii) Job (ix) Unit (x) Contract.
6. (i) True (ii) False (iii) True (iv) True (v) True.

Unit 2 □ Cost Concepts and Cost Objects

Structure

2.1 Introduction

Since cost accounting deals with the analyses of costs for various decision making purposes, a clear conception about 'cost' and its distinction from other similar terms are pre-requisite for cost accounting. With these ends in view, this unit discusses the following aspects in different sections apart from the present *introductory* section : Concept of Cost, Cost vs. Expense, Cost Object, Cost Objective, and Types of Costs.

2.2 Concept of Cost

In common parlance, cost is 'the amount of money, effort, etc. required to achieve an end.'(one of the meanings given in Webster's New World Dictionary, ed. by David B. Guralink, Oxford & IBH Publishing Co., 1976). In business parlance too, similar meaning has been expressed in the following two definitions of cost. The first definition has been given in the terminology published by ICMA; it reads as 'the amount of expenditure (actual or notional) incurred on or attributable to a specified thing or activity.' The other definition given by the Committee on Cost Concepts and Standards of the American Accounting Association goes on saying cost as 'a foregoing, measured in monetary terms incurred or potentially to be incurred to achieve a specific objective.' So, cost is essentially a sacrifice measurable in money value, made for acquisition or creation of some economic resources necessary for achievement of some objective. For example, in case of purchasing materials, cost

is the *sacrifice* of the amount of money paid or to be paid for *acquisition* of materials (economic resource) necessary for *manufacturing* (objective) goods.

2.3 Cost vs. Expenses

The two terms 'cost' and 'expense' connote more or less the same meaning as we find in the definitions of cost given above. Cost is sometimes referred to as 'the sum of the expenditures' or 'the measure of the expenditure'. However, some authors have made minute distinction between the two terms. According to them, costs may be either *deferred* for which benefits are receivable in future period of time or *expired* for which benefits have already been received. Since the benefit-period has not expired in case of deferred costs, these are also called *unexpired* costs; these are, therefore, capitalized and shown in the balance sheet as assets (for example, building, plant, equipment, inventory etc.). On the other hand, expired costs like rent, salary, wages, etc. are charged against (deducted from) revenues (sales) and are naturally shown in the Trading and Profit & Loss A/c. Expired costs are referred to as *expenses.* It may so happen that benefits out of deferred costs are gradually received in future period. In such cases, the extent to which benefits are received, are converted from 'deferred cost' to 'expense'. Depreciation (expired cost) charged on assets (unexpired or deferred cost) is an example on the dot.

2.4 Cost Object

Object is any person or thing to which an action or thinking is directed. Cost object is therefore, the thing or activity for which cost is incurred and for which we want to have a separate measurement for cost so incurred. Any activity operation, product, service, department, project or programme may be refered to as a cost object. The term 'cost' does not carry any sense unless it is tied to a cost object.

2.5 Cost Objective

Objective means purpose or goal. So, cost objective/s is/are the purpose/s for which costs are incurred. Some of the important purposes for which cost data may be used are :

i) Determining cost of a product or service,
ii) Determining periodic profit,
iii) Determining prices of products or services,
iv) Planning and budgeting,
v) Controlling costs.

To make a distinction between *cost object* and *cost objective*, an example may be useful. For the purpose of controlling cost, an old machine may be planned to be replaced by a newer and more sophisticated one. In this case, while cost control is the *cost objective*, the new machine is the *cost object.*

2.6 Types of Costs

There may be different types of cost based on the process or period of measurement, purpose, controllability, relevance, etc. Some such important and commonly used cost types are discussed below in brief :

a) *Historical Cost* : It is the cost measured on the basis of the actual amount of outlay involved.

b) *Estimated Cost* : It is the cost determined beforehand by estimation.

c) *Standard Cost* : It is a scientifically predetermined cost based on specification of the conditions or elements.

d) *Replacement Cost* : It is the cost to be incurred at present for replacing an asset.

e) *Total Cost* : It is the aggregate amount of all costs attributable to a given volume of output.

f) *Marginal Cost* : It is the additional cost for additional one unit of production.

g) *Differential Cost* : It is the difference in total cost between two levels of activity.

h) *Opportunity Cost* : It is the cost of the opportunity for alternative use foregone for choosing a particular use of any resource. It is not an actual cost since it does not involve any outlay of cash or cash-equivalent. It is only the probable cost but is very useful in managerial decision making.

i) *Imputed Cost* : It is the cost attributable to any notional exchange of resources. Notional transaction is an incomplete transaction in the sense that in such cases one party receives/gives something (of value) from/to the other party without giving to/receiving from the corresponding party. The capital invested in the business by the owner without charging any interest, family members working in the family-farm without any wages, etc. are examples of notional transactions. The notional cost of such transactions as may be imputed hypothetically is very much important in decision making; ignoring such cost, being not an actual cost, may lead to a wrong decision.

j) *Relevant Cost* : These are future costs which vary depending upon different alternatives. On the contrary, those future costs which remain unchanged under alternative situations do not merit for consideration in decision making and are known as irrelevant costs. So, relevant costs are affected or changed by a decision while irrelevant costs are not so affected.

k) *Sunk Cost* : It is that part of the historical cost which has already been incurred on the basis of a decision taken in the past and is now beyond recovery by any other decision. For example, the depreciated value of an existing asset is a sunk cost which is irrecoverable and hence irrelevant in making decision as to whether the asset is to be replaced or not.

l) *Discretionary Costs* : These are a kind of fixed costs occurrence—which depends on the discretion of the management. Such discretion is usually guided by the management policies. Costs for employees' training programme, advertising, donation, research and development cost, etc. are common examples of discretionary costs.

m) *Controllable Costs* : These can be defined as the costs which can be influenced by the action of a single responsible person in an organization within a defined period of time. On the contrary, the costs which are beyond the control of any person of an organization are known as uncontrollable costs. There may be a few items of costs which are controllable in the short run; moreover, most of the costs which are uncontrollable in the short run may be turned into controllable ones in a wider time span.

2.7 Questions

(a) Long answer type

1. Explain fully the concept of cost. How does this concept differ from that of expense?
2. What do you mean by Cost Objective? Is it different from Cost Object? Explain with the help of an example.

(b) Short answer type

3. Explain in brief the meaning of the following types of costs :
   (i) Estimated cost
   (ii) Relevant cost
   (iii) Opportunity cost
   (iv) Uncontrollable cost
4. What is imputed cost? How is it ascertained?

(c) Objective type

5. Explain the validity of the following statements by indicating 'true' or 'false' :
   (i) Cost essentially involves a sacrifice.
   (ii) Discretionary cost is essentially a fixed cost.
   (iii) Notional cost is arbitrary and has got no basis.
   (iv) Standard cost of an item may be different under different conditions.
   (v) A controllable cost always remains controllable.
6. Fill up the blanks :
   (i) Sunk cost is not _____for decision making.
   (ii) Differential cost is the difference in total costs between ————————-.
   (iii) Opportunity cost is relevant even if it is not _____cost.
   (iv) Cost must be measurable in_____term.
   (v) Cost is a _____of the expenditure.

2.8 Select Readings

Banerjee, B., *Cost Accounting*, World Press Pvt. Ltd.

Prasad, N. K., *Cost Accounting*, Book Syndicate

Wheldon's *Cost Accounting*, ELBS

Horngren, T., *Cost Accounting*—A Managerial Emphasis, Prentice Hall.

2.9 Hints for Solution (for some question)

5. (i) True (ii) True (iii) False (iv) True (v) False.
6. (i) relevant (ii) two levels of activity (iii) an actual (iv) monetary (v) measure.

Unit 3 □ Classification and Analysis of Costs

Structure

3.1 Introduction

In the previous unit (No. 2) we have discussed about different types of costs and in the very first unit (No. 1) we have learnt about the objectives of Cost Accounting. One of the objectives being cost ascertainment, it appears to be imperative to identify the relevant costs for aggregation. Various analyses of costs are necessary to help management in making rational decisions. There may be a huge number of different items of cost relevant for an object; proper recording of all such costs may pose great difficulties. Classification of costs may ease out the problem to a great extent. Keeping this in mind, the contents of this unit have been sub-divided into five sections. This introductory section is followed by the *second* which deals with Classification of Cost. Section *three* discusses Analysis of Costs which is followed by two sections for conceptualization of some basic terms viz. Concepts of Cost Centre and Cost Unit in section *four* and Concepts of Profit Centre and Investment Centre in section *five*. The last section (section *six*) deals with Cost Sheet.

3.2 Classification of Costs

Cost data are used for different purposes. Depending upon the purposes viz. cost ascertainment, cost control, valuation of inventory, decision making, etc. different kinds of information are necessary. It requires conscious grouping of relevant items of

cost to serve specific purpose. The process of such combining or grouping of cost items according to sort of similarities or commonness among them is known as cost classification. Costs may be classified according to :

i) Elements,
ii) Behaviour (variability or fixity),
iii) Functions and
iv) Identification.

i) *Element wise classification* : The most common classification is based on the factors or elements for which costs are incurred. Accordingly, costs can be classified as :

a) Materials cost i.e., the cost of commodities, other than fixed assets, which are consumed in the process of production and sale of any product.

b) Labour cost or Wages i.e., the cost of human service used in the organization. It includes wages, salaries, bonuses, commissions, etc.

c) Expenses i.e., the cost of the services other than human services used in the organization. Expenses, in effect, comprise all costs other than materials and wages.

ii) *Variability wise classification* : Changes in the volume of production may have dissimilar effects on different items of cost. Some costs vary directly with the volume of production i.e., they increase or decrease proportionately with the changes in volume while some other costs remain unchanged within a given range of production; there are yet some other costs that vary with the variation in production but not proportionately. On the basis of this dissimilar behaviour of costs, they can be classified into three categories :

a) Variable Costs i.e., the costs which vary proportionately with the changes in the volume of production.

b) Fixed Costs i.e., the costs which accrue in relation to the passage of time but remain unaffected by variation in the volume of production. Thus, fixed costs are mostly time-based. Salary, Rent, Insurance, etc. are common examples of fixed costs.

c) Semi-variable Costs i.e., the costs which are partly fixed and partly variable. Depreciation, electricity expenses, telephone expenses, etc, are semi-variable type of costs.

iii) *Function wise classification* : There are four basic functions in any manufacturing unit. These are : Manufacturing or production, Administration, and

Marketing or Selling and Distribution. Costs can be classified based on the functions for which they are incurred. Accordingly, there may be following four types of costs:

a) **Manufacturing Costs** i.e., the costs incurred for carrying out the manufacturing function. Therefore, all costs of materials, labour and services supplied to the factory for production and also for primary packing of products are known as manufacturing costs.

b) **Administration Costs** i.e., the costs of management and of secretarial, accounting and administrative services are termed as administration costs. These are in no way directly related to production but are having an indirect relation only in the sense that production function can not be run without the help of these services. Salaries of office staffs and of management people, Rent and depreciation of office buildings and equipments, postage, stationery, office telephone and electricity expenses, etc. comes under this class of costs.

c) **Marketing or Selling and Distribution Cost** i.e., the costs incurred for the products ex-factory till the products reach the hands of the customers. This cost can then be sub-divided into three components :

Selling Cost : It is the cost of securing orders for sale. Salaries, commissions, traveling expenses, etc. for salesman and sales staff, cost of ordering, sales room expenses, etc. are known as selling cost.

Publicity Cost : It is the cost of developing and capturing market for a product. It is also known as sales promotion cost.

Distribution Cost : It is the cost incurred towards movement of goods from factory into the hands of customers. Warehouse costs and transportation costs are the major components of distribution cost.

iv) *Identifiability wise classification* : When an item of cost is identifiable with or traceable to a production unit/centre it is referred to as its identifiability. On the basis of identifiability, costs can be classified into :

a) **Direct Cost :** It refers to the costs which are directly identifiable with each unit of production or service or with a department or centre (known as cost centre—to be discussed later). Since element wise there may be three types of costs viz. material, labour, and expenses, all direct costs can, therefore, be sub-divided into :

Direct Materials : It has been defined in the I.C.M.A. terminology as "the cost of materials entering into and becoming constituent elements of a product or saleable service". Therefore, the cost of any material—raw or semi-finished, spare parts and primary packing materials purchased and used specifically for any product, process or department constitute direct material cost.

Direct Wages : Wages paid or payable to labour employed for altering the construction, composition, conformation or condition of the product produced by an organization are direct wages; it must, however, be identifiable with the product concerned and must also be ascertainable in money terms.

Direct Expenses : All *direct* costs other than direct materials and direct wages are known as direct expenses. These costs must be specifically allocable to a unit of a product or a batch of a product or to a department or process. Examples of direct expenses are : hire charges or cost of special tool, patterns or designs; cost of patent, royalty, licence fees, etc.; fees for architects, surveyors, etc.

b) Indirect Cost : Simply speaking, these are costs which are not directly identifiable with any product, department or process (treated as cost centre or cost unit) but can be apportioned to it/them. As in case of direct cost, all indirect costs can element wise be classified into the following :

Indirect Materials : These are the material costs which cannot be traced to the production unit or cost centre. Consumable stores like fuel, lubricating oil, cotton waste, etc. required for running and maintenance of plant and machinery, small tools and sundry stores for common use, are some examples of indirect materials.

Treating material costs of small value as direct or indirect is sometimes guided by convenience and by 'cost of costing' principle. For example, cost of materials order form or requisition form can though be identified and ascertained per copy and hence comes under direct material group, it is more convenient and less costly to treat such material costs as indirect.

Indirect Wages : Wages which can not be identified directly with production or service unit are known as indirect wages. Salaries of supervisors, foremen, inspectors, store keepers, maintenance workers, etc. are examples of indirect wages. Grouping of wages into direct and indirect may also be a matter of convenience as observed in case of materials.

Indirect Expenses : There may also be some expenses which are not directly identifiable with product or service unit. These are known as indirect expenses. Examples are : Rent, rates and taxes, General lighting, Depreciation, Routine maintenance, etc.

3.3 Analysis of Costs

After classification of costs, as above, costs may be analysed through a process of 'step-by-step aggregation' of different classes of costs with the ultimate objective of

ascertaining Total Cost and Profit or Loss. With that end in view, identifiability classification is adopted first. So, primarily costs are segregated into direct costs and indirect costs. All direct costs are, however, classified element-wise for aggregation. The aggregated direct cost is termed as *Prime Cost*. It may be mentioned that direct material cost is to be adjusted for both the opening and closing stocks and only the cost of direct material consumed is taken into account for aggregation. Similar are the cases of direct wages and direct expenses i.e., these are also to be adjusted for advance payments and outstandings.

All indirect costs are technically termed as *Overhead*. For the purpose of stepped-up aggregation, functional classification is used for indirect costs. *Manufacturing (or Production or Factory) Overhead,* which consists of indirect materials, indirect wages and indirect expenses incurred for manufacturing operation, is the first item to be added to Prime Cost. It gives us *Gross Factory Cost* or Gross Works Cost which when adjusted for opening and closing work-in-progress (semi-finished goods) leads to *Net Factory/Work Cost.* To the Factory or Works Cost is added *Administration or Office Overhead* to arrive at *Cost of Production*. Cost of Production is adjusted for both the opening and closing stocks of finished goods to get *Cost of Production of Goods Sold*. The last item of indirect cost to be added to Cost of Production of Goods Sold is *Marketing or Selling & Distribution Overhead.* So, finally we get *Cost of Sales* or *Total Cost*. *Profit or Loss* can then be easily computed by deducting Cost of Sales from actual *Sales*.

The structure of analysis of costs as described above is shown below :

Statement of Cost and Profit/Loss

1. Direct Material consumed :		Rs.	Rs.
Opening Stock		xxx	
Add Purchases		xxx	
Less Closing Stock		xxx	xxx
2. Direct Wages (Paid & Payable)	---	----	xxx
3. Direct Expenses (Paid & Payable)	---	----	xxx
4. PRIME COST (1+2+3)	---	----	xxx
5. Factory Overhead	---	----	xxx
6. GROSS WORKS COST (4+5)	---	----	xxx
7. Adjustment for Work-in-progress :			
Add Opening Work-in-progress		xxx	
Less Closing Work-in-progress	---	xxx	xxx
8. NET WORKS COST (6+7)	---	----	xxx
9. Administration Overhead	---	----	xxx

10.	COST OF PRODUCTION (8 + 9)	---	----	xxx
11.	Adjustment for Stocks of Finished Goods :			
	Add Opening stock of finished goods	---	xxx	
	Less Closing stock of finished goods	---	xxx	xxx
12.	COST OF PRODUCTION OF GOODS SOLD (10 + 11)			xxx
13.	Selling & Distribution Overhead	---		xxx
14.	COST OF SALES (12 + 13)	---	----	xxx
15.	Profit or Loss (either 16 – 14)	---	----	xxx
16.	SALES (or 14 + 15)	---	----	xxx

3.4 Concepts of Cost Centre and Cost Unit

a) *Cost Centre* : The term 'Cost Centre' has been defined by the ICMA, London, 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'. The 'location', 'person', and 'equipment' as they have been used in the definition are organizational divisions created on the basis of convenience to accumulate costs. It may be mentioned that this division is different from the administrative division of an organization.

On the basis of the definition of cost centre, as above, cost centre can be divided into Impersonal and Personal cost centres. If the cost centre consists of either a location or an equipment or a group of these locations and/or equipment, it is an *Impersonal cost centre*. On the other hand, if the cost centre consists of a person or a group of persons, it is a *Personal cost centre*.

Cost centers can also be classified on the basis of functions as Production Cost Centre and Service Cost Centre. A cost centre, whether personal or impersonal, in which any production activity, either in full or in part, is carried on is termed as *Production Cost Centre*. If a cost centre renders services (e.g., Accounts department, Repairs & Maintenance department, etc.) to production departments or other service departments, it is known as a *Service cost centre*. There are organizations which earn revenues by marketing their services (e.g., Accounting and Audit firm, Law firm, etc.). The functional divisions, as stated above, would not suit such organizations; because there is neither any production centre nor all the cost centres are service centres in the sense of rendering services to other production or service centre/s within the organization. To make a desired distinction, some alternative terms like '*Support cost centre*' or '*Utility cost centre*' are used. Again, if a cost centre is created by grouping equipment and/or person engaged in similar operation it is termed as '*Operation cost centre*' while if they are engaged in any *specific process* or a *continuous sequence of operations*, it is termed as '*Process cost centre*'. If any

person is given the charge (management responsibility) of a cost centre, that cost centre is termed as a 'Responsibility Centre'. The main distinction between a cost centre and a responsibility centre is that a cost centre is created for accumulating cost for cost ascertainment while responsibility centre aims at controlling costs by pinpointing responsibility on a person.

There is no standard as to the number and size of cost centres in an organization. It all depends on the nature and size of the business, the importance given on cost ascertainment and cost control, availability of information, etc. However, there must always be a balance between too few and too many cost centres. While overemphasis resulting in creation of too many cost centres may increase the cost of cost centre, inadequate number of cost centres (naturally bigger in size) may frustrate the very objective of accurate cost ascertainment and hence lacking cost control.

b) *Cost Unit* : The term 'cost unit' has been defined in the ICMA terminology as "a quantitative unit of product or service in relation to which costs are ascertained". Cost is measured in terms of single monetary unit (Rupee/s). But measuring cost of a product or service essentially requires relating the unit of cost (i.e., Rupee/s) to a suitable unit of that product (e.g., Number, Ton, Km, Cubic Meter, etc.) or service (e.g., Number of patients examined by a doctor, Number of clients served by an accountant, etc.). So, cost unit is always a combination of the units of cost and product/ service (e.g., Rs./Ton, Rs./Km, Rs./Patient, Rs./Client, etc.). Practically, cost units are used like Rs. 1,000 per Ton, Rs. 100 per Patient, etc. Cost unit, therefore, means any unit used for meaningful expression of the cost of any product or service. In some cases cost unit based on single unit of a product or service like Ton, Km., Number of Patients, etc. fails to give a meaningful expression of cost of the product or service. For example, 'cost of carrying a passenger by a bus is Rs.5' does not carry the sense in full unless the unit of the distance (say, Km.) is combined with the cost unit 'Rs. Per passenger' to get 'Rs. Per passenger per Km or Rs. Per passenger-Km'. The latter type of cost units is termed as '*Composite Cost Unit'*.

3.5 Concepts of Revenue Centre, Profit Centre and Investment Centre

a) *Revenue Centre* : There may be some segments in an organisation the primary responsibility of which is generating revenues out of sales revenues. Though costs may be incurred in such segments, controlling costs may not be the responsibility of the manager of the segments. These segments of an organisation are termed as Revenue Centre. Manager of a sales department or an individual salesman may constitute revenue centre.

b) *Profit Centre* : It is a segment of an organisation in which there are both the revenues and the costs and the manager of the segment is responsible for profit which is function of revenues and costs.

c) *Investment Centre* : It has been defined as "a profit centre in which inputs are measured in terms of expenses and outputs are measured in terms of revenues, and in which assets employed are also measured, the excess of revenue over expenditure then being related to assets employed". The person in charge of an investment centre is, therefore, responsible for costs, revenues and investments of the centre.

3.6 Cost Sheet

Cost sheet is a statement of cost of a cost centre or cost unit, in which sub-divisions of costs are arranged in logical order under different heads, prepared for the purpose of cost ascertainment, cost control and price fixation. Different sub-divisions (element wise, function wise, variability wise and nature wise) and heads (prime cost, works cost, cost of production, and cost of sales) of costs as discussed under 'Analysis of Costs' are used in Cost Sheet for presentation of cost. Cost sheet is a document prepared for internal use. Information on cost is reported to management through cost sheet.

A few illustrations on preparation of cost sheet are given below :

3.7 Problem-Solution

Problem 1 :

The following data have been extracted from the books of Get-together Company as on 31st December, 2004 :

	Rs.		Rs.
Inventories (Opening)			
Raw Materials	50,000	Office Equipments	20,000
Work-in-progress	1,20,000	Plant and Machinery	3,00,000
Finished Goods	1,00,000	Buildings	5,00,000
Sales	8,20,000	Direct Labour	1,50,000
Sales Return and Rebates	8,200	Indirect Labour	20,000
Materials Purchased	4,30,000	Factory Supervision	20,000
Materials Returned	20,000	Factory Repairs	12,000
Freight on materials	10,000	Heat, Light & Power	63,000
Miscellaneous Factory Expenses	16,500	Rates & Taxes	8,000
Sales Commission	20,500	Distribution Dept.—	
Sales Promotion	22,000	Salaries & Expenses	16,000
Interest on Borrowed Funds	4,000	Office-Salaries & Expenses	22,000

The following further details are available :

i) Closing Inventories :

ii) Raw Materials Rs. 80,000; Work-in-progress Rs. 1,40,000; Finished Goods Rs.1,15,000

ii) Accrued Expenses :
Direct Labour Rs. 6,000; Indirect Labour Rs. 1,000; Interest on Borrowed Funds Rs. 2,000

iii) Rates of Depreciation applicable :
Office Equipments 10%; Plant & Machinery 15%; Buildings 10%

iv) Pattern of distribution of the following costs :
Heat, Light & Power—In the ratio of 7 : 2 : 1 among Factory, Office and Distribution
Rates and Taxes—50% each to Factory and Office
Depreciation on Building—In the ratio of 5 : 3 : 2 among Factory, Office and Distribution.

You are required to prepare a Condensed Profit & Loss Statement for the year ended 31st December, 2004 along with a schedule of Cost of Sales.

Solution 1 :

Schedule of Cost of Sales

Particulars	Amount Rs.	Amount Rs.	Amount Rs.
Raw Materials Consumed :			
Opening Stock		50,000	
Add Purchases	4,30,000		
Less Returns	20,000	4,10,000	
Add Freight		10,000	
		4,70,000	
Less Closing Stock		80,000	3,90,000
Direct Labour		1,50,000	
Add Accrued Direct Labour		6,000	1,56,000
PRIME COST			5,46,000
Factory Overheads :			
Misc. Factory Expenses		16,500	
Depreciation—-			
Plant & Machinery	45,000		
Building (5/10 of10%)	25,000	70,000	
Indirect Labour	20,000		
Add Accrued	1,500	21,500	
Factory Supervision		20,000	
Factory Repairs		12,000	
Factory Heat, Light & Power (7/10 x 63,000)		44,100	
Factory Rates & Taxes (50%)		4,000	1,88,100
GROSS WORKS COST			7,34,100

Add Opening Work-in-progress		1,20,000	
Less Closing Work-in-progress		1,40,000	(–) 20,000
NET WORKS COST			7,14,100
Office and Administration Overhead :			
Depreciation—Office Equipment	2,000		
—Building (3/10 of 10%)	15,000	17,000	
Office Heat, Light etc. (2/10)		12,600	
Rates & Taxes (50%)		4,000	
Office Salaries & Expenses		22,000	55,600
COST OF PRODUCTION			7,69,700
Add Opening stock of Finished Goods		1,00,000	
Less Closing stock of Finished Goods		1,50,000	(–) 50,000
COST OF GOODS SOLD			7,19,700
Selling and Distribution Overhead :			
Sales Commission		20,500	
Sales Promotion		22,000	
Depreciation on Building (2/10 of 10%)		10,000	
Heat, Light & Power for Distribution (1/10)		6,300	
Salaries & Expenses		16,000	74,800
COST OF SALES			7,94,500

Condensed Profit & Loss Statement for the year ended 31st December, 2003

	Rs.	Rs.		Rs.	Rs.
To Cost of Sales		7,94,500	By Sales	8,20,000	
To Interest on			**Less** Returns and		
Borrowed Funds			Rebates	8,200	8,11,800
	4,000				
Add Accrued	2,000	6,000			
To Net Profit		11,000			
		8,11,800			8,11,800

Problem 2 :

A product of a company is being sold at Rs. 2000. The following data about the cost of the product are available :

Materials	50% of the cost of sales
Wages	30% of the cost of sales
Overheads	20% of the cost of sales.

It is anticipated that the prices of all the elements of cost will be increased as follows :

Materials	10%
Wages	5%
Overheads	30%

The only other information available is that the amount of profit will be decreased by 50% as a result of the increase in cost prices if the selling price remains unchanged.

You are required to compute the selling price that would maintain the same percentage of gross profit as at present and also to prepare a comparative statement showing the unit cost, profit and selling price at two situations.

Solution 2 :

i) Computation of existing percentage of gross profit on sales :

Let the amount of profit per unit be Rs. x.

Therefore, Cost of Sales = Selling price – Profit p.u.
= Rs. (2000 – x)

Costs p.u. are :

Materials : 50% of Cost of Sales = ½(2000 – x)

Wages : 30% of Cost of Sales = $^3/_{10}$(2000 – x)

Overheads : 20% of Cost of Sales = $^1/_5$(2000 – x)

The amounts of cost increases are :

Materials : 10% of ½(2000 – x) = $^1/_{20}$(2000 – x)

Wages : 5% of $^3/_{10}$(2000 – x) = $^3/_{200}$(2000 – x)

Overheads : 30% of $^1/_5$(2000 – x) = $^3/_{50}$(2000 – x)

Total amount of cost increase

= $^1/_{20}$(2000 – x) + $^3/_{200}$(2000 – x) = $^3/_{50}$(2000 – x)

= ($^1/_{20}$ + $^3/_{200}$ + $^3/_{50}$) (2000 – x)

= $^1/_8$(2000 – x)

Decrease in profit = 50% of x = ½ x.

As per conditions given :

$^1/_8$(2000 – x) = ½ x

or, 250 – $^1/_8$ x = ½ x

or, ($^1/_2$ + $^1/_8$)x = 250

or, $^5/_8$x = 250

or, x = 250x.$^8/_5$ = 400

Therefore, existing profit p.u. = Rs. 400

And Percentage of profit on sale = (Rs. 400 / Rs. 2000) x 100 = 20%

Amount of costs are :

Materials : ½(2000 – x)	= Rs. 800
Wages : $^3/_{10}$(2000 – x)	= Rs. 480
Overheads : $^1/_5$(2000 – x)	= Rs. 320
COST OF SALES	Rs. 1,600

ii) Comparative Statement of Unit Cost, Profit and Selling Price

Particulars	Exiting Rs./Unit	Anticipated Rs./Unit
1. Elements of Costs :		
Materials	800	880(800 + 10%)
Wages	480	504(480 + 5%)
Overheads	320	416(320 + 30%)
2. Cost of Sales	1,600	1,800
3. Profit (20% on Sales i.e., 25% on Cost)	400	450
4. Selling Price	2000	2,250

Problem 3 :

The following data of a company for the month of July, 2005 are available :

	Rs.
Raw Materials : Opening	8,000
Closing	9,000
Direct Labour (150% of Factory Overhead)	22,500
Work-in-progress : Opening	10,000
Closing	12,000
Cost of Goods Sold	65,000
Finished Goods : Opening	20,000
Closing	25,000
Administration Expenses	2,000
Selling Expenses	3,000
Sales	80,000

You are required to prepare a Cost Sheet for the month of July, 2005.

Solution 3 :

Workings

Computation of Raw Materials Purchased

	Rs.	Rs.
Cost of Goods Sold		65,000
Add Closing stock of Finished Goods	25,000	
Less Opening stock of Finished Goods	20,000	(+) 5,000
COST OF PRODUCTION		70,000
Less Administration Expenses		2,000
WORKS COST (NET)		68,000
Add Closing Work-in-progress	12,000	
Less Opening Work-in-progress	10,000	(+) 2,000
WORKS COST (GROSS)		70,000
Less Factory Overhead (150% of Rs. 22,500)		15,000
PRIME COST		55,000

Less Direct Labour		22,500
RAW MATERIALS CONSUMED		32,500
Add Closing Stock of Raw Materials	9,000	
Less Opening Stock of Raw Materials	8,000	1,000
RAW MATERIALS PURCHASED		33,500

COST SHEET

For the month of July, 2005

Particulars	Amount Rs.	Amount Rs.
Raw Material Consumed :		
Opening Stock	8,000	
Add Purchases	33,500	
	41,500	
Less Closing Stock	9,000	32,500
Direct Labour		22,500
PRIME COST		55,000
Factory Overhead		15,000
WORKS COST (GROSS)		70,000
Add Opening Work-in-progress	10,000	
Less Closing Work-in-progress	12,000	(–) 2,000
WORKS COST (NET)		68,000
Administration Expenses		2,000
COST OF PRODUCTION		70,000
Add Opening stock of Finished Goods	20,000	
Less Closing stock of Finished Goods	25,000	(–) 5,000
COST OF GOODS SOLD		65,000
Selling Expenses		3,000
COST OF SALES		68,000
Profit (Balancing figure)		12,000
SALES		80,000

3.8 Questions

a) Long answer type

1. How can costs be classified? Give example for each such cost classification.
2. Explain the concepts of 'cost centre', 'cost unit', and 'responsibility centre'. Prepare an illustrative list of cost units suitably used in different industries.

b) Short answer type

3. Categorise the following expenses into direct and indirect :
   i) Cost of paint applied on a piece of furniture
   ii) Cost of buttons used in a shirt
   iii) Cost of thread used in making a shirt
   iv) Cost of printing in the total cost of a book
   v) Cost of Xeroxing
   vi) Cost of fuel in a plate of meal
   vii) Cost of shining shoes
   viii) Depreciation on machine used in the manufacture of a product
   ix) Cost of cloth in making a festoon
   x) Salary of a factory supervisor
4. Write short notes on the following :
   a) Prime Cost, b) Indirect Wages, c) Semi-variable overhead, d) Cost of Sales, e) Work-in-progress.

c) Objective type

5. State which of the following statements are correct :
   i) Period costs are not considered as product cost.
   ii) Total fixed cost does not vary with the variation in output while unit fixed cost does.
   iii) 'Cost of Goods Sold' and 'Cost of Sales' are the same.
   iv) Overhead costs are not identifiable with every production unit.
   v) Entry fee at the Indian Museum of Rs.100 for every batch of 20 students or part there of is a variable cost.
   vi) 'Cost unit' and 'Unit cost' are the same.
   vii) A 'Cost Centre' may be a 'Responsibility Centre'.
   viii) Administration cost is not relevant in ascertainment of cost of production.
   ix) Prime Cost does not involve any part of administration cost.
   x) Cost sheet gives us accurate cost of production though it is prepared before the production starts.
6. Classify the following expenses by *functions* and *behaviours* :
   i) Maintenance cost of machines
   ii) Salary of a Foreman
   iii) Depreciation on office building
   iv) Running cost of a vehicle carrying all the employees of a manufacturing company.
   v) Cost of samples.

3.9 Select Readings

Banerjee, B., *Cost Accounting*, World Press Pvt. Ltd.

Lal, Jawahar, *Cost Accounting*, Tata McGraw Hill Publishing Co. Ltd.

Iyengar, S.P., *Cost Accounting*, Sultan Chand & Sons.

3.10 Hints for Solution (for some of the questions)

3. (i) Indirect (ii) Direct (iii) Indirect (iv) Indirect (v) Indirect (vi) Indirect (vii) Indirect (viii) Indirect (ix) Direct (x) Indirect.

5. (i) Incorrect (ii) Correct (iii) Incorrect (iv) Correct (v) Incorrect (vi) Incorrect (vii) Correct (viii) Incorrect (ix) Incorrect (x) Incorrect.

6.

	Functional	Behavioural
i)	Manufacturing	Semi-variable
ii)	Manufacturing	Fixed
iii)	Administration	Fixed
iv)	Common to all the functions	Fixed
v)	Selling & Distribution	Fixed.

Unit 4 □ Allocation of Overhead Cost

Structure

4.1 Introduction

As we have already learnt, all indirect costs (indirect materials, indirect labour, and indirect expenses) are commonly termed as overhead. We also know that indirect costs are by nature not identifiable with a particular cost unit while direct costs (direct material, direct labour and direct expenses) are easily identifiable. Since total product cost is composed of both the direct costs and indirect costs, the incidence of the latter on the product cost must be ascertained. But all the attempts toward that direction are thwarted by the non-identifiability nature of the indirect costs or the overheads. This unit discusses different aspects of overhead in the following sections.

4.2 Classification of Overheads

In line with cost classification process discussed in the previous unit (Unit 3) overheads can also be classified on the basis of :

i) Elements, ii) Functions, and iii) Behaviours.

i) *Element wise classification* : On the basis of elements, overheads may be classified into *Indirect material, Indirect labour*, and *Indirect expenses*. These have been discussed in the previous unit.

ii) *Function wise Classification* : On the basis of the recognized functions of a business, there may be *Manufacturing Overhead, Administration Overhead*, and *Selling and Distribution Overhead.* It needs no mention that overhead costs related to manufacturing or production function are Manufacturing or Production Overhead; those incurred for carrying on administrative function are Administration Overhead while Selling and Distribution Overheads are indirect costs related to marketing function.

The components of manufacturing overhead are factory indirect material, indirect labour and indirect expenses. A few examples of manufacturing overheads are : Factory Indirect Materials – Consumable stores, Lubricating oil, Cotton wastes etc.; Factory Indirect Labour – Salaries of Production Management Staffs, Salaries of Foremen, Wages of indirect workers, etc.; Factory Indirect Expenses – Factory rent, Depreciation on Machinery, Power, Fuel, and Factory light.

Administration function covers policy formulation, managerial and controlling activities and other supporting services like secretarial and accounting. Since all these are not directly related to production function, the costs for all these activities are indirect in nature and are termed as administration overhead. Examples may be : Office stationery, Office supplies, Salaries of office staff, Directors' remuneration, Office rent, postage, telephone, Depreciation and maintenance of office equipments, Office lighting and cleaning etc.

Marketing function covers activities related to Selling, Publicity & Advertisement, and Distribution. Expenses on these functions are marketing overhead or more popularly known as selling & distribution overhead. Clearly, this function does not have any direct relation to production; rather, sequentially it arises after the production is complete. Expressly, production is possible without this function. That is why Cost of Production does not include selling & distribution overhead. Similar is not the case of administration function. Services of administration function are essential for both the production and the marketing of the products. Hence, administration overhead is included in Cost of Production. Some examples of selling & distribution overhead are : Salaries, Commission and travelling expenses of sales staff, Cost of catalogues and price lists, sales office expenses, showroom expenses, bad debts, advertising, publicity, cost of packages, warehouse expenses, carriages, insurance, wages of packers, loaders, drivers, etc.

A distinction is, however, made between selling function, distribution function and advertisement & publicity. Marketing is common term encompassing all the above functions. Selling is that part of marketing which aims at securing orders. Publicity includes advertising and promotional activities undertaken to the eventual sale of goods and services. Distribution covers warehousing and delivery of goods and services.

Apart from the above three major functions which are also common to all businesses, there may be another function known as Research and Development which may be undertaken by large firms. Small firms cannot afford to bear the huge costs involved in it. Research cost is the cost of searching for new or improved products, new applications of materials or new or improved methods. Development function involves implementation of the successful research results and ceases with the commencement of formal production by such implementation.

iii) *Behaviour wise Classification* : This basis of classification puts emphasis on the pattern of relationship that exists between the overheads and the volume of output. On that basis overheads are classified into *fixed, variable,* and *semi-variable.*

Fixed overheads : The overheads which tend to remain unchanged with the changing levels or volume of production within the specified range of installed capacity. These are mainly the 'time costs' or 'period costs' and hence remain fixed within a given period. So, the fixed overheads per unit gradually come down as the volume of production increases within the installed capacity. Examples of fixed overheads include rent, insurance, depreciation, staff salaries, etc.

Variable overheads : The overheads which tend to vary in aggregate in direct proportion to the changes in the volume of production are known as variable overheads. So, there exists a linear relationship between variable overheads and volume of production. In effect, the variable overheads per unit of output remain fixed for all levels of output within the given range. Indirect materials, indirect labour, power, fuel, lighting and heating, postage, stationery, salesman's commission, etc. fall in this class of overheads.

Semi-variable overheads : These are partly fixed and partly variable. Certain overheads are there which vary with the variation in the volume of production but not in direct proportion. So, these are neither truly fixed not truly variable. Examples of this type of overheads may be – supervisor's salaries, repairs and maintenance, telephone charges, etc.

4.3 Process in Determining the Amount of Production Overhead in the Unit Cost

Owing to indirect nature, the amount of production overhead in the cost of production of a unit is unlike direct costs, not directly ascertainable. But even in the absence of direct linkage between the amount of expenses and the production unit we want each production unit to be charged with an appropriate share of production overhead (It is equally desired in case of administration and selling & distribution overhead; but we take up the case of production overhead for discussion). With that end in view we may adopt the following steps sequentially :

i) Classification of overhead
ii) Collection of overhead
iii) Distribution of Overheads to Departments :
a) By Allocation, b) By Apportionment
iv) Redistribution to Production Departments
v) Absorption by Production Units

The first step is to classify an item of overhead expense as production or administration or selling & distribution overhead. The criteria and process of classification have been discussed earlier. So, we take up discussion on the other steps.

4.4 Collection of Overhead

After having classified all the overhead expenses into production, administration and selling and distribution overhead, items of expenses under each such class of overheads are required to be grouped further in order to bring similar expenses under one account heading. A list of account heads is kept prepared beforehand. The size of the list, long or short, is not standardized; it all depends on the nature and types of expenses that generally occur. It will ensure more effective analysis and control of overhead expenses owing to uniformity and accuracy in collecting them. For such grouping and sub-classification, usually a system using code numbers / symbols is used. Code numbers used for identifying expenses as Production Overhead are known as *Standing Order Numbers* while those used for administration and selling and distribution overhead are termed as *Cost Accounting Numbers.*

As soon as a transaction occurs involving an item of overhead expenses, the source document (invoice, stores requisitions, wages analysis sheet, cash memos, etc.) is analysed primarily to identify whether it is an item of production overhead or of administration and selling and distribution overhead. Analysis is continued to identify the department responsible for the expense and also to identify the group (for similar items) to which the item can be collected. For example, expenses on cotton waste and lubricating oil (both are indirect materials and can be brought under one group, 'maintenance') incurred by Production Department 'D' can be allotted a standing Order Number like '010405'. The first two digits '01' may indicate that the expenses are items of Production overhead; the digits '04' indicate Production Department 'D' and the last two digits may be used to indicate the group 'maintenance'.

As the above example of coding uses only numerals it is called 'Decimal Method' of coding. There are, in fact, other methods of coding also. The method which uses only alphabets (e.g., SA for Sales, SAL for Salaries, DEP for Depreciation, etc.) is known as 'Mnemonic Method'. Codes may also use both the numerals and the

alphabets (e.g., S1 for Salaries of Foremen, S2 for Salaries of Gangboss, D1 for Depreciation on Plants, D2 for Depreciation of Buildings, etc.).

4.5 Distribution of Overheads to Departments

There are generally two types of departments in a factory; some are production departments where products are produced while there may be other departments in which no production operation is carried on but these departments are meant for providing some support services for the production departments. These latter types of departments are termed as service departments. Examples of service departments may be : Canteen, Stores, Personnel, Accounts, Boiler House, etc. Overhead expenses are incurred at both the types of departments. But there may be some common expenses incurred for both the production and service departments. These common expenses are to be distributed amongst all the departments (both the production and service departments) benefited in proportion to the services received by them. For such distribution of common expenses some surrogate measures (alternative bases) are identified which are themselves identifiable with the departments and at the same time having nearest relation with the expenses. For example, general electricity expenses may be distributed amongst the departments on the basis of points of consumption in various departments for lights and fans or on the basis of area occupied by the departments (assuming that light and fan points get multiplied on the basis of increase in area to be served). An illustrative list showing some common expenses and their corresponding bases suggested to be used for distribution is given below :

Items of Expenses	Basis of Distribution
Rent, Rates and Taxes	Floor space occupied
Insurance, Depreciation and repairs of Buildings	— Do —, or Value of buildings
Insurance, Depreciation and Repairs to Plant and Machinery	Plant Value
Insurance of Stock	Value of stock
Lighting	Light points or Area occupied
Power	Horse Power of Machines
Supervision, Canteen, Time-keeping, Medical	No. of workers
Internal transport	No. of requisitions, Weight or Value of materials / stores supplied

The distribution of overheads to departments by direct identification and/or by indirect proportionate sharing on some suitable bases leads to determination of the amount for each department. The process involved in the determination of the

overheads of the departments is known as *Departmentalisation;* it is also termed as *Primary Distribution.* Thus, the amount of overheads of a department as arrived at after primary distribution consists of :

a) the amount of overheads directly identified with the department, and
b) the share of common overheads assigned to the department.

The process involved in determining the first part is known as *Allocation.* Allocation is 'the allotment of the whole items of cost to cost centers or cost units'. The process involved in determining the second part (proportionate share) is what is termed as *'Apportionment'.* Apportionment is, therefore, the allotment of an item of overhead to two or more cost centers on an estimated basis of benefit received by them.

4.6 Distinction between Allocation and Apportionment

The main distinction between allocation and apportionment lies in the degree of accuracy in ascertaining the amount of overhead that can be reasonably charged to a cost centre. With regard to that allocation appears to be more accurate at least so far as ascertainment of cost centre level overhead is concerned. Because, process of allocation is adopted only when an item of overhead is identified with a particular cost centre. On the other hand, apportionment identifies a cost center's share in an item of overhead only approximately. The process of apportionment is adopted when no direct measure is available to ascertain the cost center's share in an item of overhead. For example, it is not possible to accurately identify the rent of a Department when a consolidated amount is paid as rent for the entire building which houses a number of such departments. In such a case an approximate share of rent is identified as the rent of a department by resorting to the process of apportionment based on the proportions of area occupied by the departments. Area is only one of the factors, may be the major and the most important one, on which rent depends. Other factors may be geographical location, lighting and ventilation, nearness to the locations of the service facilities, etc. Apportionment on the basis of area ignores all other factors. That way, apportionment on 'the most appropriate' basis possible gives only 'next to accurate' solution. Explicitly, the degree of accuracy depends on the selection of an appropriate basis of apportionment.

The more appropriate is the basis the more accurate is the distribution. The appropriateness of a basis of apportionment depends on the closeness of its relationship with the overhead. Choice between allocation and apportionment is also a matter neither of discretion nor of a feature of the overhead but of the relationship between the overhead and the cost centre or cost unit.

4.7 Redistribution to Production Departments

Service departments do not have any production; so there is no revenue earnings in these departments. Naturally, the cost incurred in these departments including the direct costs, if any, and also that apportioned to them are necessarily to be transferred to the production departments for subsequent absorption by the production units so that these costs too can be recovered out of revenues. It may be specifically mentioned that direct cost of service departments and overhead costs are to be treated alike for the purpose of redistribution.

Usually a service department renders services to a number of departments which may include both the production and service departments. If, however, a service department renders services to a single department, the process of *allocation* is resorted to while *apportionment* is adopted when two or more departments receive services of a service department. Since this is the second time distribution of overhead is made (the first time in primary distribution as stated earlier), such redistribution is also known as *Secondary Distribution*.

For apportionment of service department overheads, again some suitable bases are to be identified just like those found necessary in case of primary distribution. There may be a number of considerations which govern the selection of a suitable basis for redistribution by apportionment. The most popular amongst them is the proportion in which the services are received by the departments. The other considerations may be the 'ability to bear the burden' i.e., to charge the department more which earns more, the 'survey' conducted for the purpose (e.g., the cost of a centralized PBX department may be apportioned on the basis of a survey of the records indicating the department using the service), etc. An illustrative list showing some common service department costs and the corresponding bases commonly used is given below :

Cost of the Service Department	Commonly Used Bases
1. Purchase	No. of purchase requisitions No. of purchase orders Quantity or Value of Materials purchased
2. Stores	No. of stores requisitions Quantity or Value of stores issued
3. Canteen	No. of employees
4. Accounts	No. of employees
5. Power House	Metered consumption of power Horse Power-Hours
6. Inspection	Inspection time spent

7. Tool Room	Direct labour hours Direct machine hours Direct wages
8. Repairs & Maintenance	Hours worked Asset value x hours worked
9. Time-keeping	No. of employees Labour hours Direct wages
10. Medical Unit	No. of employees No. of cases attended

4.7.1 Methods of Redistribution

Basically there are three different methods for redistribution (rather reapportionment) of service departments' overheads to production departments. The methods differ on the basis of whether interdepartmental services amongst the service departments are there and recognized or not. The methods, however, are :

i) Direct Redistribution,

ii) Step Method, and

iii) Reciprocal Services Method.

These methods are discussed below in brief.

i) *Direct Redistribution* : This method is used when there is no case of services being rendered to other service departments or even if there be any such case that is ignored for the purpose of redistribution. In other words, service departments' overheads are directly distributed only to the various production departments selecting suitable bases.

ii) *Step Method* : This method takes into account the services rendered by service departments to other service departments only partially on a non-reciprocal basis. In this method, redistribution of the overheads of the service department rendering services to the highest number of other service departments but not receiving any service from other departments is taken up first. Second to choose is the service department that ranks second in the number of other service departments to which it renders services but does not receive services from them. The process continues until the overheads of all the service departments are apportioned to the production departments. The point to note here is that this method recognizes services rendered by one service non-reciprocally i.e., recognizes only to the extent where a service department does not render services to a service department from which it receives services.

Illustration 1 *(Step Method)*

The costing records of a company having three production departments and three service departments show the following data for the year ended 31st December, 2004 :

Particulars	Production Departments			Service Departments		
	P_1	P_2	P_3	S_1	S_2	S_3
Direct Materials (Rs.)	9,000	10,500	7,500	1,500	3,000	4,500
Direct Wages (Rs.)	15,000	12,000	16,000	4,000	2,000	1,000
Floor Space (Sq. ft.)	2,400	1,800	1,200	1,200	600	600
Light Points (No.)	40	20	30	20	10	15
Electricity (KWH)	4,000	3,500	2,500	500	1,500	1,000
No. of Employees	70	50	30	10	30	10
Value of Machines (Rs.)	60,000	1,50,000	80,000	10,000	5,000	20,000
Value of Stock (Rs.)	40,000	60,000	30,000	—	20,000	—

The expenses incurred during the year were :

Fire Insurance Rs. 3,000, Canteen expenses Rs.6,000, Stores expenses Rs.7,200, General Electricity Rs.5,400, Motive Power Rs.10,400, Rent Rs.15,600, General Overhead Rs.5,000 Depreciation on Machines Rs.13,000, Repairs and Maintenance Rs.6,500.

Apportion the costs of the service departments to the production departments assuming the following pattern of rendering services by the service departments :

Service Departments	% of services rendered					
	P_1	P_2	P_3	S_1	S_2	S_3
S_1	40	30	20	—	—	10
S_2	10	20	40	10	—	20
S_3	30	40	30	—	—	—

Solution :

Statement Showing Primary Distribution of Overhead

Items of expenses	Basis of Distribution	Total Amount Rs.	Production Departments			Service Departments		
			P_1 Rs.	P_2 Rs.	P_3 Rs.	S_1 Rs.	S_2 Rs.	S_3 Rs.
Fire Insurance	Value of stock (4:6:3:0:2:0)	3,000	800	1200	600	—	400	—
Canteen Expenses	No. of employees (7:5:3:1:3:1)	6,000	2100	1500	900	300	900	300
Stores Expenses	Direct Materials (6:7:5:1:2:3)	7,200	1800	2100	1500	300	600	900
General Electricity	Light Points (8:4:6:4:2:3)	5,400	1600	800	1200	800	400	600
Motive Power	KWH (8:7:5:1:3:2)	10,400	3200	2800	2000	400	1200	800
Rent	Floor Space (4:3:2:2:1:1)	15,600	4800	3600	2400	2400	1200	1200
General Overhead	Direct Wages (15:12:16:4:2:1)	5,000	1500	1200	1600	400	200	100
Depn. on Machines	Machine Value (12:30:16:2:1:4)	13,000	2400	6000	3200	400	200	800
Repairs & Maintenance	—Do—	6,500	1200	3000	1600	200	100	400
Direct Materials	Allocation	9,000				1500	3000	4500
Direct Wages	Allocation	7,000				4000	2000	1000
		88,100	19,400	22,200	15,000	10,700	10,200	10,600

Secondary Distribution Summary

Departments	Overheads as per Primary Distribution Summary				
	Rs.	Rs.			
S_2	10200	(–) 10200	Rs.		
S_1	10700	(10%) 1020	(–) 11720	Rs.	
S_3	10600	(20%) 2040	(10%) 1172	(–) 13812	Rs.
P_1	19400	(10%) 1020	(40%) 4688	(30%) 4144	29252
P_2	22200	(20%) 2040	(30%) 3516	(40%) 5525	33281
P_3	15000	(40%) 4080	(20%) 2344	(30%) 4143	25567
	88100				88100

iii) *Reciprocal Service Method* : Reciprocal service means exchange of services between two service departments. As the name suggests this method recognizes such exchange of services. Resultantly, after distribution of overheads of a service department *inter alia* to another service department for the portion of services rendered to the latter, a proportionate part of the latter department's overhead (comprising its own overhead and those distributed to it) should be distributed back to the former department for the reciprocal services received by it.

There are two alternative methods to deal with the reciprocal services :

(a) Repeated Distribution, and

(b) Simultaneous Equation.

Repeated Distribution Method suggests continuing the process of distribution (obviously apportionment) of the service departments' overheads to other service departments and production departments. Because, as pointed out above, it is not an one-shot operation to distribute the overheads of a service department exhaustively when there are reciprocal services. In fact, repeated distribution in a cyclical manner leaves too negligible a balance of overhead in the service department to distribute it further. The process of repetition is continued to that end. The process is illustrated below :

Illustration 2 *(Repeated Distribution Method)*

A manufacturing company has three Production Departments and two Service Departments. The departmental overheads for a month as arrived at after Primary Distribution are as follows :

		Rs.	Rs.
Production Departments :	P_1	19,400	
	P_2	22,200	
	P_3	15,000	56,600
Service Departments :	S_1	10,200	
	S_2	10,700	20,900
		Total	77,500

The Service Departments render services to other departments roughly in the following pattern :

Service Departments	Production Departments			Service Departments	
	P_1	P_2	P_3	S_1	S_2
S_1	30%	40%	10%	—	20%
S_2	20%	30%	40%	10%	—

Prepare a statement showing the apportionment of the overheads of the service departments to the production departments :

Solution *(Repeated Distribution Method)*

Secondary Distribution Summary

Particulars	Production Departments			Service Departments	
	P_1 Rs.	P_2 Rs.	P_3 Rs.	S_1 Rs.	S_2 Rs.
Departmental Overheads (as per Primary Distribution)	19400	22200	15000	10200	10700
Service Dept. : S_1	3060	4080	1020	(–) 10200	2040
S_2	2548	3822	5096	1274	(–) 12740
S_1	382	510	127	(–) 1274	255
S_2	51	76	102	26	(–) 255
S_1	8	10	3	(–) 26	5
S_2	1	2	2	—	(–) 5
Total	25450	30700	21350		

Note : Fraction of a rupee apportionable to S_1 in the last round has been ignored.

Simultaneous Equation Method is an alternative method to ascertain the total overhead of a service department taking into account all its shares in repeated reapportionments. It is done with the help of simultaneous equation – hence such a nomenclature of the method. Once the gross distributable amounts of each service departments are thus ascertained algebraically, it then becomes very simple to just distribute the amounts only amongst the production departments in proportion to the given percentages of rendering services to them.

The above problem as used to illustrate the repeated distribution method is used to illustrate this method.

Solution *(Illustration 2 – Simultaneous Equation Method)*

Let x = Total overhead of Service Department S_1

y = Total overhead of Service Department S_2

Conditionally,

x = 10,200 + 10% of y,

y = 10,700 + 20% of x

or, x = 10,200 + 1/10 of y

or, 10 x = 1,02,000 + y .....(i)

y = 10,700 + $^1/_5$x

or, 5y = 53,500 + x .....(ii)

Equation (i) is multiplied by 5 :

50x = 5,10,000 + 5y .....(iii)

x = (-) 53,500 + 5y .....(iv)

Subtracting eqn.(iv) from eqn.(iii), we get, 49x = 5,63,500

or, x = 11,500

Putting the value of x in eqn.(ii), we get, 5y = 53,500 + 11,500 = 65,000

or, y = 13,000

Thus, Total overheads of S_1 and S_2 taking reciprocal services into account are Rs. 11,500 and Rs.13,000 respectively. These are now redistributed only to the production departments as shown below :

Statement showing redistribution of service department overheads to production departments

Particulars	Production Departments			Service Departments	
	P_1 Rs.	P_2 Rs.	P_3 Rs.	S_1 Rs.	S_2 Rs.
Overheads (as per Primary Distribution)	19,400	22,200	15,000	—	—
Overheads (as computed above)	—	—	—	11,500	13,000
Service Dept. :					
S_1	3,450	4,600	1,150	(–) 11,500	—
S_2	2,600	3,900	5,200	—	(–) 13,000
Total	25,450	30,700	21,350		

The total overheads of production departments after redistribution under repeated distribution method and simultaneous equation method may be verified.

4.8 Absorption of Overheads by Production Units

Absorption of overheads means charging an equitable proportion of the total overhead of a production department to production unit. It is the ultimate stage of recognizing production overhead as a part of the cost of production. It means no mention that the process of apportionment, not the allocation, is to be resorted to again. Naturally, an appropriate measurable base is to be identified and the total amount of production overhead is to be spread over all the measured units of that base. A base is a factor which significantly influences the costs of a department. It is alternatively known as the *cost driver.* A production department may have a number of cost drivers such as production units, direct materials, direct labour (hours/wages), machine hours, a combination of material and labour cost i.e., prime cost, etc. The amount of production overhead per unit of the base used is known as *Overhead Absorption or Recovery Rate*. The output as measured in terms of the base used (e.g., direct materials cost per unit, direct wages per unit, direct labour hours per unit, machine hours per unit, etc.) is multiplied by the absorption rate (e.g., overheads per rupee of direct materials or direct wages, per direct labour or machine hour, etc.) to determine the amount of overhead per unit. This is what is known as *absorption of overhead* by production units.

The overhead absorption or recovery rate may be either actual or predetermined. This rate may again be computed either for the factory as a whole comprising a number

of production departments or separately for each department or cost centre; while the former is known as single rate, the latter rates are called multiple rates. Usually, a rate whether it is actual or predetermined, single or one of the multiples, is computed once for a whole year. But in cases when both the amount of overhead and/or the base used undergo a change more frequently say, changes take place every month or quarter or for any shorter period (e.g., changes in direct wages or labour or machine hours in a month due to variation in number of working days) or when they change due to seasonal fluctuations, the rate should be computed for a period so as to match the period of fluctuation. Accordingly, there may be seasonal or other periodical rates like monthly, quarterly, daily, etc.

Actual Rate vs. Pre-determined Rate

Actual overhead rate is the rate which is computed on the basis of actual figures. Thus,

$$\text{Actual Rate} = \frac{\text{Actual Overheads}}{\text{(Actual number of units of the base used).}}$$

Actual rate may be computed for any period say, monthly, quarterly, half-yearly or annual.

Actual rate is very simple to understand and may be more acceptable for its objectivity (independent of the mind of the person using it). It can be suitably used for computation of historical cost of production. But it suffers from two major limitations :

(a) The rate may be computed only at the end of the accounting period (month, quarter, half-year or year) when actual figures are available. So, it may be used only for post-mortem exercise. It becomes useless in determining selling price where the latter is based on cost of production. Because cost of production using actual overhead rate can be computed only at the end of a period while both the productions and sales operations are carried over throughout the period.

(b) Actual rate is sensitive to the periodical fluctuations in both the volume of production and the overhead costs. Different rates in different periods make the costs of production and the selling prices incomparable over the periods. Frequent changes in selling prices may affect the volume of sales adversely.

Pre-determined overhead rate, as the name suggests, is determined beforehand i.e. before the commencement of the period over which it would be used. Naturally, it is based on budgeted figures which are then available.

Thus,

$$\text{Pre-determined Overhead Rate} = \frac{\text{Budgeted overhead for the period}}{\text{Budgeted number of units of the base used}}$$

Following arguments are usually put-forward in favour of the use of a pre-determined rate :

(i) The rate becomes available rightly at the beginning of the period since budgets are always prepared beforehand. It thus helps in avoiding the delay in computing the cost of production and the selling price. It is, therefore, more suitable for application in jobbing type of industries.

(ii) Once the rate is computed it can be used throughout the entire period without any change. As a result, it brings in uniformity in the unit cost over the period and avoids the onslaught of fluctuations in productions (base) and overhead costs.

(iii) The pre-determined rate is very much useful for control and decision making purposes since they generally require use of data in advance of the actual operation.

Single vs. Multiple Rate

A single absorption rate for the factory as a whole is also known as *blanket* rate. If the products of a factory are more or less identical and all of them receive similar services from all the departments or cost centers, use of a single rate may be recommended. It is actually an average rate for all the departments.

Time, cost and energy involved in computing different rates for different departments can be avoided by use of a single rate. Single rate is thus suitable for small firms. These advantages of single rate are, however, available only to the sacrifice of accuracy. For example, in a multi-product firm where different products have to use services of different departments or cost centers disproportionately, use of single rate gives inaccurate product costing.

In such cases, multiple rates i.e., different rates for different departments, are to be used for more accurate absorption of overheads.

Annual vs. More Frequent Periodical Rates

An actual rate or a pre-determined one may be used either as a single rate or in multiples. But in either case a decision is to be taken as to the length of the period during which the rate will be used. In other words, it is an issue of how

frequently the rate should be revised. The absorption rate is usually computed on an annual basis so as to match the use-period with the normal accounting period. This is particularly so in case of pre-determined rate. But in case of actual rate, annual revision suffers from the limitation of getting delayed as stated earlier. More frequent revision may ease out the problem significantly but may invite another problem of fluctuating product cost.

Some businesses may be more sensitive to cyclical fluctuations; business ups and downs in those cases coincide with the phases of business cycles. Overhead rate in those businesses should be used continually over the period so long as to cover all the phases of the business cycle which usually extends beyond one year.

4.9 Methods of Overhead Absorption

There are different methods of charging overhead to unit cost of a product. The methods differ depending on different bases (Direct Materials, Cost per unit, Direct labour hours / wages per unit, Unit prime cost, etc.) used in computing the overhead absorption rate. All the methods are discussed below in brief classifying them under three broad groups :

A) Production Unit method

B) Percentage methods :
   i) Percentage on Direct Materials Cost
   ii) Percentage on Direct Wages
   iii) Percentage of Prime Cost

C) Hourly Rate methods :
   i) Direct Labour Hour Rate
   ii) Machine Hour Rate

- **Production Unit Method**

Under this method overhead rate is computed by dividing the total overhead cost directly by the number of units produced i.e.,

$$\text{Overhead Rate} = \frac{\text{Total overhead cost}}{\text{Total no. of units produced}}$$

The rate may be an actual or a pre-determined one. The base used here is the volume of production which may also be measured, if possible, in terms of the units of common characteristics like weight, length, volume, etc. This method is suitable for use in a single-product firm or even in a multi-product firm where all the products may

be measured in terms of some common unit as above. The suitability of this method is, however, based on the assumption that the overhead cost is mainly influenced by such common characteristic.

- **Percentage on Direct Materials Cost Method**

  Under this method,

$$\text{Overhead Absorption Rate} = \frac{\text{Total Overhead Cost}}{\text{Total Direct Materials Cost}} \times 100$$

This method is rarely applied since a meaningful relationship between overhead cost and direct material cost is rarely found. It is totally unjustified to charge higher amount of overhead simply because the product consumes expensive material. Again, materials price is subject to greater and frequent fluctuations while prices of different items of overhead may not. Thus, total overhead cost remaining same, higher or lower amount of overhead may be charged to product unit due to fluctuations in the prices of materials used. Finally, this method ignores the time factor while most of the items of overhead cost are time-based. For example, two products having the same materials cost will bear the same amount of overhead charge even though they are having different processing times attracting different incidence of rent (an overhead item).

(i) Percentage on Direct Wages Method

This method is similar to the earlier method the only difference being replacement of direct materials cost as base by direct labour cost or direct wages. Thus,

$$\text{Overhead Absorption Rate} = \frac{\text{Total Overhead Cost}}{\text{Total Direct Wages}} \times 100$$

This method can be suitably used in the following situations :

i) Where production process is labour intensive demonstrating a close relationship between overhead cost and direct wages.

ii) Where all workers are paid at a uniform rate. Different rates of pay for different workers mean different direct wages for uniform time involving uniform overhead cost. So, overheads may be charged not in proportion to their accruals.

iii) Where there is uniform production process for all the products. Different production processes usually involve different overhead costs.

The advantages of this method are :

(a) It is very simple.

(b) Time factor which is the most influential one in accrual of overhead cost is duly recognized in this method.

(c) Labour rate is more stable than material price. So, incidence of overhead cost on the cost of production also remains stable in different periods.

The major limitation of this method is ignoring the fact that production involving more machine-time usually leads to more overhead cost.

(ii) Percentage on Prime Cost Method

Under this method, prime cost being a composition of all the direct costs is used as base. It is not a widely used method. Because it attracts all the limitations of using both the direct material cost and direct wages as bases while attempting to derive their advantages. The only weak argument put forward in its favour is that overhead cost is mainly associated with the direct material and labour.

- **Direct Labour Hour Rate Method**

Labour Hour Rate is computed as given below :

$$\text{Hourly Rate} = \frac{\text{Total Overhead Cost}}{\text{Total Direct Labour Hours}}$$

This method is considered to be superior to any of the methods discussed above. Because this method accords real recognition to the time factor which is believed to have major influence on the overhead cost. It is more suitable in labour intensive manufacturing firms particularly when there are different rates of wage payment. It is, however, not suitable in machine intensive manufacturing firms.

- **Machine Hour Rate Method**

Under this method overhead cost is absorbed by machine-hours used for production. This method is suitable where production operation is highly mechanized. In such cases machine related costs like depreciation, repairs and maintenance etc. dominate the overhead cost. Machine related costs do usually have direct relation with the machine running time.

Where a number of dissimilar machines are in use rates are to be computed separately for each such machine. If, however, all the machines are similar, one rate may be computed for all the machines. Different rates for different groups of similar machines may also be computed. In either case, overhead costs are first allocated or apportioned to each of the different dissimilar machines or to each group of similar machines. Each machines or each group of machines is treated as a cost centre. Once the process of allocation and/or apportionment is completed computation of machine hour rate is very simple. It just involves dividing the overhead cost of a machine cost centre by the machine hours for that cost centre.

Again, machine related costs are not specific to the machine running time. Some costs may be incurred even when the machines remain idle. Running time costs are usually variable in nature while idle time costs are mainly fixed. So, absorption of overhead cost by a single rate taking both the single and variable machine costs together may be inequitable. Computation and application of separate rates for running and idle hours may ease out the problem of inequitable absorption of overhead.

Additionally, possibility of treating wages of operators either as direct or as indirect creates confusion. If treated as direct wages, normally it should not be included in computation of machine hour rate. But if it is considered worthwhile to include it in the computation of machine hour rate, it being a significant item of machine related cost, it is to be included as a variable item. The machine hour rate so computed is known as Comprehensive Machine Hour Rate. It may be included in the group of fixed expenses if an operator cannot be terminated even in case of falling demand and production.

4.10 Limitation of the Volume-based Methods

Different methods of absorption of overhead have been discussed above. The process in each case is simple and similar i.e., dividing the amount of overhead by the base used. The bases used in the above methods are – production units, direct materials cost, direct wages, prime cost, direct labour hours and machine hours. All these bases may be used as measures of the volume of production. Hence, the methods are alternatively called volume based methods. As the volume increases, the absorption rate decreases and vice-versa. Consequently, a product or service is charged with higher amount of overhead if it consumes higher volume of resource (direct material, direct labour, machine time, etc.) that is used as base in determining absorption rate. For example, overhead cost (consisting of set up cost and other batch-specific costs) for a batch volume of 1000 units of a product in a plant should be the same for a batch-volume of 100 units of a similar product (in all respects) in another plant. So, incidence of overhead cost on the unit cost of the product should be rationally lower in the first plant (amount of overhead being distributed over 1000 units in a batch) than that of the second plant (same amount of overhead being distributed over 100 units in a batch). But traditional costing system using volume-based method of overhead absorption (say, 100% of direct wages) will lead to equal incidence of overhead on the unit cost in both the plants; because direct wages per unit are equal in both the plants. So, volume-based overhead distribution method leads to mis-costing i.e., under-costing of low-volume products and over-costing for high-volume products. This misinformation in cost may in turn lead to wrong decisions (pricing, subsidy allocation, resource allocation, etc.).

Of the different volume-based methods, direct labour based methods are the most popular ones in use. These methods have become consistent and conventional in use. The underlying logical assumption is that most of the items of indirect cost are more related to direct labour. But things have undergone havoc change in the recent past. With the introduction of more and more automatic and advanced manufacturing techniques the importance of direct labour has declined. It may be evident from the observations of a few studies conducted between 1960 and 1986 (collected from "Activity Based Costing, by N.S. Acharya, The Management Account, 1996, p.520). One of the studies revealed that share of direct labour in total cost reduced from 22% to 15% while that of indirect costs increased from 22% to 32%. But interestingly, despite the declining importance of direct labour, its use as a base, for absorbing overhead was on the rise from 40% to 50% of the organizations studied. So, in spite of lost relevance of direct labour its increasing use as a base for overhead absorption may be due to more affinity to consistency and convention.

4.11 Under- or Over-absorption of Overhead

As discussed earlier, actual overhead absorption rate is seldom used owing to lack of its practical utility in determining cost of production and selling price. Selling price is required to be determined as soon as the goods are ready for sale; it may be well ahead of the end of the accounting period. So, overhead is recovered based on predetermined rate.

The amount of overhead cost charged to product cost applying the pre-determined rate is known as the amount of overhead *recovered*. For example, if Production Unit Method of recovery is applied then :

$$\text{Overhead recovered} = \text{Actual production} \times \text{Recovery rate per unit}$$

$$= \text{Actual Production} \times \frac{\text{Estimated or Budgeted Overhead}}{\text{Estimated or Budgeted Production}}$$

Naturally, the amount of overhead recovered is only an estimated figure which creeps into the product cost. But product cost for accounting purposes must be an actual one. Actual overhead costs are incurred independent of this process of recovery. These are just collected and accounted for by debit to Production Overhead Account (Accounting for cost transactions, is a matter of discussion for the next unit). If, incidentally, two figures of *overhead recovered* and *overhead incurred* exactly match, which is a rare occasion, there will be no problem since product cost will reflect the actual cost.

The problem arises when the two figures of overhead recovered and the overhead incurred do not match. There may be two situations of such a mismatch :

i) When the amount of overhead recovered falls short of overhead incurred. It is termed as *under-recovery* or *under-absorption of overhead.*

ii) When the amount of overhead recovered exceeds the amount of overhead incurred. It is termed as *over-recovery* or *over-absorption of overhead.*

In either case, product cost will show a distorted picture.

Identifying the basic reasons behind under-or over-recovery of overhead becomes very simple. These are :

i) When actual overhead incurred differs from overhead estimated as used in determining recovery rate. Under-estimation of overhead leads to lower rate of recovery which in turn leads to lower recovery or under-absorption and vice-versa.

ii) When actual figures for the base elements (production unit, labour hours, etc.) differ from the estimated figures. Under-estimation of base element leads to higher rate of recovery and consequential higher recovery or over-absorption and vice-versa.

Further analyses of causes as to why actual figures of overhead and base elements differ from those estimated may reveal the following :

a) Demand-supply factor in production. Production may be increased to meet the increased demand and vice-versa.
b) Mistakes in estimating the figures either of overhead or of base element.
c) Unforeseen changes affecting the amount of overhead and the base element e.g., change in overhead prices, change in production methods, etc.
d) Seasonal fluctuations.

- **Treatment of under-or over-absorbed overhead :**

There are three alternative ways of treating under-or over-absorbed overhead in cost accounts. These are :

i) Carry forward to the next accounting period,
ii) Write off to Costing Profit and Loss Account,
iii) Adjust product cost by use of Supplementary Rate.

Carry Forward Method : Under this method the amount of under-or over-absorbed overhead is transferred to an Overhead Suspense Account which is carried forward to the next period with the hope that it may be neutralized by an opposite balance next period. This method is seldom applied but suitable to counter the effects of business cycle which extends beyond one accounting period.

Write off Method : The amount of under-or over-absorbed overhead is transferred to a separate account called Overhead Adjustment Account. This is to collect under-

and over-absorbed amounts of all types of overheads namely, production overhead, administrative overhead and selling & distribution overhead. The final balance of Overhead Adjustment Account is transferred to Costing Profit & Loss Account. This is, in effect, a treatment by neglect. When the amount of under-or over-absorbed overhead is too small to adopt another treatment this method is applied.

Supplementary Rate Method : When the amount of under-or over-absorbed overhead is significant distorting the product cost significantly the product cost is adjusted by applying a supplementary rate of overhead. The supplementary rate may be computed as follows :

$$\text{Supplementary Rate} = \frac{\text{Amount of under-or over-absorbed overhead}}{\text{Base element (Production Unit, Labour Hours, etc.)}}$$

The rate is applied in the same process as applied for original absorption. But this adjustment to product cost is to be carried over through all the three statuses of production. Completely produced goods may be either sold out or held in store. Production process may remain incomplete for certain units. So, supplementary rate is to be applied to proportionately adjust the cost of production involved in—

a) Cost of Sales : for the goods already sold,
b) Finished Goods (in store) : for unsold goods, and
c) Work-in-progress : for semi-finished goods.

4.12 Allocation of Overhead using Activity Based Costing

Distribution of overheads on volume-based factors assumes that volume of production as measured in terms of production units, direct labour hours, etc. is the major driver of overhead cost. But this assumption does not hold good in majority of the cases particularly in a multi-product firm producing non-uniform products. As a result, volume-based allocation of overhead leads to mis-costing. To overcome the problem, an alternative method of overhead distribution based on activities that really cause overhead cost is recommended by different authors and experts. This alternative method is termed as *Activity Based Costing (ABC).*

Under ABC, activities are treated as *cost drivers*. It may be made very clear that ABC is suggested for distribution of overhead or indirect costs only and for direct costs which are readily traceable to production units. So, activities mean activities of the centers or departments which support or provide services to production operation. These activities as cost drivers are used as bases for distribution of overhead costs. For example, machine set-up cost which is distributed by use of machine hour rate under

traditional costing, will be distributed on the basis of a rate per set-up. The cost is ultimately charged to product by multiplying the number of set-ups required for a product by the rate per set-up. Where batch production is followed the set-up cost for a batch of production will be shared equally by the production units in the batch. An illustrative list showing some activities with corresponding cost drivers is shown below (Source : Cost Accounting by B. Banerjee, p. 307) :

Activity	**Cost driver**
Machine set-up	Number of production runs
Purchasing materials	Number of orders placed
Warehousing	Item in stock
Material handing	Number of parts
Inspection	Inspection per item
Quality test	Hours of test time
Receiving materials	Number of receiving orders
Packing	Number of packing orders
Store delivery	Number of store deliveries
Line item ordering	Number of line items

The total cost for all the set-ups that become necessary during an accounting period constitutes a 'cost pool'. Such a cost pool is established for each identified cost driver. It is just grouping of costs having similar cause and effect relationship with the identified cost driver. The cost drivers for the activities are called transaction-based cost drivers. The underlying logic behind the replacement of volume-based cost driver as used in traditional costing by transaction-based cost driver in ABC lies in the belief that overhead costs are actually caused by the transactions handled in the support department. Thus, use of real cost-drivers for distribution of overhead more accurate allocation of overhead cost.

All the activities that are necessarily required to be performed for a complete production may be ranked into three levels :

i) *Production unit level* : There are certain activities which are required to be performed in proportion to the number of units produced. These are called unit level activities. Naturally, the costs of these activities are variable in nature.

ii) *Batch level* : There may be some activities which do not vary with the variation in the production units but vary with the number of production batches. The cost of these activities remain fixed for a batch whatever may be the production units in the batch. These are called batch level activities.

iii) *Product-sustaining level* : Activities performed to sustain or maintain a product-line come under this level. Examples of such activities include product designing, quality testing, customer satisfaction, etc.

The entire process of allocation of overhead cost to cost object (i.e., product) involves apportionment at two *stages* :

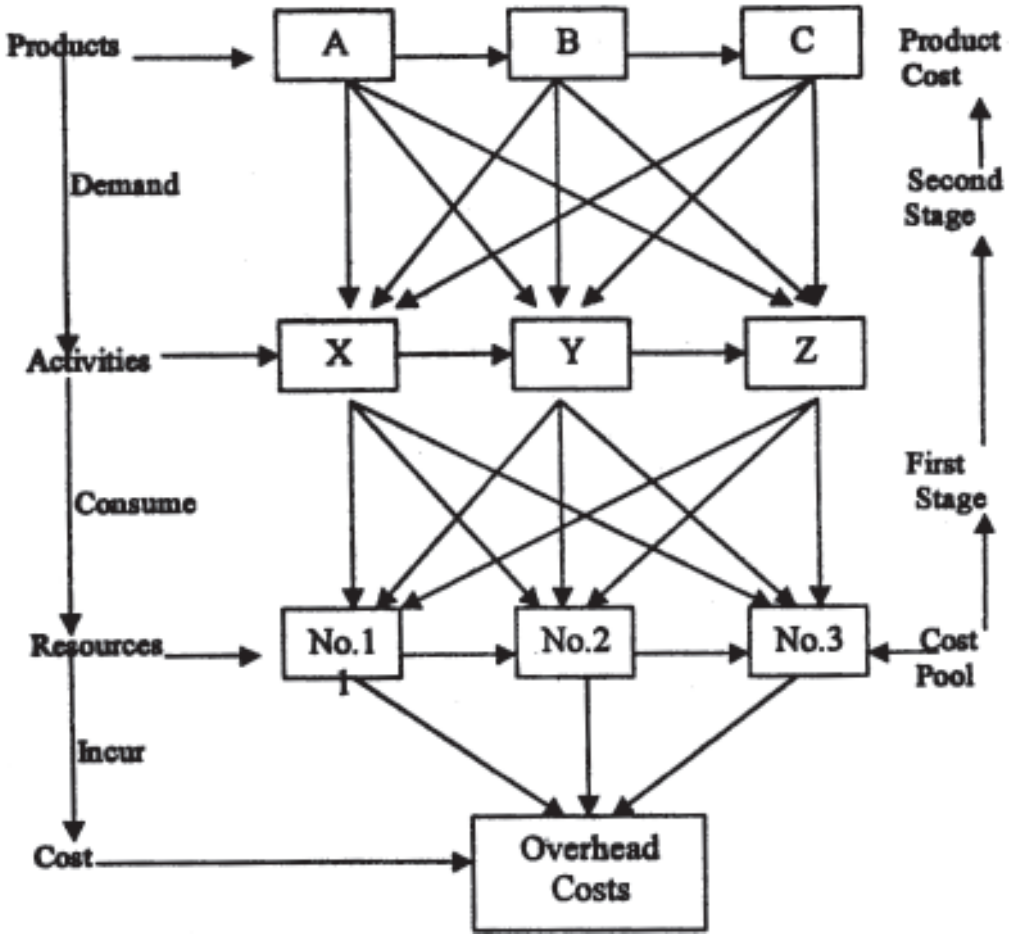
i) *First stage* : The first stage of apportionment distributes cost of a cost pool to the related activities. The cost drivers used at this stage are known as *first stage cost drivers*.

ii) *Second stage* : Activity-costs are re-apportioned to cost objects by using *second stage cost drivers.*

The process of ABC is shown by a Flow Chart as shown in Figure 1.

Figure 1

Flow Chart Showing Activity Based Costing



4.13 Benefits of ABC

The benefits of ABC are :

i) Activities being the real cost drivers, analysis of overhead costs on the basis of activities are expected to attain more effective control on costs. The scope of combining costs of similar activities of different departments also facilitates better cost allocation.

ii) Better cost allocation with the use of activities as cost drivers leads to more accurate cost determination.

iii) Better management of activities may lead to various changes in them directed towards cost reduction.

iv) Under ABC, activities at all levels (unit level, batch level, etc.) can be separately evaluated identifying economically strong and weak activities. It helps in better decision making and better resource allocation and prioritisation of activities.

Weaknesses of ABC

Despite the above benefits, ABC suffers from certain weaknesses as mentioned below :

i) Requirement of huge data for effective implementation of ABC involves huge time, energy and cost.

ii) It fails to follow generally accepted accounting principles in some cases. For example, ABC supports distribution of some non-product overhead costs like costs of planning, general administration, building maintenance, etc. to the product cost while it does not allow allocation of some committed product cost like depreciation on factory assets.

iii) Possibility of cost reduction by change of work process is not encouraged by ABC.

iv) It fails to draw attention to the problem areas. Thus overemphasis on cost reduction overshadows the problem rather than solving them.

4.14 Questions

(a) Long answer type

1. Explain the steps involved in the process of distribution of overhead under traditional costing system.
2. What are the problems of distribution of overhead by volume-based measures? How can those problems be overcome?
3. What do you mean by under-or over-absorption of overhead? What accounting treatments are available for their disposal?

(b) Short answer type

4. Explain in brief the following terms :
   (a) Allocation and Apportionment, (b) Pre-determination overhead rate,
   (c) Basic process in Activity Based Costing, (d) Blanket overhead rate.
5. What factors would you take into account in choosing an appropriate overhead absorption rate?
6. What are the advantages of Activity Based Costing?

(c) Objective type

7. Mention the validity of the following statements indicating 'true' or 'false' :
   (i) Variable overheads are direct costs.
   (ii) The process of allotment of overhead to cost unit is known as allocation.
   (iii) Re-appointment of service department costs to production departments is known as absorption.
   (iv) The only reason for the under-or over-absorption of factory overhead is wrong estimation about factory overhead.
   (v) Actual overhead absorption rate is more useful than pre-determined rate.
8. Fill in the blanks :
   (i) Actively Based Costing can be applied only for distribution of _____ costs.
   (ii) Superiority of Activity Based Costing lies in using _____ based cost drivers for distribution of _____.
   (iii) A cost driver is _____ which generates cost.
   (iv) A cost pool is a pool of costs of _____ activities of different departments.
   (v) Unit level costs under ABC are costs of resources which vary _____ with the number of production units.

4.15 Select Readings

Banerjee, B., *Cost Accounting*, World Press Pvt. Ltd.

Horngren, T., *Cost Accounting*, A Managinal Emphasis.

4.16 Hints for Solutions (for objectives type questions)

7. (i) to (v) False.
8. (i) indirect, (ii) transaction, overheads, (iii) an activity, (iv) similar, (v) proportionately.

Unit 5 □ Cost Control Accounts, Cost Reconciliation and Integrated Accounts

Structure

5.1 Introduction

The purposes of cost accounting being different from that of financial accounting, cost accounting requires maintenance of cost accounting records. Since source documents for cost accounting transactions may in majority of the cases be common to financial accounting there are chances for duplication of recording. Again recording of same transaction in two separate sets of books following different sets of principles usually gives different results. It requires reconciliation. To avoid duplication of records integration between the two systems of accounting is made. To cover the above aspects this unit is designed to deal with those issues in the following sequences : Non-integrated Cost Accounting System, Reconciliation of Cost and Financial Accounts, Integrated Cost Accounting System. In any case, it may be mentioned that double entry principle is followed in cost books also.

5.2 Non-integrated Cost Accounting System

Under this system separate books of accounts are maintained for cost transactions. The basic ledgers maintained in the Cost Department are :

a) *Cost Ledger* : This is the main ledger in which all the nominal accounts (representing incomes, expenses, gains and losses) and a few real accounts are maintained. This is also called Nominal Ledger.

b) *Stores Ledger* : This ledger is maintained for recording all transactions related to stores like receipts, issues, wastages, etc. Separate accounts are opened for each item of stores.

c) *Work-in-progress Ledger* : This ledger is meant for recording transactions relating to incomplete productions. Separate accounts are maintained for each job, process, or batch in process.

d) *Finished Goods Ledger* : It maintains accounts separately for each job, batch or process completed.

The last three ledgers are subsidiary ledgers. Under self-balancing system, the Cost Ledger, i.e., the Principal Ledger, should maintain a control account entitled Cost Ledger Control Account. Similarly, for all the above subsidiary ledgers, it should also maintain separate control accounts so that cost ledger can be self-balanced. Thus, the principal accounts to be maintained in different ledgers under cost books are :

i) *Cost Ledger Control Account* : As mentioned above, it is maintained in the Cost Ledger. This is also termed as General Ledger Adjustment Account, Financial Ledger Control Account or Nominal Ledger Control Account. Since only nominal accounts and a few real accounts are maintained in the Cost Ledger, recording of transactions involving personal accounts and some real accounts remain incomplete. To complete the recording of that aspect this account is used. For example, Wages A/c is maintained to record wages paid but the other account i.e., Cash or Bank A/c, is not maintained to record the payment. To complete the double entry, Cash or Bank A/c is replaced by Cost Ledger Control A/c in cost books. This account will in effect reflect all the personal accounts maintained in financial books of accounts.

ii) *Stores Ledger Control Account* : While stores ledger maintains accounts of individual items of stores, Stores Ledger Control Account records the aggregate amount of all such transactions entered in individual accounts under Stores Ledger. The balance of this account will, therefore, represent the total balance of all individual stores accounts.

iii) *Work-in-Progress Control Account* : This account records all transactions related to cost of production (direct and indirect expenses) of goods completely produced and in process. The account is credited with the value of goods transferred. The balance of this account will represent the cost of all jobs or products which are in process.

iv) *Finished Goods Control Account* : This account is debited with the value of goods transferred to Finished Goods Store. Administration overhead is also debited to this account. It is credited for the value of goods sold by debit to Cost of Sales Account. The balance of this account shows the value of closing stock of finished goods.

v) *Wages Control Account :* This account is debited with the total amount of wages paid, both direct and indirect. It is credited with the amount of direct wages by debit to Work-in-Progress Account and with indirect wages by debit to respective overhead accounts (e.g., Production Overhead, Administration Overhead and Selling and Distribution Overhead). Wages for abnormal idle time is entered in the credit side by corresponding debit to Costing Profit & Loss Account.

vi) *Different Overhead Control Accounts :* Separate control accounts are maintained for each type of overhead (like Production Overhead Control Account). Respective overhead control accounts is debited with the amount of related indirect costs (e.g., Administration Overhead Control Accounts is debited with the amount of administration expenses). The amount of overhead recovered or absorbed is credited to the respective Overhead Control Account. The balance of each overhead control account is transferred to Overhead Adjustment Account or directly to Profit & Loss A/c.

vii) *Overhead Adjustment Account :* As a result of the transfers of the balances of Overhead Control Accounts, this account is debited for under-recovery of overhead and credited for over-recovery. The balance of this account is transferred to Costing Profit & Loss A/c.

viii) *Cost of Sales Account* : As stated in (iv) above, this account is debited for transfer from Finished Goods Control Account. It is also debited with the amount of selling and distribution, or marketing overhead recovered. Balance of this account is transferred to Costing Profit & Loss A/c.

ix) *Costing Profit & Loss Account :* A close look into the above accounts reveal that this account is debited with the cost of sales, under-recovered overheads and abnormal losses and credited with the amount of sales, over-recovered overhead and abnormal gains, if any. Balance of this account representing net profit or loss as per cost books is transferred to Cost Ledger Control Account.

Journal Entries for Some Specimen Transactions :

a) Materials

i) *For Purchases :*
Debit Stores Ledger Control A/c
Credit Cost Ledger Control A/c

ii) *For returns :*
Debit Cost Ledger Control A/c
Credit Stores Ledger Control A/c

iii) *For Issues for Production :*

Debit WIP Control A/c (for direct materials)
Debit Production OH Control A/c (for indirect materials)
Credit Stores Ledger Control A/c

iv) *For Returns from factory to store :*

Debit Stores Ledger Control A/c
Credit WIP Control A/c

b) Wages

i) *For payment (both direct and indirect) :*

Debit Wages Control A/c
Credit Cost Ledger Control A/c

ii) *For allocation of Direct Wages to Production :*

Debit WIP Control A/c
Credit Wages Control A/c

iii) *For Indirect Wages attributed to different functions :*

Debit Production OH Control A/c
Debit Administration OH Control A/c
Debit S&D OH Control A/c
Credit Wages Control A/c

c) Direct Expenses incurred

Debit WIP Control A/c
Credit Cost Ledger Control A/c

d) Overheads (Different types)

i) *Expenses incurred*

Debit Production OH Control A/c
Debit Administration OH Control A/c
Debit S&D OH Control A/c
Credit Cost Ledger Control A/c

ii) *For Overheads absorbed or recovered*

Debit WIP Control A/c (for Production OH)
Debit FG Ledger Control A/c (for Admn. OH)
Debit Cost of Sales A/c (for S&D OH)
Credit Production OH Control A/c (for Prodn. OH)
Credit Admn. OH Control A/c (for Admn. OH)
Credit S&D OH Control A/c (for S&D OH)

iii) *For under-recovery of Overhead*
Debit Overhead Adjustment A/c
Credit Production OH Control A/c (for Prodn. OH)
Credit Administration OH Control A/c (for Admn. OH)
Credit S&D OH Control A/c (for S&D OH)

iv) *For over-recovery of Overhead* (e.g., Production Overhead)
Debit Production OH Control A/c
Credit Overhead Adjustment A/c

v) *For transferring net balance of Overhead Adjustment Account*
Debit Overhead Adjustment A/c (for net credit balance)
Credit Costing Profit & Loss A/c
Reverse entry for transfer of net debit balance

e) Sales

Debit Cost Ledger Control A/c
Credit Costing Profit & Loss A/c

f) Profit/Loss

i) *For Profit transfer*
Debit Costing Profit & Loss A/c
Credit Cost Ledger Control A/c

ii) *For Loss transfer*
Debit Cost Ledger Control A/c
Credit Costing Profit & Loss A/c

5.3 Reconciliation of Cost and Financial Accounts

When two separate sets of accounts are maintained in financial and cost accounts the profit or loss figures under two sets may not tally. Under such circumstances, attempts are made to identify the reasons behind such difference. The underlying process is called reconciliation. Reconciliation is necessary to detect error in any one or both of the sets of accounts. Over and above all, reconciliation tests arithmetical accuracy in maintaining accounts in the two sets of accounts, which strengthens internal control.

Reasons for the differences in profit figures may be due to the following :

i) Items affecting only one set of accounts,
ii) Under-or over-absorption of overhead,
iii) Different methods of stock valuation adopted,
iv) Other factors.

The details under each of the above are mentioned below :

i) Items specific to one set of accounts

a) *Purely Financial Incomes and Expenses*

1. Profit or Loss on sale of fixed assets
2. Interest, dividend, rent, fines, penalties, etc.
3. Cost on issue of shares, debentures, bonds, etc.
4. Fees or commission received on issue of shares, debentures, etc.

b) *Purely Financial Appropriation Items*

1. Provision for tax
2. Provision for dividend payment
3. Writing off Goodwill, Preliminary expenses, etc.
4. Transfer to General Reserve
5. Additional provision for depreciation, bad debt, etc.

c) *Purely Cost Items*

1. Notional interest on owned capital
2. Notional rent on owned building.

Items under (b) above will cause difference only when profit figure after appropriation (financial books) is compared with the profit under cost books. Otherwise, these items may be ignored for the purpose of reconciliation. The items under (c) above will not affect the costing profit or loss. For example, Production Overhead Control A/c is debited for notional rent with a corresponding credit to Costing Profit & Loss A/c. Production Overhead Control A/c is, in effect, a debit item for Costing Profit & Loss A/c. Thus, the two aspects of debit and credit neutralize the effect of notional rent on costing profit or loss. These items are, therefore, to be ignored for the purpose of reconciliation.

ii) Under-or Over-absorption of Overhead

In cost accounting, overheads are absorbed based on a pre-determined rate. It causes under-or over-absorption of overhead. Costing Profit is overstated for under-absorption and vice-versa. Thus, they cause difference in profit figures under two sets of accounts. If, however, such under-or over-absorbed overheads are charged off to Costing Profit & Loss A/c through Overhead Adjustment A/c, then the effects are neutralized retaining profit figure unaffected.

iii) Different bases of stock valuation

In financial accounts, stocks (raw materials, work-in-progress and finished goods) are valued at lower of cost and net realizable value. But in cost accounts, stocks are

valued at cost. So, when stocks in financial accounts are valued at net realizable value, being lower than cost, financial profit is overstated for opening stock and understated for closing stock. Profit figures may also differ even when stocks in both sets of books are valued at cost. For example, cost (of stock) may mean 'latest purchase price' in financial accounts and 'weighted average cost' in cost accounts. Again, composition of cost in two sets may be different. For example, cost of transporting finished goods to the location of sale is included in the cost of finished goods in financial accounts but not in cost accounts.

iv) Other factors

There may be some other items which receive different treatments in the two sets of accounts. For example, depreciation in financial accounts is almost always treated as an annual charge while in cost accounts it is sometimes charged on production unit basis or on hourly basis. Profit in cost accounts may also be affected for under-or over-absorption of direct wages when direct wages, in some exceptional cases, are charged to cost of production by use of a pre-determined rate just like overheads.

After having identified the causes behind the two different profit figures, it is simple to make reconciliation. The process is a kin to the preparation of a Bank Reconciliation Statement. However, the process may be summarily stated as follows :

i) Start with the profit figure of either of the books of accounts. Say, we start with Profit as per Cost Accounts and want to arrive at profit as per other set of books.

ii) Analyse individual items causing difference in profit. It is to be ascertained whether a particular item has increased or decreased the profit under cost accounts.

iii) Add the amounts involved in the items causing difference in profit to the cost profit if the items have reducing effects on cost profit.

iv) Deduct the amounts involved in items causing increased profit under cost books.

We get the profit as per financial accounts.

If we start with profit as per financial accounts, the amounts involved in items stated in (iii) above are to be deducted and the amounts in items stated in (iv) above are to be added to arrive at the profit as per cost accounts.

5.4 Integrated Accounts

Maintaining separate sets of books for cost and financial accounts needs reconciliation between the profits under two sets. Integrated system of accounting will help avoid reconciliation since accounts are maintained in the single combined set of books.

In the integrated system, duplication of records is avoided. Thus, personal accounts and real accounts are maintained as per financial accounting principles since these are better maintained there. On the other hand, nominal accounts related to cost and sales are better analysed under cost accounting rules; so these are maintained as per those rules.

- **Main Accounts to be maintained**

Maintaining Cost Ledger Control A/c. in Cost Ledger is dispensed with. Other accounts in the Cost Ledger as discussed earlier are retained. In addition, the following accounts, most of which are specific for the financial accounts, are also maintained :

1. Bank Account
2. Debtors Control Account
3. Creditors Control Account
4. Provision for Depreciation Account
5. Discounts Account
6. Accrual and Prepayment Account
7. Fixed Assets Account
8. Share Capital Account
9. Profit and Loss Account
10. Cost Control Account

The first nine accounts are very much the same as they are maintained in financial accounts. Cost Control Account acts as a *Central Control Account*.

- **Specimen Journal Entries**

1. Materials
   a) *For Purchases* :

      Debit Stores Ledger Control A/c
      Credit Creditors A/c (for credit purchases)
      Credit Cash A/c (for cash purchases)

b) *For Returns to Creditors* :
Reverse entry to that for (a) above

c) *For Issues to Production* :

d) For *Issue of Indirect Materials to Production*

e) For *Returns to Stores*

For (c), (d), and (e) above, entries are the same as stated for non-integrated Cost Books of Accounts.

2. *Wages* :

a) Payment (both direct and indirect)
Debit Wages Control A/c
Credit Cash A/c

b) Charging direct wages for Production

c) For Indirect Wages charged to Production

For (b) and (c), entries are the same as stated for non-integrated Cost Books of Accounts.

3. *Overheads* :

a) *For Overheads incurred* :
Debit (Respective) OH Control A/c
Credit Creditors for Services A/c

b) *For Payments* :
Debit Creditors for Services A/c
Credit Cash A/c

c) For *Overheads recovered*

d) For *under-or over-absorption of Overheads*

e) For *transferring balances of OH Control A/cs*

For (c), (d), and (e), entries are the same as stated for non-integrated Cost Books of Accounts.

4. *Sales* :
Debit Debtors/Cash A/c
Credit Sales A/c

5.5 Questions

a) Long answer type

1. What principal ledgers and accounts are maintained in a system of cost control accounting?

2. Why is reconciliation of cost and financial accounts necessary? Can it be avoided? If so, when?

(b) Short answer type

3. What are the advantages of maintaining a cost ledger?
4. Give specimen entries in integrated system of accounting for all types of overhead transactions.

(c) Objective type

5. State whether the following statements are True or False :
   (i) Notional transactions do not have any effect on costing profit or loss.
   (ii) Loss of stock by fire is excluded to be recorded in cost books.
   (iii) Both types of balances of Overhead Adjustment A/c are transferred to Costing Profit & Loss A/c.
   (iv) Costing profit is understated for under-absorption of overhead.
   (v) Cost Control A/c is the same as Cost Ledger Control A/c.
6. Fill in the blanks :
   (i) Work-in-Progress Control A/c is debited for all ————————costs.
   (ii) Balances of Overhead Control A/c is transferred to _____ Account
   (iii) For absorption of Administration Overhead _____Account is debited.
   (iv) Undervaluation of opening stock leads to ————————stated profit.
   (v) Double entry system ——— followed in cost books.

5.6 Select Readings

Banerjee, B., *Cost Accounting*, World Press Pvt. Ltd.

Wheldon's *Cost Accounting*, ELBS

Horngren, T., *Cost Accounting* — A Managerial Emphasis, Prentice Hall.

5.7 Hints for Solution (for objective type questions)

5. (i) to (iii) True (iv) & (v) False.
6. (i) direct (ii) Overhead Adjustment Account (iii) Finished Goods ledger Control Account (iv) overstated (v) is.

Unit 6 □ Methods of Costing : Job, Contract, Process and Service Costing

Structure

6.1 Introduction

As discussed earlier (Unit 1), methods of costing indicate the methods of collecting, collating (gather together in proper order) and presenting cost data. These methods differ depending on the nature of the product, production process, etc. So, different methods are to be adopted for ascertaining costs for job-order type of works, construction contracts, production involving sequential processing operations or for a specific service and function. The methods of costing applicable in the above cases have accordingly been named, as the nature of the product and production process involved in individual case suggests, as Job Costing, Contract Costing, Process Costing and Service Costing respectively. These are essentially the subject matters of discussion in this unit.

6.2 Job Costing

Job Costing is applicable where goods are produced on the basis of the orders received from the customers. Since customers' specifications for desired goods differ, goods that are to be produced would not be all alike; naturally they involve different costs. So, costs and so also the profit/loss are to be ascertained for each such job separately. Industries where job costing can be applied include tailoring, printing, furniture manufacturing, machine tools manufacturing, etc.

6.2.1 Job Cost Collection

Usually the process of ascertaining costs for a job is exercised before the actual production starts. So, it is based on estimated cost. Such a pre-production estimation of cost for producing goods as per customers' specification is necessary because it is on the basis of this estimated cost a price is quoted and an agreement is entered into between the producer and the customer. The producer starts production thereafter when the job (for supplying the goods) is formally accepted.

The Production Order is, however, issued by the Planning Department of the manufacturing unit. Each job being dissimilar separate production orders are required to be issued for different jobs undertaken. For identification of the jobs each production order is alloted a number called Production Order Number.

Actual costs of production for the jobs are then collected by the Production Order Numbers. Costs as collected by the Production Order Number are recorded in a Job Cost Sheet. A job cost sheet thus accumulates the costs of each job in a systematic manner and in the proper format. Actual costs are compared with the estimated cost figures for control purposes.

For systematic collection of costs the following procedure is followed :

i) *Direct Materials* : If materials are purchased for a particular job, cost of materials is collected from the related Purchase Invoice. On the other hand, if materials are issued from stores, the related documents may be Stores Requisition, Bill of Materials, etc. The values of materials issued are obtained from Cost Department.

ii) *Direct Labour* : The related documents for booking labour cost to a job are Operation Schedule, Job Card or Wages Analysis Sheet or any other document used for time booking.

iii) *Direct Expenses* : Direct expenses like hire charge of any machine hired specifically for a job or the cost of sub-contracting, etc. must always be supported by the vouchers. These vouchers are used for collection of direct expenses of a job.

iv) *Overheads* : Actual overheads are collected by Standing Order Numbers or Cost Account Numbers. But, as stated earlier (unit 4), overheads are charged to the jobs on the basis of pre-determined rates. So, it may lead to under- or over-absorption attracting treatments as discussed in Unit 4.

6.2.2 Job Cost Accounting

So far as accounting aspect is concerned, the usual procedure as discussed earlier (Unit 5) under 'Cost Control Accounts' is followed when job costing is applied. For detailed job wise recording of costs incurred for each job, a separate subsidiary ledger called Job Cost Ledger is, however, maintained. Total amounts of costs incurred on different elements for all the jobs are entered in the Work-in-Progress Ledger Control A/C. When a job is finished, the total cost incurred for the job is ascertained from the individual job account maintained in Job Cost Ledger. The individual job account is then closed. The W.I.P. Ledger Control A/C is credited with the total cost of the job so completed by debit to Cost of Sales A/C. When the job is invoiced to customer, Cost of Sales A/C is credited with the amount of total cost for the job debiting Costing Profit & Loss A/C. Costing Profit & Loss A/C is credited with the amount of agreed price of the job debiting Sales A/c. Thus, W.I.P. Ledger Control A/c will leave a balance representing the value/cost of unfinished jobs and Costing Profit & Loss A/c will show the profit or loss on the jobs completed and sold.

6.2.3 Job Cost Sheet

The proforma of a Cost Sheet as given in Unit 3 is actually meant for use in jobbing type of operation. But if a job passes through a number of departments for its

completion drawing resources and services from such departments, the same proforma of a cost sheet can be used with certain minor modifications so as to make it suitable for application. Below is given a modified proforma of a Job Cost Sheet or alternatively called a Job Cost Card.

Job cost card

Job Order No.	**Quantity Ordered . . . . . .**
Description	**Date started . . . . . .**
Customer	**Date completed . . . . . .**

Date	**Particulars**	**Cost**					**Remarks**
		Dept. 1 Rs.	**Dept. 2 Rs.**	**Dept. 3 Rs.**	**Total Rs.**	**Per unit Rs.**	
	1. Direct Materials 2. Direct Wages 3. Direct Expenses 4. Overheads						
	Total (1+2+3+4)						

The proforma may be suitably redesigned by adding additional rows to show more detailed cost information like Prime Cost, Works Cost, Cost of Production, Cost of Sales, etc.

6.2.4 Problems and Solutions

Problem 1

Following figures are extracted from the cost records of a firm for the accounting year 2003-2004 :

	Rs.		Rs.
Direct Materials	90,000	Office and Administration	
Direct Wages	60,000	Overhead	39,200
Direct Expenses	10,000	Selling and Distribution	
Manufacturing Overhead	36,000	Overhead	49,000
		Profit	85,260

In 2004-2005, an article had been manufactured and sold on the basis of an order received from a customer. The following expenses were incurred for the article :

Direct Materials Rs. 5,000, Direct Wages Rs. 3,000, and Direct Expenses Rs. 2,000.

In 2004-2005, the prices of overhead expenses had undergone change as follows :

Manufacturing overhead increased by 10%, Office and Administration overhead increased by 20% and Selling and Distribution overhead decreased by 20%.

At what price the customer is to be billed for the supply of the article as per his order so as to earn the same rate of profit on cost as in 2003-2004 ?

Solution 1

Workings

Cost Sheet for 2003-2004

Particulars	Amount Rs.	Relations Worked Out for 2004-2005
Direct Materials	90,000	i) Manufacturing OH (% of Direct
Direct Wages	60,000	Wages) =
Direct Expenses	10,000	(36,000 + 10%) × 100/60,000 = 66%
Prime Cost	1,60,000	ii) Office and Administration OH
Manufacturing Overhead	36,000	(% of Works Cost) =
Works Cost	1,96,000	(39,200 + 20%) × 100/1,96,000
Office and Administration Overhead	39,200	= 24%
Cost of Production	2,35,200	iii) Selling and Distribution OH
Selling and Distribution Overhead	49,000	(% of Works Cost) = (49,000-
Cost of Sales	2,84,200	20%) × 100/1,96,000 = 20%
Profit	85,260	iv) Profit (% of Cost of Sales) =
Sales	3,69,460	85,260 × 100/2,84,200 = 30%

Job Cost Sheet
(Job No. . . . . in 2004-2005)

Particulars	Amount Rs.
Direct Materials	5,000
Direct Wages	3,000
Direct Expenses	2,000
Prime Cost	10,000
Manufacturing Overhead (66% of Direct Wages)	1,980
Works Cost	11,980
Office and Administration Overhead (24% of Works Cost)	2,875
Cost of Production	14,855
Selling and Distribution Overhead (20% of Works Cost)	2,396
Cost of Sales	17,251
Profit (30% of Cost of Sales)	5,175
Selling Price	22,426

Problem 2

A job has been priced at Rs. 350 calculated on the following basis :	Rs.	Rs.
Materials : Dept. A	60	
Dept. B	40	100
Wages : 30 hours @ Rs. 6 per hour		180
(Dept. A–15 hours, Dept. B–5 hours, Dept. C–10 hours)		
		280
Plus 25% on Prime Cost		70
		350

Previous year's Profit and Loss Account may be redesigned in the following manner to reveal relevant information :

	Rs.	Rs.		Rs.
Materials Consumed :			Sales	2,40,000
Dept. A	35,000			
Dept. B	30,000			
Dept. C	15,000	80,000		
Direct Wages :				
Dept. A	30,000			
Dept. B	12,000			
Dept. C	18,000	60,000		
Factory Overhead :				
Dept. A	40,000			
Dept. B	10,000			
Dept. C	18,000	68,000		
Gross Profit c/d		32,000		----------
		2,40,000		2,40,000
Administration Overhead		10,400	Gross Profit b/d	32,000
Selling and Distribution Overhead		5,200		
Net Profit		16,400		
		----------		----------
		32,000		32,000
		======		======

Your are required to prepare a job Cost Sheet to show the final selling price taking the following into account :

i) revised costs based on previous year's figures are to be adopted, and

ii) a profit margin of 10% on total job cost is to be added.

Solution 2

Job Cost Sheet

(Job No. . . . . Period . . . . . .)

		Rs.	Rs.
Materials :	Dept. A	60	
	Dept. B	40	100.00
Wages :	Dept. A (15 hours @ Rs. 6)	90	
	Dept. B (5 hours @ Rs. 6)	30	
	Dept. C (10 hours @ Rs. 6)	60	180.00
	Prime Cost		280.00
Factory Overhead[1] :			
	Dept. A (15 hours @ Rs. 8)	120	
	Dept. B (5 hours @ Rs. 5)	25	
	Dept. C (10 hours @ Rs. 6)	60	205.00
	Works Cost		485.00
Administrative Overhead (5% of Works Cost)[2]			24.25
Selling and Distribution Overhade (2.5% of Works Cost)[3]			12.13
	Cost of Sales		521.38
Profit (10% on Cost of Sales)			52.14
	Selling Price		573.52

Note 1

Factory overhead rates for different departments are computed on the basis of previous year's figures as follows :

Dept. A :

Direct Wages Rs. 30,000

Hourly rate Rs. 6 (assumed unchanged)

Direct Labour Hours = Rs. 30,000 / Rs. 6 per hour = 5000

Factory Overhead Rs. 40,000

Factory Overhead rate : Rs. 40,000 / 5000 hours = Rs. 8 per hour

Dept. B :

Direct Labour Hours = Rs. 12,000 / Rs. 6 per hour = 2,000

Factory Overhead rate : Rs. 10,000 / 2000 hours = Rs. 5 per hour

Dept. C :

Direct Labour Hours = Rs. 18,000 / Rs. 6 per hour = 3,000

Factory Overhead rate : Rs. 18,000 / 3000 hours = Rs. 6 per hour

Note 2

Administration overhead rate is computed as a % on works cost as follows :

Total administration overhead	Rs. 10,400
Work Cost [Rs. (80,000 + 60,000 + 68,000)]	Rs. 2,08,000

Administration overhead rate = (Rs. 10,400 × 100) / Rs. 2,08,000 = 5%

Note 3

Selling and Distribution overhead rate is also computed as a% on works cost :

Total selling and distribution overhead	Rs. 5,200
Works cost	Rs. 2,08,000

Selling and distribution overhead rate = (Rs. 5,200) / (Rs. 2,08,000) × 100 = 2.5%.

6.3 Contract Costing

6.3.1 Introduction

Contract costing is similar to job costing. Both are undertaken to satisfy customers' special requirements i.e., 'tailor-made'. Naturally, therefore, no two jobs or contracts are exactly similar. These are also terminal in nature in the sense that the terminal points i.e., beginning and end, of each job or contract are easily identifiable. It makes separate cost ascertainment for each terminated job or contract easier. That is why these are also called Terminal Costing.

In spite of the above similarities, contract costing is separated from job costing for the following peculiarities of contract costing :

i) Duration of a contract is usually longer involving more than one accounting period.

ii) Operations are usually constructional involving designing, erection or providing structures as in cases of building, dam, road, bridge, shipbuilding, etc.

iii) Operations are generally carried out at a place other than the contractor's own place.

iv) Not like job costing most of the costs incurred for a contract are identifiable and specific for the contract. There are rare cases of costs which may require apportionment.

Escalation Clause is a clause in the contract, which provides scope for revision of the contract price necessitated by the abnormal upward changes in usages or prices of inputs from those (usages or prices) estimated at the time of entering into the contract. The clause specifically aims at compensating the contractor for any unforeseen changes that may take place.

On the basis of its nature all contracts can be classified into two categories as follows :

a) **Fixed Price Contracts**–In such contracts a fixed price for the contract is agreed upon with or without having an 'escalation clause'.

b) **Cost plus contracts**–In such contract an agreement is entered into for (i) reimbursement of allowable or defined costs, and (ii) payment of a certain percentage of these costs or a fixed amount towards profit.

6.3.2 Collection of Costs for Contracts

Procedures : Similar to job costing, each contract undertaken by a contractor is given a Contract Account Number. It distinguishes one contract from the others. All costs relating to a particular contract are collected with reference to that number. It may also be used for purposes of cost estimation which is important for price quotations.

Principles :

i) Each contract is treated as a cost unit. So, cost is generally ascertained for the entire contract as a whole although in some cases it may be possible to ascertain costs for smaller component parts of a contract. Such ascertainment of costs for smaller parts of a contract leads to more effective cost analysis and cost control.

ii) For periodical finalization of accounts, the principle of matching costs with revenues is followed. That is, only that portion of the costs incurred in an accounting period is taken into account for which revenue has been recognized. So, costs for the *certified portion* of the work completed are to be matched against the corresponding part of the contract value.

iii) Another principle which assumes significance in Finalization of periodical accounts is principle of conservatism. Following this principle, only that portion of the profit on contract which is realized is taken into account. Anticipated profit does not find place in profit determination. Contrarily, all losses – both the actual and anticipated – are given effect to.

Accounting : All costs which are specifically identified with a contract are debited to the related Contract Account. There may be some general costs which are incurred for all the contracts or for a group of contracts under a contractor but cannot be identified with any specific contract. These are treated as overhead. Treatments of different types of costs of a contract are discussed below :

i) *Materials*

Materials may be either directly purchased or issued form stores. In either case contract account is debited with the value of materials. In the former case, purchase

price including carriage inwards constitutes the value. In the latter case, value is ascertained following the method of pricing adopted, e.g., FIFO, LIFO, Average, Standard, etc.

The value of materials lying unused at the site of the contract at the end of an accounting period is credited to the contract account.

For normal loss or wastage of materials, nothing is done i.e., the cost of such normal loss is left to be absorbed within the cost of the contract.

For abnormal loss, if any, costing profit and loss account is debited with the value of such loss by credit to contract account.

Transfers (to other contracts) and returns (either to the store or to the supplier) are credited to the contract account.

ii) *Labour*

Cost of labour employed for a contract is direct and specific irrespective of the fact that some of the duties performed by them (e.g., supervisors' salaries) may be of indirect nature. However, if a supervisor or an engineer employed by a contractor has to look after a number of contracts under the same contractor, the salaries of such supervisor or engineer have to be apportioned amongst the contracts. Anyway, salaries and wages allocated or apportioned to a contract are to be debited to the contract account.

iii) *Direct Expenses*

All direct expenses i.e., the expenses which may be directly allocated to the contract but are neither direct materials nor direct wages, are to be debited to the contract account. Examples of direct expenses may be costs of design, special tools, hire charge of a mixer machine or a road-roller, etc.

iv) *Overheads*

As mentioned above, most of the expenses of a contract can be directly allocated to it; thus there may only be a few items of general nature like cost of administration or central supervision, which are treated as overheads. Some firms like to apportion the overhead expenses and an appropriately apportioned share is debited to the respective contract account. Most of the firms, however, prefer to charge the total amount of general overhead expenses to the costing profit and loss account.

v) *Plants and Equipments*

Hire charge (in case of hired plants and equipments) and depreciation (in case of owned plants and equipments) are debited to contract account. Sometimes, instead of charging depreciation, the book value of the plants issued is debited and depreciated

to the contract account. It will effectively result in charging the contract account with the use-value of the plants. This method is followed when valuation of plants appears to be easier than determining the rate of depreciation or when plants are issued to the contracts for regular use over a longer period of time.

Sometimes an 'Upkeep Account' is opened and the costs of repairs, maintenance, depreciation and obsolescence are debited to that account. At the end of an accounting period, contract account is charged with the amount of depreciation, repairs, etc. computed at a rate sufficient to cover the annual depreciation, repairs, etc. It is like 'Repair Provision Method' of charging depreciation.

vi) *Miscellaneous Expense*

All other expenses related to a contract are debited to contract account. The examples of other expenses may be surveyor's fees, fines, penalties, etc.

Apart from the issues relating to costs as discussed above, there are certain commonly used terms which are relevant in preparing a contract account and determining profit or loss in a contract. These are discussed below :

a) Contract Price : It is the agreed amount payable to a contractor. It may be a fixed amount (as in case of fixed price contract) or a conditioned amount (as in case of cost plus contract).

b) Work Certified and Progress Payment : Contracts are usually of longer duration involving more than one accounting period and a huge amount. Contract price is, therefore, paid in installments on the basis of the progress of the work. An independent surveyor is appointed who occasionally visits the site of the work and inspects the work done. He finally certifies the portion of work completed as on the day of his visit and its corresponding value.

c) Retention Money : The contract entered into between the contractor and the contractee generally contains a *retention clause* which provides for keeping withheld payment of a portion (certain percentage) of the certified value till the entire contract is completed or even beyond that period. The amount of money so retained temporatily by the contractee is called 'Retention Money'. This is just a security measure in the hands of the contractee to keep pressure on the contractor to complete the work in time, prevent him from leaving the contract before completion or to rectify the mistakes that may be discovered within a short period after completion of the contract.

d) Profit on Incomplete Contracts : Determination of actual profit is possible only on the completion of a contract which generally involves more than one accounting period. But it poses a number of problems. Firstly, it may lead to heavy fluctuations in profits – higher in the years in which contracts are completed and lower in other

years when contracts are in progress; more likely is the fact that the result may show a loss for a year in which no contract is completed even though operationally the year may be a successful one. Secondly, it may attract higher tax rate when the entire profit on a contract is shown in a year putting it in a higher slab. Thirdly, from the point of view of rational accounting practice, it appears to be irrational in the sense that profit does not accrue suddenly on completion of the contract; it rather accrues gradually over the years during which works have been carried out.

The other alternative to ascertain profit is to anticipate profit in the years during which works are in progress. This practice, however, goes against the accounting doctrine of conservatism. According to the doctrine, profits are to be taken into account only when these are realized but provisions should be made in accounting for all anticipated losses.

The popular practice in contract costing, however, goes in favour of anticipating profit and to take a portion of such anticipated profit into Profit & Loss Account because it appears to be more rational. But there is no uniformity as to how much profit of the incomplete contract is to be credited to Profit & Loss Account. Practices vary widely depending on the nature of the work, policies of the management, portion completed, risk in completing the incomplete work, etc. With a view to having a general guiding principle in this regard, all the on-going contracts may be classified as follows on the basis of their degree of completion.

i) Contracts at the initial stage of completion,
ii) Contracts which are half-way to their completion,
iii) Contracts at the advanced stage of completion, and
iv) Contracts nearing completion.

Contracts which are at their initial stage (say, not more than 25% of the work has been completed) can hardly give any indication as to whether a particular contract will ultimately turn out as a profitable or loosing one. So, no profit on such contracts should be taken into account at their initial stages of completion.

Contracts which have taken pace in work-activities and are at their half-way of completion (say, 25% to 50% completed) should be assessed as to their profitability. Profit on such a contract is to be estimated on a notional basis by comparing the cost of the work certified against the certified value of the contract. As a safeguard against the possibility of a loss that may arise out of the remaining portion of the contract, only a small fraction of the notional profit, say one-third, is credited to profit and loss account and the balance is retained as provision against future loss, if any.

For contracts the works of which have sufficiently been progressed, say between 50% and 90%, two-thirds of the notional profit may be taken to profit and loss account.

A greater portion of such profit is taken to the profit and loss account since only a smaller part of the contract remains to be completed, which may qualify for a remote chance of turning the entire contract into a loosing one.

Contracts which are *almost completed* say, 90% or more complete, are treated a bit differently. Profits in such cases are estimated on a prospective basis considering the cost and the price for the contracts as a whole. The works of these contracts are at so advanced a stage that the costs for the insignificant incomplete portion can easily be estimated. Thus, the estimated total cost of a contract comprising *actual cost of* completed portion and *estimated cost of* incomplete portion is compared against the contract value (not the certified value) to arrive at *total estimated profit*. Provision for contingencies can still be made by recognizing only the following portion of estimated total profit i.e.,

(Estimated total profit × Actual Cost to data) / Estimated total cost,

and leaving the rest portion as profit provision.

To be overcautious about future contingencies the amount of profit recognition can be reduced further in each of the cases by taking credit of the *realized portion* of the profit only to the profit and loss account. This can be done by applying the following formula :

Realised notional profit = Notional profit × Cash received / (Work Certified).

On prospective basis, the denominator 'work certified' in the above proportion is replaced by 'contract value'.

Different formulae that are used to determine the amount of profit to be credited to profit and loss account in different cases of incomplete contracts are summarized below :

Let N = Notional profit,

E = Estimated total profit (prospective basis), and

P = Cash received / Work certified

Sl. No.	Types of incomplete Contracts	Degree of completion	Profit to be recognised
1.	Initial Stage	Not more than 25%	Nil
2.	Half-done	Between 25% and 50%	(1/3 × N) or (1/3 × N × P)
3.	Advanced Stage	Between 50% and 90%	(2/3 × N) or (2/3 × N × P)
4.	Nearing Completion (prospective basis)	90% and above	(E × Actual Cost to date / Est. total cost) = A (Say) or (A × Cash received) / (Contract value)

e) Loss on Incomplete Contracts : Loss on incomplete contracts arises if the value of the work certified is less than its cost. Such situation may arise due to inefficient cost management or unforeseen price rise of inputs specially when that is not duly guarded by escalation clause. Unlike profit on incomplete contracts, the entire loss is charged to profit and loss account irrespective of the degree of completion. Moreover, provision should also be made for any future anticipated loss although it is quite natural that the contractor would take appropriate measures to avoid or reduce the loss so anticipated.

f) Work-in-Progress : Alike the need for ascertaining profit / loss on incomplete contracts, need also arises for valuation of incomplete contract that is in progress. Basis of the valuation is the actual total cost incurred so far on contract *plus* the portion of profit recognized. Work-in-Progress is an asset and, therefore, is to be shown in the balance sheet; care should, however, be taken to deduct the amount realized, if any, from the contractee. The value of work-in-progress can thus be computed as shown below :

1.	Value of work certified :			
	2. Cost of work certified		* * *	
	3. Profit element in work certified :			
	4. Profit taken to P/L A/C	* * *		
	5. Profit provision	* * *	* * *	* * *
				* * *
6.	Cost of work not certified			* * *
7.	*Less :* Profit provision		* * *	
8.	*Less :* Cash received		* * *	* * *
9.	Work-in-Progress			* * *

Alternatively,

Work-in-Progress (9) = (2 + 4 + 5 + 6) – (7 + 8)

= (2 + 6 + 4) – (8) [as (5) = (7)]

It may be mentioned that (2 + 6) constitutes 'Total Cost to Date'.

6.3.3 Problems and Solutions

Problem 1

The following particulars have been supplied by M/s Sugathan Construction Co. Ltd. in respect of their three contracts namely, Contract Nos. 201, 202 and 203 for the year ended 31st March, 2005 :

Particulars	Contracts		
	No. 201	No. 202	No. 203
Date of Commencement	01.07.04	01.10.04	01.01.05
	Rs.	Rs.	Rs.
Contract Price	5,00,000	2,40,000	3,20,000
Materials purchased	1,05,000	80,000	1,20,000
Materials in hand on 31.03.05	20,000	16,000	22,000
Wages paid	70,000	54,000	48,000
Wages outstanding	3,000	2,000	1,000
Plant installed at the beginning	1,50,000	80,000	60,000
Establishment charges	5,000	2,000	3,000
Other expanses	12,000	8,000	10,000
Work certified	2,10,000	1,10,000	2,00,000
Cost of uncertified work	8,000	6,000	10,000
Cash received	1,68,000	80,000	1,80,000

Depreciation is charged @ 10%. Prepare Contract Accounts for the year ended 31st March, 2005. Show computation for the values of Work-in-progress and also the figures as they would appear in the Balance Sheet.

Solution

Dr. **Contract Account** **Cr.**

Particulars	N0. 201 Rs.	No. 202 Rs.	No. 203 Rs.	Particulars	N0. 201 Rs.	No. 202 Rs.	No. 203 Rs.
To Materials Purchased	1,05,000	80,000	1,20,000	By Materials c/d	20,000	16,000	22,000
To Wages Paid	70,000	54,000	48,000	By Plant c/d (Cost less Depn.)	1,38,750	76,000	57,000
To Wages Outstanding c/d	3,000	2,000	1,000	By Cost c/d	1,86,250	1,34,000	1,63,000
To Establishment Charges	5,000	2,000	3,000				
To Other Expenses	12,000	8,000	10,000				
To Plant	1,50,000	80,000	60,000				
	3,45,000	2,26,000	2,42,000		3,45,000	2,26,000	2,42,000

To Cost b/d	1,86,250	1,34,000	1,63,000				
				By Contractee's			
To Profit b/d	31,750	---	47,000	A/c			
				(Value of Work			
				Certified)	2,10,000	1,10,000	2,00,000
				By Cost of			
				Uncertified			
				work c/d	8,000	6,000	10,000
				By Profit &			
				Loss A/c			
				– Loss			
				transferred[1]	---	18,000	---
	2,18,000	1,34,000	2,10,000		2,18,000	1,34,000	2,10,000
To Profit &							
Loss A/c[1]	8,467	---	28,200	By Profit b/d	31,750	---	47,000
To Profit							
Provision c/d	23,283	----------	18,800				
	31,750	----------	47,000		31,750	---	47,000
To Materials	20,000	16,000	22,000	By Profit			
b/d				Provision b/d	23,283	---	18,800
To Plant b/d	1,38,750	76,000	57,000	By Wages			
To Cost of				Accrued b/d	3,000	2,000	2,000
Uncertified							
Work b/d	8,000	6,000	10,000				

Note 1 :

Profit to be taken to Profit & Loss Account

Contract Nos.	**201**	**202**	**203**
1. Contract Price (Rs.)	5,00,000	2,40,000	3,20,000
2. Value of Work Certified (Rs.)	2,10,000	1,10,000	2,00,000
3. (Work Certified / Contract Price) (%)	42	45.8	62.5
4. Profit / Loss (–) (Rs.)	31,750	(–) 18,000	47,000
5. Profit to be taken :			
[1/3 × 31,750 × (1,68,000 / 2,10,000)]	8,467	----	----
[2/3 × 47,000 × (1,80,000 / 2,00,000)]	----	----	28,200
6. Loss to be transferred (Rs.)	----	(–) 18,000	----
7. Profit Provision (Rs.)	23,283	NIL	18,800

Note 2 :

Computation of Work-in-progress

Particulars	Contract Nos.		
	201	202	203
1. Cost to date (Rs.)	1,86,250	1,34,000	1,63,000
2. Proportion of profit taken (Rs.)	8,467	----	28,200
3. Loss transferred (Rs.)	----	(–) 18,000	----
4. Cash received (Rs.)	1,68,000	80,000	1,80,000
5. Work-in-progress :			
[1 + 2 – 4] (Rs.)	26,717	----	11,200
[1 – 2 – 4] (Rs.)	----	36,000	----

(Extract from) Balance Sheet as at 31st March, 2005

Liabilities	Contract Nos.			Assets	Contract Nos.		
	201 Rs.	202 Rs.	203 Rs.		201 Rs.	202 Rs.	203 Rs.
Profit & Loss A/c (includes) :				Fixed Assets (includes) :			
Profit on Contracts	8,467	---	28,200	Plant (Cost			
Loss on Contract	---	(–) 18,000	---	Less depn.)	1,38,750	76,000	57,000
Sundry Creditors (include) :				Current Assets (include) :			
Wages Accrued	3,000	2,000	1,000	Materials	20,000	16,000	22,000
				Work-in-Progress	26,717	36,000	11,200

Problem 2

XYZ Ltd. undertook a contract for Rs. 10,00,000 on 1st April 2003. The following particulars about the costs and progress of the contract at the end of the year on 31st March 2004 were available.

	Rs.		Rs.
Materials Issued	3,70,000	Share of Head Office expenses	60,000
Direct Wages Paid	1,20,000	Materials in hand (31.03.04)	10,000
Wages Outstanding	30,000	Value of Plant (31.03.04)	3,80,000
Site Expenses	80,000	Work Certified	8,00,000
Plant Purchased	5,00,000	Work Uncertified	69,000
Plant installation cost	10,000	Cash received (80%)	6,40,000

The contract contained the following escalation clause :

"In the event of increase in the price of raw materials by more than 15% and the rates of wages by more than 10%, the contract price would be increased accordingly by 40% of such increase in cost of materials and rates of wages beyond the respective percentages".

It was found that since signing the agreement both the material prices and the rates of wages increased by 20%. The value of work certified did not take the escalation clause into account.

Prepare Contract Account.

Solution 2

Dr. Contract Account Cr.

	Rs.		Rs.
To Materials issued	3,70,000	By Materials c/d	10,000
" Direct Wages : Rs.		" Plant c/d	3,80,000
Paid 1,20,000		" Cost c/d	7,80,000
Outstanding 30,000	1,50,000		
" Site expenses	80,000		
" Plant 5,00,000			
Installation 10,000	5,10,000		
" Share of H.O. expenses	60,000		
	11,70,000		11,70,000
To Cost b/d	7,80,000	By Value of work certified	8,00,000
" Profit c/d	1,00,000	" Cost of uncertified work	69,000
		" Cost escalation	11,000
	8,80,000		8,80,000
To Profit & Loss A/C [(2/3 × N × P) = 2/3 × 1,00,000 × (80/100)]	53,333	By Profit b/d	1,00,000
To Profit Provision c/d	46,667		
	1,00,000		1,00,000
To Materials b/d	10,000	By Wages outstanding b/d	30,000
" Plant b/d	3,80,000		

Workings

	Total increase Rs.	Ineffective portion		Effective portion	
Cost of materials (20%)		%	Rs.	%	Rs.
[(Rs. 3,70,000 – Rs. 10,000) × 20/120]	60,000	15%	45,000	5%	15,000
Wages (20%)					
[(Rs. 1,20,000 + Rs. 30,000) × 20/120]	25,000	10%	12,500	10%	12,500
	85,000		57,500		27,500

40% of Rs. 27,500 = Rs. 11,000

Therefore, contract price is to be increased by Rs. 11,000.

6.4 Process Costing

6.4.1 Introduction

Process costing, as stated earlier, is a method of costing used for ascertaining costs of all the processes/operations involved in converting materials into finished products. It may be mentioned that, except in cases where a single unit of a product is produced in a process, unit product costs can not be ascertained directly under this method; only common costs for all the products produced smultaneously in a process are ascertained; common costs are then averaged to get product costs. When more than one process are involved, the average unit costs in all such processes are aggregated to get the total unit cost of a product.

6.4.2 Distinction between Job Costing and Process Costing

The main points of distinction between job costing and process costing are summarized below :

i) In job costing, goods are produced as per customer's specification; so goods are not homogeneous. In process costing, specifications are standardised; so goods are homogeneous.

ii) In job costing, jobs are terminable and costs are accumulated job-wise. Since processes are continuous, costs in process costing are accumulated process-wise for each period.

iii) Each production unit in job costing remains identifiable during production stage while production units may not be identifiable during processing.

iv) A product and its cost is generally not required to be transferred from one job to another while a product and so also its cost partly processed in one process is almost always transferred to the next process for further processing and completion.

v) Work-in-progress is more or less a common and significant feature in process costing while it is not so common in job costing.

6.4.3 Costing Procedure

With the ultimate objective of ascertaining cost of a product passing through different processes, the following procedure is to be followed :

i) The entire factory is divided into identifiable processes which are treated as cost centers. Separate accounts are opened for each such process.

ii) The elements of costs as collected for each process are debited to the respective process accounts.

iii) Output of each process is also similarly recorded in suitable units.

iv) Average cost per unit of output is computed by dividing the total cost for running a process throughout the accounting period by the total number of good units produced during the same period. Element wise cost per unit can also be computed if this process is carried out for each element of cost.

v) If a product has to pass through more than one process, the cost incurred in a process is to be transferred to the next process and the costs are thus accumulated.

Various elements of costs that may be involved in any process are :

Materials : Direct materials may be required to be issued only in the first process or may be required at each process. Output of one process, if transferred, may be treated as input material in the next process. Whatever may be the case, the cost of materials is to be debited to the respective process account.

Direct Labour : Similar to direct materials cost, direct labour cost in a process is to be debited to the respective process account. In case the labour employed serves a number of processes, the wages are to be allocated to the processes in proportion to the time spent in different processes.

Direct Expenses : Hire charge of special plant, depreciation, repairs and maintenance, etc. constitute direct expenses of a process. These costs are also to be debited to the respective process account.

Overheads : Problem of overheads is one of apportionment amongst the products and processes. In any case, actual overhead apportioned to a process is to be debited to the process account.

The costing procedure as described above is so simple that it hardly needs any explanation. But the complexity arises by the presence of some features peculiar to process industries only. Accordingly, costing procedure for process industries is taken up for discussion dividing it into the following different sections; each such section deals with a particular type of complexity :

A) When process *gains or losses* are involved,

B) When transfer of output from one process to the next is made at a *profit*,

C) When opening and / or closing *work-in-progress* exists in a process, and

D) When two or more different products are produced *simultaneously* from a single process.

6.4.4 Process Gains or Losses

Materials losses, output being less than input, are almost inherent in all process operations and are normally unavoidable. The volume of loss is usually dependent on the characteristics of the materials used (e.g., evaporation, shrinkage, etc.), the nature of process operation (e.g., chemical reaction), and other technicalities involved. So, it can be estimated on the basis of past knowledge / experiences in those factors and is expressed in terms of certain percentage of the materials input. This allowance towards loss which can be normally estimated is termed as *Normal Loss*.

The actual loss may, however, be more or less than the normal estimation owing to some abnormal factors like use of sub-standard or high quality materials, accidents, change in plant-design, etc. The loss over and above the normal loss is known as *Abnormal Loss*. On the other hand, *Abnormal Gain* results when actual loss is less than the normal loss.

Accounting treatments for normal loss, abnormal loss and abnormal gain differ. These are :

a) For Normal Loss : The cost that is proportionately assignable to normal loss units are to be absorbed by the good units produced, thus inflating the costs of the latter. This can be given effect to by simply ignoring any accounting entry. But if the scrap units (arising out of normal loss) do have any realizable value, that is to be credited to Process A/c to reduce the cost effect on the good units to that extent. The journal entries are :

i)	Normal Loss A/c Dr. }		With the expected realizable scrap value
	To Process A/c }		Do
ii)	Cost Ledger Control (C.L.C.) A/c Dr. }		For realization on sale of scrap
	To Normal Loss A/c }		Do

b) For Abnormal Loss : The cost attributable to abnormal loss units i.e., additional units lost, is, however, to be segregated not to burden the cost of good units. The cost so attributable is ascertained by treating these lost (abnormally) units as *equivalent* to good units. It may be mentioned that abnormal loss occurs along with (never in isolation of) normal loss : so accounting entries for normal loss remain as above. Other entries are :

i)	Abnormal Loss A/c Dr. }		With the attributable cost
	To Process A/c }		Do
ii)	C.L.C. A/c	Dr.	(For amount realized on sale as scrap)
	Costing Profit & Loss A/c	Dr.	(For balance amount)
	To Abnormal Loss A/c		(With attributable cost)

c) For Abnormal Gain : It is similar but opposite to abnormal loss. Abnormal loss units are actually a part of normal loss units which have turned to be good units. So, it reduces the number of scrap units that may be available for sale. The journal entries, therefore, are :

i) Normal Loss A/c Dr. } With the scrap value on expected normal loss units
To Process A/c } Do

ii) Process A/c Dr. } With the cost attributable to abnormal gain units
To Abnormal Gain A/c } Do

Cost per unit = [A – (B.C)] / (D – B)

where, A = Total cost charged to the process
B = Number of normal loss units
C = Scrap value per unit
D = Input units.

iii) Abnormal Gain A/c Dr. (For attributable cost)
To Normal Loss A/c (For scrap value lost)
To Costing Profit & Loss A/c (For balance amount)

iv) C.L.C. A/c Dr. } For realized scrap value
To Normal Loss A/c } Do

6.4.5 Inter-process Profit

Some industries may decide to assess the operating efficiency of each of the processes separately. For the purpose they may follow the system of transferring outputs (which are actually semi-finished in terms of the finished product) of a process (known as transferor process) to the transferee process at a price (not simply cost) which includes an element of profit. This element of profit included in the transfer price is known as *inter-process profit*. This system will not unduly distort the profitability of the firm since the profit arising on transfer will automatically be set off against the increased cost of the input to the transferee within the same firm.

Advantages :

i) It permits comparison of costs of both the inputs and outputs of a process with their market prices even at the intermediate stages of completion.

ii) Neutral performance assessment of individual processes gets facilitated.

Disadvantages :

i) It increases accounting complexities.

ii) Further complexity arises when a part of the stocks received on transfer remains unsold. Because it will require exclusion of unrealized profit for valuation of such unsold stock at 'lower of cost or market price'. The profit figure to be credited to Profit & Loss A/c should also be adjusted by an amount of provision that may be created for such unrealized profit.

Problem (Inter-process Profit)

Product X passes through two processes before it is completed and transferred. The following data are made available for the month of June, 2005 :

Particulars	Process I Rs.	Process II Rs.	Finished Stock Rs.
Opening stock	5,000	8,000	22,000
Direct materials	26,000	20,500	
Direct wages	14,000	14,000	
Factory overhead	12,000	8,000	
Closing stock	3,500	5,500	12,500
Inter-process profit included in opening stock	---	1,200	7,500
Profit on transfer (% on transfer price)	20%	10%	---

Process stocks are valued at prime cost while finished stockes are valued at the price at which these are received from Process II. Sales during the period are Rs. 1,67,694. You are required to :

i) Prepare Process Accounts and Finished Stock Account showing profits at each stage,

ii) Compute realized profit, and

iii) Compute stock values for balance sheet purpose.

Solution :

Dr. **Process I Account** **Cr.**

	Rs.	Rs.		Rs.	Rs.
To Opening Stock	5,000		By Process II A/C		
Direct materials	26,000		- transfer		79,375
Direct wages	14,000				
	55,000				
Less Closing stock	3,500				
Prime Cost		51,500			
To Factory Overhead		12,000			
Process Cost		63,500			
To Profit (20% on tranfer price i.e., 25% on cost)		15,875			
		79,375			79,375

Dr. **Process II Account** **Cr.**

	Rs.	Rs.		Rs.	Rs.
To Opening Stock	8,000		By Finished		
To Process I A/c			Stock A/c		
- transfer	79,375		- transfer		1,38,194
To Direct Materials	20,500				
To Direct Wages	14,000				
	1,21,875				
Less Closing stock	5,500				
Prime Cost		1,16,375			
To Factory Overhead		8,000			
Process Cost		1,24,375			
To Profit (10% on transfer price i.e., 1/9th of cost price)		13,819			
		1,38,194			1,38,194

Dr. **Finished Stock Account** **Cr.**

	Rs.	Rs.		Rs.	Rs.
To Opening Stock	22,000		By Sales		1,76,694
To Process II A/c			A/c		
-transfer	1,38,194				
	1,60,194				
Less Closing Stock	12,500				
Cost of Goods Sold		1,47,694			
To Profit		20,000			
		1,67,694			1,67,694

Total Profit as per above accounts may be summarized as shown below :

	Rs.
Process I A/C	15,875
Process II A/C	13,819
Finished Stock	20,000
	49,694

ii) Computation of Realised profit involves a process of estimation of the unrealised profits included in stocks in both the processes and in finished goods. This is shown below :

Particulars	Unrealised Profit Rs.	Adjustment for Unrealised Profit Rs.	Realised Profit Rs.
A) Process I			
Apparent Profit as shown in Process I A/C		15,875	
Add Profit in opening Stock	NIL		
Less Profit in closing Stock	NIL		
Net adjustment		NIL	15,875
B) Process II			
Apparent Profit as shown in Process II A/C		13,819	
Add Profit included in Opening Stock as given	1,200		
Less Profit included in Closing Stock-Proportionate profit as charged by Process I [{(1,200 + 15,875)/1,21,875} × 5,500]	(771)		
Net adjustment		429	14,248
C) Finished Goods			
Apparent Profit as shown in Finished Stock A/C		20,000	
Add Profit included in Opening Stock as given	7,500		
Less Profit in Closing Stock [{(7,500 + 13,819)/1,60,194} × 12,500]	(1,664)		
Net adjustment		5,836	
			25,836
			55,259

iii) *Closing Stock values for Balance Sheet purposes*

	Gross Value Rs.	Unrealised Profit Rs.	Balance Sheet Value Rs.
Process I	3,500	NIL	3,500
Process II	5,500	771	4,729
Finished Goods	12,500	1,664	10,836
	21,500		19,065

6.4.6 Process Work-in-progress

In process industries, processing operations are usually continuous. So, it is quite likely that on the date of closing the accounts there remain some production units which are still under processing and have been consuming resources. These production units may be at different degrees of completion with respect to different elements of costs. It causes problem in determining the number of units fully completed during an accounting period. In process costing, we cannot identify the costs with each physical unit separately. So, for determining cost per unit what is actually done is that the total cost during a period is divided by the total number of units completely produced during the same period. It, therefore, necessitates conversion of semi-finished production units into *equivalent* number of completed units. The whole procedure of ascertaining cost of production per unit can be summarised as follows :

i) Ascertaining *Equivalent Production*, giving due consideration to the process losses and to the opening and closing work-in-process with their respective degrees of completion,
ii) Ascertaining the total *Process Costs* with element wise break up,
iii) Ascertaining *Cost per Unit* of Equivalent Production, and
iv) Ascertaining values of (a) completely processed and transferred units, and (b) Work-in-progress.

The above steps essentially involve preparation of the following three working statements :

i) Statement of Equivalent Production – dealing with the first step.
ii) Statement of Cost – dealing with the second and third steps.
iii) Statement of Evaluation – dealing with the last step.

Again, the preparation of the above statements may involve different degrees of attention to deal with different situations like there being only closing work-in-progress, with no process losses or process losses and gains. So, for easy understandability we take up discussions under the following separate heads :

a) Only closing Work-in-progress and no process gains and losses,
b) Only closing Work-in-progress but with process gains and losses,
c) Both types of WIPs with or without process gains and losses.

a) Only closing WIP but no process loss

This is the simplest situation; the only complexity is that related to the elementwise conversion of incomplete units of closing WIP into equivalent number of completely processed units. For example, we assume that there are 100 units of closing WIP which are 100% complete with respect to materials, 60% complete with respect to labour and 40% complete with respect to overhead. Its Conversion may be shown as follows :

Element	Closing WIP		Corresponding Equivalent Production Units
	No. of Units	Degree of Completion	
Materials	100	100%	100*100% = 100
Labour	100	60%	100*60% = 60
Overhead	100	40%	100*40% = 40

Once we complete the above conversion the rest part is very easy and similar to other situations. The entire process is illustrated in a later section.

b) Only closing WIP but with process gains and losses

The following points are worth noting :

i) Normal loss units are ignored for the purpose of conversion into Equivalent Production. But the realizable scrap value, if any. is to be deducted from the material cost.

ii) Abnormal loss units are to be converted taking into consideration the stage (degree of completion) when these are lost. If the information as to the degree of completion at the time of losing or rejection is not available it is to be assumed that losses occur at the Final stage i.e., when these are 100% complete in all respects.

iii) Abnormal Gain units are always to be taken as 100% complete in all respects.

c) Having both the opening and closing WIPs

Existence of opening WIP makes the unit cost computation process further complex. Conversion results for opening WIP would vary depending on whether FIFO method or Weighted Average Cost method is assumed. So, discussions are taken up in the following paragraphs to deal with the issues separately. It may be mentioned that the issues of existence or absence of process gains and losses can be handled following the same methods as discussed under (a) and (b) above.

i) Weighted Average Cost Method

Under this method, the degree of completion of opening WIP is considered irrelevant since these units are bundled with the category of units 'completed and transferred' during the period. So, effectively opening WIP units are treated alike with the units which are completely processed (i.e., 100%) during the period. The value

of opening WIP with the element wise break up is, however, to be added to the respective elements of cost incurred during the current period.

Problem

The following information is available in respect of an intermediate process (No. 2) for the month of April. 2005 :

Opening WIP : 1,000 units made up of :

Process I cost	Rs. 2,000
Materials	Rs. 4,500 (60% complete)
Labour	Rs. 3,600 (40% complete)
Overhead	Rs. 3,000 (30% complete)

Transfer from Process I : 19,000 units at Rs. 58,000

Transfer to Process III : 17,500 units

Process costs during the month :

Materials	Rs. 84,000
Labour	Rs. 66,800
Overhead	Rs. 32,000

Normal Loss : 10% of the input

Scrap value : Rs. 3 per unit

Closing WIP : 1,000 units; Degree of Completion :
Materials 70%, Labour 60%, Overhead 50%.

Prepare necessary statements and Process II Account.

Solution (Weighted Average Method)

Statement of Equivalent Production

Input		Output		Equivalent Production							
Items	Units	Items	Units	Materials I		Materials II		Labour		Overhead	
				%	Units	%	Units	%	Units	%	Units
Opening WIP	1,000	Completely processed and transferred	17,500	100	17,500	100	17,500	100	17,500	100	17,500
Transfer from Process I	19,000	Normal Loss	2,000	---	---	---	---	---	---	---	---
		Closing WIP	1,000	100	1,000	70	700	60	600	50	500
		Total	20,500		18,500		18,200		18,100		18,000
		Less Abnormal Gain	500	100	500	100	500	100	500	100	500
	20,000		20,000		18,000		17,700		17,600		17,500

Notes : 1) Cost that is transferred from earlier process is designated as Materials I and materials of this process as Materials II.

2) Normal Loss = 10% of (1000 + 19000).

Statement of Cost

Elements of Cost	Cost Rs.	Equivalent Production Units	Cost per unit Rs.
Materials I :			
Opening WIP	2,000		
Transfer from Process I	58,000		
	60,000		
Less Scrap Value :			
2,000 units @ Rs. 3	6,000		
	54,000	18,000	3
Materials II :			
Opening WIP	4,500		
Added in Process II	84,000		
	88,500	17,700	5
Labour :			
Opening WIP	3,600		
Added in Process II	66,800		
	70,400	17,600	4
Overhead :			
Opening WIP	3,000		
Added in Process II	32,000		
	35,000	17,500	2
			14

Statement of Evaluation

Completed Production	Units	Rate Rs.	Amount Rs.	Total Rs.
Materials I	17,500	3	52,500	
Materials II	17,500	5	87,500	
Labour	17,500	4	70,000	
Overhead	17,500	2	35,000	2,45,000

Abnormal Gain				
Materials I	500	3	1,500	
Materials II	500	5	2,500	
Labour	500	4	2,000	
Overhead	500	2	1,000	7,000
Closing WIP				
Materials I	1,000	3	3,000	
Materials II	700	5	3,500	
Labour	600	4	2,400	
Overhead	500	2	1,000	9,900

Dr. Process II Account Cr.

	Units	Amount Rs.		Units	Amount Rs.
To Opening WIP	1,000	13,100	By Normal Loss	2,000	6,000
To Process I A/c			By Process III A/c		
-- transfer	19,000	58,000	-- transfer	17,500	2,45,000
To Materials		84,000	By Closing WIP	1,000	9,900
To Labour		66,800			
To Overhead		32,000			
To Abnormal Gain A/c	500	7,000			
	20,500	2,60,900		20,500	2,60,900

ii) FIFO Method

This method differs from the earlier method only in respect of dealing with the processing and completion of opening WIP units. Under this method it is assumed that opening WIP units are completed first; so, in conversion of these units into equivalent production units the fact that a part of the production process has been completed in the earlier period and only the residual part has been completed in the current period has to he given effect to. Thus, the costs of the current period (obviously excluding the cost / value of opening WIP brought forward from the earlier period) are to be apportioned amongst the equivalent production units taking into consideration only the percentage of work completed during the current period so far as opening WIP is concerned. The method is demonstrated below using the ***same problem*** as used for Weighted Average Method.

Solution (FIFO Method)

Statement of Equivalent Production

Input		Output		Equivalent Production							
Items	Units	Items	Units	Materials I		Materials II		Labour		Overhead	
				%	Units	%	Units	%	Units	%	Units
Opening WIP	1,000	Opening WIP	1,000	---	---	40	400	60	600	70	700
Transfer from Process I	19,000	Completely processed (17,500–1,000)	16,500	100	16,500	100	16,500	100	16,500	100	16,500
		Normal Loss	2,000	---	---	---	---	---	---	---	---
		Closing WIP	1,000	100	1,000	70	700	60	600	50	500
		Total	20,500		17,500		17,600		17,700		17,700
		Less Abnormal Gain	500	100	500	100	500	100	500	100	500
	20,000		20,000		17,000		17,100		17,200		17,200

Notes **:** 1) Cost that is transferred from earlier process is designated as Materials I and materials of this process as Materials II.

2) Normal Loss = 10% of (1000 + 19000).

Statement of Cost

Elements of Cost	Cost Rs.	Equivalent Production Units	Cost per unit Rs.
Materials I :			
Transfer from Process I	58,000		
Less Scrap Value :			
2,000 units @ Rs. 3	6,000		
	52,000	17,000	3,059
Materials II :			
Added in Process II	84,000	17,100	4,912
Labour :			
Added in Process II	66,800	17,200	3,884
Overhead :			
Added in Process II	32,000	17,200	1,860
			13,715

Statement of Evaluation

	Units	Rate Rs.	Amount Rs.	Total Rs.
Opening WIP :				
Materials II	400	4.912	1,965	
Labour	600	3.884	2,330	
Overhead	700	1.860	1,302	5,597
Completed Production	16,500	13.715	2,26,304*	2,26,304
Abnormal Gain	500	13.715	6,858	6,858
Closing WIP :				
Materials I	1,000	3.059	3,059	
Materials II	700	4.912	3,438	
Labour	600	3.884	2,330	
Overhead	500	1.860	930	9,757

*Figure is adjusted for fraction

Dr. Process II Account Cr.

	Units	Amount Rs.		Units	Amount Rs.
To Opening WIP	1,000	13,100	By Normal Loss	2,000	6,000
To Process I A/c -- transfer	19,000	58,000	By Process III A/c -- transfer	17,500	2,45,001*
To Materials		84,000	By Closing WIP	1,000	9,757
To Labour		66,800			
To Overhead		32,000			
To Abnormal Gain A/c	500	6,858			
	20,500	2,60,758		20,500	2,60,758

Notes **:** Value of Transfer to Process III : Rs.

Opening WIP :	Cost in the previous period	13,100
	Cost in the current period (as per Evaluation Statement)	5,597
Completely processed (as per Evaluation Statement)		2,26,304*
		2,45,001

*Figure is adjusted for fraction.

6.4.7 Simultaneous Production of Different Products

In process industries there may be some processing operations in which two or more different products may be processed simultaneously in the same operation. So, in such cases both the processes and the costs may be common, either in full or in part, for the products getting processed. The products, however, may be different in

terms of volume, size, nature, value, resource consumption, scope for processing after separation, etc. These variations make accounting treatments complex. Before taking up discussion on accounting for costs we must have a clear understanding about a few commonly used terms. These are discussed below.

Joint Product

When two or more products of equal importance are simultaneously produced by a common process or a set of common processes, such products are known as joint products. Importance is judged in terms of value or the objectives of production to the company. For example, in oil refinery, products produced like fuel oil, lubricants, coal tar, paraffin, gasoline, etc., are joint products. Similarly, in dairy industries, milk, butter, cream, cheese, etc., are joint products.

By-Product

When one or more of the products that come out of the common process / es is / are of lesser economic value or incidentally produced (production process being carried out for production of other main product/s), such product/s (other than the main product/s) is/are known as by-product. Examples of by-products may include : saw-dust and off-cuts in saw mills, cow-dung in dairy, bones in meat industry, oil-cakes in oil extraction units, etc.

Co-product

Co-products are similar to joint products but they may not come out of the same operation or from using same raw materials. Common examples may be : chair, table, etc., manufactured in a furniture manufacturing unit. Co-products have more dissimilarities than similarities with the by-products. Common areas being negligible separate discussion on accounting for co-products is avoided.

We have discussed about process gains and losses in earlier section (6.4.4). There we have categorized gains and losses on the basis of ***normality***. For better management and disposal of lost units, we can additionally classify process losses on some other bases. These are discussed below in brief.

Classification on the basis of ***recoverable value*** :

i) ***Waste***

If and when some portion of raw materials is discarded in the production process such that the discarded materials have no realizable value, the materials so discarded are known as wastes. Accounting treatment for waste materials is guided by whether the waste is normal or abnormal. Cost of normal waste is to be absorbed in the cost of good production units while that of abnormal waste is to be transferred to Costing Profit and Loss Account.

ii) ***Scrap***

Materials as discarded in the production process, which are having some recoverable values without further processing, are known as scraps. The scraps are either disposed or reintroduced as raw materials.

There are alternatives of accounting treatment for scrap.

If scraps are of insignificant value the cost of the scraps is ignored i.e., not deducted from the cost of materials introduced; the realized amount, if any, on sale of scrap is treated as other income. The realized amount can alternatively be credited to overhead resulting in reduction in the overhead rate. Yet another alternative to deal with the realized amount is to deduct it from the material cost. On the other hand if cost is identifiable with a particular process and is of significant value, the cost of the scrap is debited to a Scrap Account against a credit to the identified Process Account. Any profit or loss on sale of scrap is transferred to Costing Profit and Loss Account.

Classification on the basis of ***rectifiability*** :

i) ***Defectives***

While the terms 'waste' and 'scrap' are used in relation to raw materials, the terms 'defectives' and 'spoilage' under this classification are generally used in relation to the processed materials towards finished goods. The production units which fail to satisfy the specifications for standard products but which can be re-worked or reconditioned by use of additional raw materials, labour or processing to transform them into standard product or sub-standard product, are known as defectives.

Accounting for defectives essentially means accounting for the cost of rectification. If such defective productions are abnormal, the cost is charged to Costing Profit and Loss Account. If, however, defectives are normal, the cost is ignored and left to be absorbed by good production units. Alternatively, the cost may be treated as overhead-departmental overhead if department responsible for detectives can be identified and general overhead if department cannot be identified. Yet in situations where it is identifiable with a specific job, it is better to charge the cost to the job.

ii) ***Spoilage***

When production units are so damaged during processing that they are not worth-rectification, they are known as spoilage. In case of normal spoilage the cost is either charged to production order account or production overhead account and the realizable amount, if any, is credited to the corresponding account. The cost of abnormal spoilage is charged to Costing Profit and Loss Account.

6.4.8 Accounting for Simultaneously Produced Products

There may be two types of products under simultaneous production : Joint Product and By-Product (co-products are excluded as stated earlier). The issue to be discussed under this section relate to determination of the cost of production of these products. All its problems centre around apportionment of joint costs. Joint cost is the cost incurred jointly for all the products and not identifiable with the individual products. Costs incurred on the products can be separated if they are identifiable with individual product/s and therefore, such costs do not pose any problem. Methods of apportionment may be significantly different depending on whether by-product is also there or not. Accordingly, discussion is taken up under the following two separate heads :

i) Where there is no by-product, and

ii) Where there are both the joint product and the by-product.

i) ***Only Joint Products***

There are a good number of alternative methods that are used for apportioning joint costs. These are discussed below :

1) ***Average Unit Cost Method***

This is the simplest method where the total joint costs are divided by the total number of units produced taking all the joint products into account to determine the average cost per unit. It is needless to mention that under this method all the different joint products are treated alike in terms of costing and pricing. The method, however, fails if the products differ in quality deserving different price attribution or if the products are not measurable in any common unit.

2) ***Physical Unit Method***

Under this method a common physical base like any measure of raw materials (unit, weight, volume, etc.), labour hour, etc., is identified and the total joint costs are divided by the aggregate measure of the common physical unit. It gives us the cost per unit of common physical base. This rate is then applied to determine the cost per unit of the joint products. Finding a common physical base is a precondition which may stand on the way of applying this method.

Example

Joint costs Rs. 50,000

Production data :

Products	Production Units	Labour Hours used
X	1,000	500
Y	2,000	400
Z	2,500	100
		1000

Here, common physical unit is labour hour.

So, joint cost per labour hour = Rs. 50,000/1000 hrs. = Rs. 50.

Joint cost is to be apportioned as shown below :

Products	Share of joint costs Rs.	Production units	Cost per unit Rs.
X	500 hrs. @ Rs. 50 = 25,000	1,000	25
Y	400 hrs. @ Rs. 50 = 20,000	2,000	10
Z	100 hrs. @ Rs. 50 = 5,000	2,500	2

3) *Survey Method*

To obviate the limitation of finding out a common physical unit for the joint products, sometimes a number of such different factors are considered as bases for apportionment of joint costs. Each such factor is assigned point values considering its relative importance with respect to a particular product. We can thus have a point value per unit of each joint product. Joint costs are then apportioned on the basis of aggregate point values.

Example

Joint costs Rs. 68,000

Other information :

Products	Production Units	Point Values Per Unit			
		Raw Materials	Selling Price	Marketing Channels	Total
A	1,000	2	1	3	6
B	2,000	1	2	1	4
C	2,500	2	3	3	8

Apportionment of Joint Costs

Products	Units	Points p.u.	Total Points	Share of Joint Costs Rs.	Cost p.u. Rs.
A	1,000	6	6,000	6,000 × 2 = 12,000	12
B	2,000	4	8,000	8,000 × 2 = 16,000	8
C	2,500	8	20,000	20,000 × 2 = 40,000	16
			34,000		

Note : Share of cost per point : Rs. 68,000 / 34,000 Points = Rs. 2.

4) *Standard Cost Method*

In industries where standard costing is in operation standards may easily be set for each type of joint products; joint costs are apportioned on that basis.

5) *Contribution Margin Method*

This method requires segregation of costs (both pre- and post-separation) into variable and fixed. In effect, it uses marginal costing technique. Unit Contribution for each product is then computed by deducting variable cost from selling price. Thus product wise total contribution can be calculated. Joint costs (pre-separation cost) are apportioned on that basis.

Example

Two products—A and B are produced jointly. Joint costs are : Direct Materials Rs. 20,000, Direct Labour Rs. 6,000, Variable overheads Rs. 4,000, and Fixed overheads Rs. 10,500.

Production and sales data are given below :

Products	Production	Selling Price
	Kgs.	Rs.
A	500	50
B	200	35
C	300	60

Apportion joint costs on the basis of contribution and compute profits for each product.

Solution

	A	B	C	Total
	Rs.	Rs.	Rs.	Rs.
Sales (Weight × Selling Price)	25,000	7,000	18,000	50,000
Less Variable Costs of Rs. 30,000 (20,000 + 6,000 + 4,000) apportioned on the basis of weights of production i.e., (5 : 2 : 3)	15,000	6,000	9,000	30,000
Contribution	10,000	1,000	9,000	20,000
Less Joint Fixed Costs of Rs. 10,500 apportioned on the basis of contributions i.e., (10 : 2 : 9)	5,000	1,000	4,500	10,500
Profit	5,000	NIL	4,500	9,500

6) *Market Value Method*

Under this method joint costs are apportioned in the ratio of market value of the products. So, the joint product with higher market value will bear proportion of joint costs. It is based on the assumption that there is a direct relationship between costs and market values. The method, therefore, fails if the assumed relationship does not hold good. Moreover, collection of market value information before actual selling or precise estimation of market value may pose problem. However, since a product may have different market values at two significant stages of production—at the point of

separation and at the end of further processing—this method has three variants. These are discussed below.

a) Market Value at the Point of Separation

The joint costs are apportioned in proportion to the market value of the products at the point of separation. The method is suitably applied when post-separation processing or other costs are disproportionate.

For example, apportionment of joint costs in the above example will be as shown below :

	A	B	C	Total
	Rs.	Rs.	Rs.	Rs.
Sales	25,000	7,000	18,000	50,000
Less Joint Costs : Rs. 40,500 (20,000 + 6,000 + 4,000) + 10,500) apportioned in the ratio of 25 : 7 : 18)	20,250	5,670	14,580	40,500
Profit	4,750	1,330	3,420	9,500

b) Market Value after further Processing

This method is similar to the earlier method, the only difference being that market value at the end of final processing is to be used as the base for apportionment of joint costs.

c) Net Realisable Value Method

Under this method net realizable values of joint products are obtained by deducting profit margin, selling and distribution expenses and post-separation costs. Joint costs are apportioned in proportion of net realizable values of the products.

ii) Both the Joint Product and the By-product

Various methods of accounting that are in use for apportionment of joint costs in situations where both the joint products and the by-products are produced simultaneously can be divided into two categories : A) *Non-cost Methods*, and B) *Cost Methods*. Some of the methods ignore the by-products to make them bear the burden of any portion of joint costs. Those methods come under the first category. On the other hand, the methods which consider by-products to share some reasonable portion of joint costs fall under the second category. These are discussed below :

A) Non-cost Methods

Other Income Method : Any amount realizable on sale of by-products is treated as 'Other Income'. This method is suitable where the realizable value of by-products is negligible.

Total Sales less Total Costs : Under this method by-products are not considered worth paying attention-neither in terms of their pre-separation costs nor in terms of their sales value. In effect, sales values of by-products are included in the sales values of joint products. Thus, total costs (both pre-and post-separation) are deducted from total sales value to determine net profit.

Total Costs less Sales Value of By-products : Instead of assigning a portion of joint costs on the by-products, the amount of total costs is reduced by the sales values of by-products. The reduced value of total costs is then to be shared only by the joint products.

Total Costs less Sales Value of By-products : Instead of assigning a portion of joint costs on the by-products, the amount of total costs is reduced by the sales values of by-products. The reduced value of total costs is then to be shared only by the joint products.

Two other methods, like *Total Costs less value of by-products after setting off selling and distribution overheads of by-products* and *Total Costs Less net yield of by-products* are in no way different from the present method.

B) Cost Methods

Reverse Cost Method : Under this method a portion of joint costs is to be borne by the by-products. The amount of joint costs to be shared by the by-products is determined by what a particular by-product can bear after allowing an estimated profit margin for the by-product. The method is demonstrated below :

		By-Products		
		A		B
	Rs.	Rs.	Rs.	Rs.
Sales Value		XXX		XXX
Less : Estimated net profit	XXX		XXX	
Selling & Distribution exp.	XXX		XXX	
Post-separation processing costs	XXX	XXX	XXX	XXX
Share of Joint Costs		XXX		XXX

Comparative Price : Sometimes when by-products are of no or negligible value but the by-products are used as raw materials in the same organization, the value of the by-product is determined on the basis of the market value of similar or alternative raw material. The value so determined is credited to the process account resulting in a reduction in the joint costs to be borne by the joint products.

Standard Cost : This is similar to the above method, the only difference being that the value of the by-product that is to be credited to process account is determined on the basis of a predetermined standard.

Treating By-products alike Joint Products : In cases where by-products are also of significant values, they are treated like joint products and any suitable method of those available for apportionment of joint costs amongst the joint products may be applied.

6.4.9 Further Processing Decision or Depth of Processing

Sometimes joint products or by-products may not be profitable at the point of separation but may appear to be so after further processing. Thus a decision situation arises : whether to go for further processing. Decision principle is : *Go for further processing if the incremental revenue is greater than the cost of further processing*.

Problem

The costs of a manufacturing company for a year are as follows :

	Rs.	
Direct Materials	1,30,000	
Direct Wages	70,000	
Production Overheads (100% of D. Wages)	70,000	
Selling and Distribution Overheads	50,000	
Sales during the year are :		
Joint Products : A	1,80,000	
B	1,30,000	
By-Products :	X (5,000 units)	30,000
Y (2,000 units)	40,000	

There is scope for further processing the by-products, which involves combining X with Y in the ratio of 10 : 1 to yield a new product Z with a sale value of Rs. 120 per unit. The following additional costs are to be incurred :

	Per unit of Z
	Rs.
Direct Materials	10
Direct Wages	2

A new plant costing Rs. 40,000, installation cost Rs. 5,000 is to be installed. It will have a scrap value of Rs. 3,000 at the end of its useful life of 10 years. Will you recommend further processing ?

Solution

			Rs.
Sales of possible production of Z : 500 units @ Rs. 120 p.u.			60,000
Less Sales of by-products before processing : (corresponding to production of Z)			
	X : 5,000 units @ Rs. 6	30,000	
	Y : 500 units @ Rs. 20	10,000	40,000
			20,000

Additional costs for production of Z :		
Direct Materials : 500 units @ Rs. 10 p.u.	5,000	
Direct Wages : 500 units @ Rs. 2 p.u.	1,000	
Production Overheads (100% of D. Wages)	1,000	
Depreciation [(40,000 + 5,000 – 3,000)/10 yrs]	4,200	11,200
Additional Profit		8,800

So, further processing and manufacture of Z is recommended.

Note : Manufacturing one unit of Z requires 10 units of X and 1 unit of Y, Although 2000 units of Y are sufficient to manufacture 2000 units of Z, 5000 units of X can produce only 500 units of Z.

6.5 Service Costing

Service costing is a method of costing used in organizations which render services instead of manufacturing goods. Examples include those providing transport services, utility services like hotels, canteens, hospitals, etc., distribution services like gas, electricity, etc., and professional services like accounting services, management consultancy, etc. The services may be exclusively for internal use or for the general public or for both. In any case, ascertainment of service costs is common but the method of allocation of these costs to cost units differs from that adopted in case of manufacturing organizations.

6.5.1 Cost Units in service costing

One of the peculiar features of service costing is that the proportion of fixed cost in the total cost is higher in general and usually the variation in costs is associated with double cost units. That is why composite units like passenger-km, bed-day, kilowatt-hour, etc. are more suitable.

6.5.2 Collection and Classification of Cost

Costs are collected and classified under suitable heads so selected as to facilitated cost control and decision making. Naturally, such classification will vary depending on the nature of the industries. Methods used in two such industries leading to ascertainment of cost per cost unit are discussed below.

6.5.3 Transport Costing

Transport industry covers a wide variety of industries like Road, Air and Water transport. Each of them may again be further divided and subdivided. We take up only Motor Transport for a brief discussion.

Costs and their classification

Motor transport costs are classified into three broad heads mainly on the basis of variability. These are

a) *Operating and running costs* : These are of variable nature and include petrol, oil, grease, etc., wages of driver, conductor, helper, etc., when they are paid on the basis of running time or distance, depreciation, etc.

b) *Maintenance costs* : These are of semi variable type and include tyres and tubes, repairs and paintings, overhauls, etc.

c) *Standing or Fixed costs* : Costs like salary of operating manager, supervisor, etc. Taxes, Insurance, License, Garage rent, Interest on capital, etc.

As in case of Job or Contract Costing, under Motor transport costing too each vehicle is given a separate number. Costs for a vehicle are collected through a Daily Log Sheet maintained by the driver of each vehicle. So, separate Log Sheets are maintained for different vehicles. Each such Log Sheet will bear the number assigned to a particular vehicle; this helps in maintaining and collecting costs for each vehicle separately. Daily Log Sheet is suitably designed to record all necessary information relating to the vehicle, its running and the costs.

Costs so collected from the Daily Log Sheet are then arranged in a Cost Sheet to spread over the appropriate number of cost units. It will give us an average unit cost.

Similar to Motor Transport, cost sheet can be prepared for Boiler House, Canteen, Hospital, Nursing Home, etc. For example, Canteen expenses may include the following :

i) Wages and Salaries,

ii) Provisions like meat, fish, egg, tea, biscuits, etc.

iii) Consumable Stores : cutlery, crockery, cleaning materials, wash clothes, etc.

iv) Services : steam, gas, electricity, etc.

v) Miscellaneous : Rent, Depreciation, Insurance, Maintenance, etc.

Problem

A transport company operates a fleet of lorries. Following information relating to a lorry (No 10) for the month of June 2005 was available :

A) *Operation information* :

Days maintained	30
Days operated	24
Total hours operated	250
Total kilometers covered	2700
Total tonnage carried	216

(4 tonnes load per trip, return journey empty)

B) *Cost information* :

i) Operating costs : Petrol Rs. l,600, Oil Rs. 300, Grease Rs. l50, Driver's wages Rs. 2000, Wages for Khalasi Rs. 1500.

ii) Maintenance costs : Repairs Rs. 650, Tyres Rs. 700, Garage rent Rs. 1000.

iii) Fixed costs : Insurance Rs. 1,500, License, tax, etc. Rs. 1,000, Interests 700, Other overheads Rs. 400.

iv) Capital costs : Acquisition cost Rs. 2,80,000, Residual value at the end of 10 years life Rs. 40,000.

Prepare a cost sheet and a performance statement showing :

a) Cost per day maintained,
b) Cost per day operated,
c) Cost per kilometer,
d) Cost per hour,
e) Cost per commercial tonne-km.

Solution

……. Transport Company Ltd.
Cost Sheet for the month of June 2005

	For the month (4,800 ton-km) Rs.	**Per Tonne-km Rs.**
1. *Operating Costs* :		
Petrol	1,600	0.333
Oil	300	0.063
Grease	150	0.031
Driver's Wages	2,000	0.417
Wages of Khalasi	1,500	0.313
	5,550	1.157
2. *Maintenance Costs* :		
Repairs	650	0.135
Tyres	700	0.146
Garage rent	1,000	0.208
	2,350	0.489
3. *Fixed Costs* :		
Insurance	1,500	
Licence, tax, etc.	1,000	
Interest	700	
Other overheads	400	
Depreciation [2,80,000 – 40,000)/(10 × 12)]	2,000	
	5,600	1,167
4. Total Costs [1 + 2 + 3 + 4]	13,500	2,813

Performance Statement

1.	Days maintained		30
	Total cost (Rs.)		13,500
	(a) Cost per day maintained (Rs.)	(13,500/30)	450
2.	Days operated		24
	(b) Cost per day operated (Rs.) (13,500/24)		563
3.	Idle days (30–24)		6
4.	Total kilometers covered		2,700
	(c) Cost per kilometer (Rs.)	(13,500/2700)	5
5.	Total hours operated		250
	(d) Cost per hour (13,500/250) (Rs.)		54
6.	Total number of trips [216 tonnes/4 tons per trip]		54
7.	Total Ton-kilometer per month (2700 km/54 trips)		
	[50 kms × 4 tons × 24 days]		4,800
	(e) Cost per commercial ton-km (Rs.) [13,500/4,800]		2,813

6.6 Select Readings

Banerjee, B., *Cost Accounting*, World Press Pvt. Ltd.

Lal, Jawahar, *Cost Accounting*, Tata Mc Graw Hill Publishing Co. Ltd.

Wheldon, *Cost Accounting*, ELBS

6.7 Questions

(a) Long answer type

1. What are the main features of Job Order Costing? Describe how costs of a job are collected for recording in Job Cost Card.
2. What is meant by 'Equivalent Production'? How is it computed? Illustrate your answer with reference to the methods which are in common use.
3. Explain the distinction between Joint Product, By-product and Co-product. Give an outline of any four methods of valuing and costing by-products, selecting two methods from each of the 'non-cost' and 'cost' methods of accounting for by-products.

4. i) "The more kilometers you travel with your own vehicle, the cheaper it becomes."— Comment briefly on this statement.

ii) What records should a Transport Company maintain in respect of each vehicle to determine cost per unit of services rendered? Draw up a Cost Sheet of such a company assuming your own figures.

(b) Short answer type

i) Specify some industries where job costing can be suitably applied.

ii) Distinguish between normal loss and abnormal loss.

iii) How is opening work-in-progress handled in process costing?

iv) How can the income from the sale of by-products be shown in the income statement?

v) What is 'operating cost'?

vi) What is 'composite unit'? Give a list of six such units indicating the industries in which these are used.

(c) Objective type

x. i) A job cost sheet prepared on the basis of estimated cost is more useful than that prepared on the basis of actual costs.

ii) Main product of one industry can never be the by-product of another industry.

iii) Production completed and on hand in one processing department can still be treated as work-in-progress.

iv) The output of one process, which needs further processing in the next process, is to be transferred only at cost.

v) The method of costing to be used by a gas distributing company is operating costing.

y. *Fill in the blanks* :

i) The value of normal material wastage for a particular job is not to be charged to the _____ separately.

ii) The _____ Department prepares production order which acts as an authorization to start work on the job.

iii) In case of abnormal gain in process costing, _____ A/C is credited for loss of income from sale of normal loss units.

iv) The industries which render services must use _____ costing.

v) The products of insignificant value, produced simultaneously from same raw material are known as _____ .

(d) Hints for solutions *(for objective type questions)*

x. (i) True, (ii) False, (iii) True, (iv) False, (v) True.

y. (i) job, (ii) Production Control, (iii) Normal Loss, (iv) operating, (v) By-products.

Unit 7 □ Marginal Costing : Conceptual Aspects

Structure

7.1 Introduction

Marginal costing has been defined earlier. Under this method of costing only variable costs are charged to cost units i.e., these are deducted from the revenues earned by selling the product. It thus leaves an amount known as *contribution*. A *contribution pool* is created by aggregating the product contributions. The fixed costs attributable to the *period concerned* (since it is not identifiable to the products) are then written off against this combined contribution pool; the residue, if any, is considered to be the profit.

7.2 Concepts of Marginal Cost and Marginal Costing

Marginal Cost : Marginal cost is the change (increase or decrease) in the total cost consequent to a unit change (increase or decrease) in the volume of production. This is the economists' interpretation of marginal cost. According to the accountants, marginal cost is the variable cost for one unit of a product or service. The two views

are essentially the same. Because it is nothing but the variable cost that accounts for the change in the aggregate cost for a unit change in the volume of production. Within a given range of production (as may be set by the installed production capacity) fixed cost remains constant despite changes in the volume of production. Hence, in the short run during which production capacity (created by fixed costs) is not likely to undergo a change, fixed costs are not therefore considered relevant in decision making; only the variable or marginal costs are relevant.

Marginal Costing : Marginal costing is the technique of ascertaining marginal cost by differentiating between fixed and variable costs; it also studies the effect of changes in the volume and type of product on profit. As stated earlier, only the variable costs are traceable to the product and are, therefore, considered as *Product Costs*. The fixed costs incurred for providing production infrastructure based on policy decision are traceable to the period of production, not to the product directly, are thus known as *Period Costs*. Such fixed costs are periodically charged to periodical (annual) Costing Profit & Loss Account. Variable costs are also included in cost of sales in the Costing Profit & Loss Account.

7.3 Semi-variable Costs

Though only fixed and variable costs are recognized, in practice we may very often come across some costs which are neither 'fixed' nor 'variable'. These are rather partly fixed and partly variable and are known as 'semi-variable' costs. Variation in the amount of these costs (consequent to the changes in the volume of production) is not in proportion to the changes in the volume of production. In effect, each item of these costs contains both the fixed and the variable components. Examples of such costs may include Depreciation, Repairs and Maintenance, Supervision cost. Telephone charges. Electricity charges (when consumption exceeds a particular slab), etc.

7.4 Segregation of Semi-variable Costs

Since marginal costing technique considers only the variable costs as the product costs and since semi-variable costs contain variable components in them, identification of the variable portion (consequently of the fixed portion also) in the semi-variable costs becomes necessary. If this variable portion is not identified and not included in the product cost, the determination of the product cost under marginal costing technique will be vitiated. Accurate product cost determination depends on accurate segregation of semi-variable costs into fixed and variable components. So, we have to deal with different methods of segregation of semi-variable costs.

7.5 Methods of Segregation

There are a number of different methods for segregating semi-variable costs into Fixed and variable components. The major ones are :

i) Comparison method,

ii) Range or High and Low Points method,

iii) Simultaneous Equation method,

iv) Least Square method,

v) Averaging method,

vi) Graphical method,

The major methods are discussed below in brief.

i) Comparison method

Under this method, a comparison of past semi-variable costs either of two periods or of two levels of activities is made. The difference between those two semi-variable costs is attributed to the corresponding variation in the output. So, variable cost per unit can then be easily computed by the following formula :

Variable cost per unit = (Difference in semi-variable costs) / (Difference in output).

This rate if applied on either of the output levels gives us the total variable cost for that level of output. We get the fixed cost by deducing it from the total semi-variable cost.

ii) Range or High and Low Points method

This is similar to the Comparison method; the only difference is that instead of comparing costs of any two levels the highest and the lowest costs during a given period are compared. The difference between those two costs is related to the difference in the corresponding outputs. The same formula as in the earlier method will give us the variable cost per unit of output.

iii) Simultaneous Equation method

In this method it is assumed that there exists a linear relationship between costs (both fixed and variable) and output. Thus, the following straight line equation can be fitted for every semi-variable cost for a given level of output :

$y = mx + c$, where y = total semi-variable cost,
m = variable cost per unit,
x = volume of output (no. of units), and c = fixed cost.

Two such equations representing relevant data for only two levels of production will enable us to easily compute the values of m and c. It may be mentioned that for a given level of output the values of x and y are known.

iv) Least Squares method

This method uses regression analysis (a statistical technique) for finding out a straight line of 'best fit' from out of a number of observations. To fit a straight line trend, we have to solve the following two normal equations :

$$\Sigma y \; n.c + m\Sigma x \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$\Sigma xy = c\Sigma x + m\Sigma x^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where n is the number of observations and all other notations have the same meanings as mentioned in the above simultaneous equation method [(iii)]. By solving equations (1) and (2), the values of m and c are determined.

v) Averaging method

Under this method average figures of output and costs of two selected groups are compared. The differences in output and costs are then used to segregate the variable and fixed portions.

Illustration

Groups	Average Output (units)	Average Cost (Rs.)
First Quarter	2000	21,200
Third Quarter	2250	22,700
Difference	250	1,500

Variable cost = Rs. 1,500/250 units = Rs. 6 per unit.

Fixed cost (taking cost figure of First Quarter) :

Rs. [21,200 – (2,000 × 6)] = Rs. 9,200.

vi) Graphical method

This method is also known as regression line method. This is similar to the least squares method but instead of using statistical technique graphical technique is used to segregate the variable and fixed elements. The steps involved are :

a) Outputs at different levels are represented on x-axis and costs on y-axis.

b) Each point representing a particular output and its corresponding cost is plotted on the graph. Abnormal cost, if any, for a particular output is ignored.

c) A line is so drawn through the plotted points that there remains more or less equal number of points on either side of the line. This is known as the line of best fit and it is also the total cost line.

d) The 'line of best fit' is extended to the y-axis. The point at which the line intersects the y-axis indicates the fixed cost element.

e) A line parallel to the x-axis is drawn through the point of intersection [as mentioned in (d)]. This is fixed cost line.

f) Any vertical line drawn through any point on x-axis representing a particular level of output will intersect the total cost line and the fixed cost line at two different points. The point of intersection with the total cost line will indicate the total cost for that level of output. The difference between the total cost and the fixed cost [as indicated in (d) above] will give us the variable cost for that particular level of output.

g) Variable cost when divided by the number of units will determine the variable cost.

7.6 Ascertainment of Marginal Cost

Marginal cost consists of all direct costs (or the prime cost) plus indirect variable costs. Direct costs include direct materials, direct labour and direct expense. Since direct cost is constant per unit it is very easy to ascertain all direct costs from the past data. If, however, the firm is new having no past data, the detailed budget of the firm may provide necessary information. Indirect variable costs include the segregated variable portion of the semi-variable cost. Indirect variable cost can also be ascertained from the budgeted figures. The basic source documents are : Material Requisition Note for direct and indirect material costs. Job Cards or Wage Analysis sheet for direct and indirect labour and Expense Analysis Sheet for expenses.

7.7 Concept of Profit under Marginal Costing

As stated at the outset, only marginal or variable costs are recognized as *'product cost'* under marginal costing. Since profit is the excess of revenues over cost, 'product profit' under marginal costing is the excess of sales value of a product over the 'product cost'; 'product profit' is technically known as 'contribution'. Thus, fixed costs are kept outside the scope of product cost. However, fixed costs are to be deducted from the aggregate contribution of all the products in a firm to derive *'business profit'*. So, fixed costs are treated as 'business costs' rather than being treated as 'product costs'. The logic behind assumption of this concept of profit is that a business cannot

make profit by just producing one unit of a product; rather it earns profit from out of the sum total of the activities undertaken during a period. It is illogical to think of arranging just that much of production facility (which involves fixed costs) as may be necessary for producing only one unit of a product as the proportionate share of fixed cost for a unit can command. For example, we can not buy a part of a machine or a part of the machine can not be used for manufacturing one unit of a product.

What has been described above regarding the concept of profit under marginal costing is different from that under absorption costing. Since only marginal costs are treated as product costs under marginal costing, the closing stocks, if any, of finished goods and work-in-progress are not attributed with any element of fixed cost. So, effectively there is no chance of carrying over any portion of fixed cost to the next period. In fact, the entire amount of fixed cost for a given period is deducted from the contribution pool to arrive at the business profit for the period concerned; this is irrespective of whether the entire production of the period is sold out during the same period or a portion is carried over to the next period. On the contrary, fixed cost is included in the product cost under absorption costing. Consequently, a proportionate share of fixed cost is included in the value of closing stock (either of finished goods or of work-in-progress) and carried over to the next period.

7.8 Break-Even Analysis

Break-even is a profitability position of a firm at which the total cost is equal to its total revenue and the profit/loss is, therefore, zero. It is also known as 'no-profit, no-loss' position of a firm. The profit is a function of revenues and costs while both the revenues and the costs depend on the volume of production and sales. So, there is a close interrelationship between cost, volume and profit. Break-even analysis is the study of this interrelationship at various levels of activity. The interrelationship can be presented in the form of the following equation known as the Marginal Cost Equation :

$$S - V = C$$

where S = Sales, V = Variable or marginal cost, and C = Contribution.

Again, P = C – F or, C = F + P, where P = Profit and F = Fixed cost.

So, Break-even point (BEP) [in sales value]

= (Fixed Cost/Total Contribution) × Total Sales

BEP (in units)

= BEP (in sales value)/Selling price.

- **Profit-Volume Ratio**

Profit-volume Ratio, popularly known as P/V Ratio, is simply the ratio of Contribution (for profit) to Sales (for volume). That is—

P/V Ratio = Contribution/Sales
= Change in Contribution/Change in Sales
= Change in Profit (or Loss)/Change in Sales.

P/V ratio, usually expressed in percentage, is an important measure of profitability. A high P/V ratio indicates high profitability and vice-versa. The ratio can be used to compute BEP. Other uses of P/V ratio include determination of profit or loss at a given level of sales, sales volume needed to earn a given amount of profit, sales needed to maintain profit at a given level when selling price changes, etc. The above formulae of P/V ratio can be used to find out ways and means of improving the ratio and thereby the profitability. For example, P/V ratio can be improved by increasing selling price, reducing variable cost and by changing the sales mix by providing for increasing sales of more profitable products.

- **Break-Even Chart (BEC)**

A Break-even chart is the graphical presentation of the marginal costing information. The chart shows all the information relating to fixed cost, variable cost, sales, and profit/loss at different levels of activities. Resultantly, it also shows the Break-even point. Margin of Safety and Angle of Incidence (the last two terms will be discussed herein after). For construction of a BEC, certain assumptions are to be made. These are stated below :

i) Selling price remains constant for all volumes of sales; otherwise sales line cannot be shown as a straight line.
ii) Fixed cost does not change i.e., the component costs constituting Fixed cost do not undergo any change throughout the different levels of activities.
iii) Variable costs are truly variable.
iv) Semi-variable costs can be segregated into fixed and variable components.
v) Volume of production and sales are equal.
vi) Volume is the only factor which is having influence on costs. In other words, other factors like operating efficiency, production method, product-mix, etc. which may have their influence on cost, are assumed to remain unchanged.

Construction of a BEC

The following procedure is to be followed for construction of a BEC :

i) Costs and revenues are represented along the vertical axis of the graph.
ii) Levels of activities or volumes (in units) are represented along the horizontal axis.

iii) Fixed cost line representing a fixed amount for all the levels is drawn parallel to the x-axis.

iv) Variable cost line is drawn over fixed cost line so that it takes the form of total cost line. In effect, total costs for different levels of activities (starting with total cost being equal to fixed cost at zero level) are plotted to draw this line.

v) Sales line is similarly drawn by connecting the plotted points representing sales values of different volumes of sales. The line will pass through the origin since sales value is zero at zero level of activity.

vi) The point at which sales line intersects with the total cost line is the BEP.

vii) The perpendicular from BEP drawn on x-axis will indicate BEP in units or levels of activity. It is the horizontal distance along x-axis between the origin and the perpendicular line. Similarly, the vertical distance along y-axis between the origin and the perpendicular line (drawn from BEP on y-axis) will indicate BEP in sales value.

viii) The angle formed between the total cost line and the sales line is known as *Angle of Incidence*.

ix) The break-even chart also shows the *Margin of Safety* — the difference between existing sales and the break-even sales.

A typical BEC (not drawn to scale) is shown below :

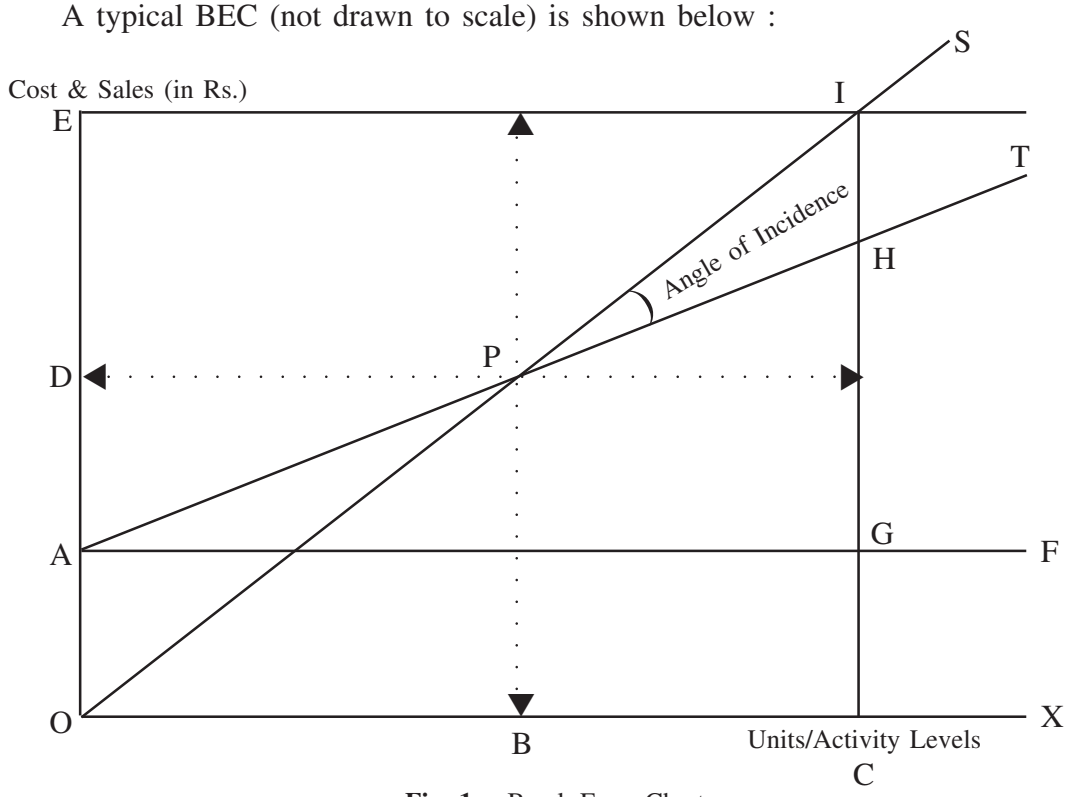


Fig. 1. : Break-Even Chart

Interpretation of the BEC :

i) AF is the Fixed Cost line.

ii) AT is the Total Cost (Variable Cost plus Fixed Cost) line.

iii) OS is the Sales line.

iv) P, the point of intersection between OS and AT, is the BEP. OB is the BEP in terms of units or levels of activities and OD is BEP in sales value.

v) The angle SPT, the angle formed between Total Cost line and Sales line is the Angle of Incidence.

vi) I is any point above BEP on Sales line. It represents sales volume of OC (or EI) and a corresponding sales value of OE (or CI).

vii) Different costs and profit for a sales volume of OC :

CH = Total Cost, GH = Variable Cost, CG = Fixed Cost, HI = Profit.

viii) BC and DE are the Margin of Safety in volumes and value respectively.

- **Margin of Safety**

As stated earlier, it is the excess of actual sales over BEP sales. Thus,

Margin of Safety (M/S) = Actual Sales – BEP Sales; M/S is usually expressed as a percentage of actual sales, i.e.,

$$M/S = [(\text{Actual Sales} - \text{BEP Sales})/\text{Actual Sales}] \times 100.$$

M/S can also be computed by applying P/V ratio :

$$M/S = \text{Profit} / (\text{P/V Ratio}).$$

Margin of Safety is used as an indicator of the soundness or strength of a business. A high M/S of say 60% may indicate that the business remains in safe position even if the sales go down by more than 50%. A low M/S, on the other hand, gives us a signal to take care of improving M/S to avoid imminent danger from the slightest deterioration in sales. The following measures may be taken to improve the M/S :

i) Increasing the selling price,

ii) Increasing the level of activity / sales,

iii) Lowering BEP by reducing costs-fixed and/or variable,

iv) Changing product-mix by substituting existing product/s by higher-contribution product/s.

- **Angle of Incidence**

As stated earlier, it is the angle formed between the Sales line and the Total Cost line above BEP. Angle of Incidence is an indicator of *profit earning capacity*. A larger

angle of incidence indicates profit earning capacity at higher rate. It may be mentioned that angle of incidence can only be visualized in the graph : we can not compute it by applying any formula.

- **Profit Chart or Profit/Volume Graph**

Sometimes, a BEC is simplified by avoiding cost lines. Only profits/losses corresponding to sales at different levels are shown in *P/V Graph* or what is known as a *Profit Chart* (see Fig. 2). Profits and Losses are represented along the vertical axis – profits are represented along that portion of the vertical axis which is above the zero level and the losses below it. Sales values are represented along the horizontal axis. The profits and losses at different sales levels are plotted on the graph and the points are connected by the line known as Profit/Loss line. The point at which Profit/Loss Line intersects with the Sales Line is the BEP. The portion along vertical axis below zero level that is used to represent losses can also be used to represent fixed cost; the logic may be like this that loss is that portion of fixed cost which remains uncovered by the contribution from sales effected. The Profit/Loss Chart can then be used to show the effects of different amounts of fixed cost on BEP, profits/losses, and on M/S. The Chart is also used to show similar effects of varying selling prices.

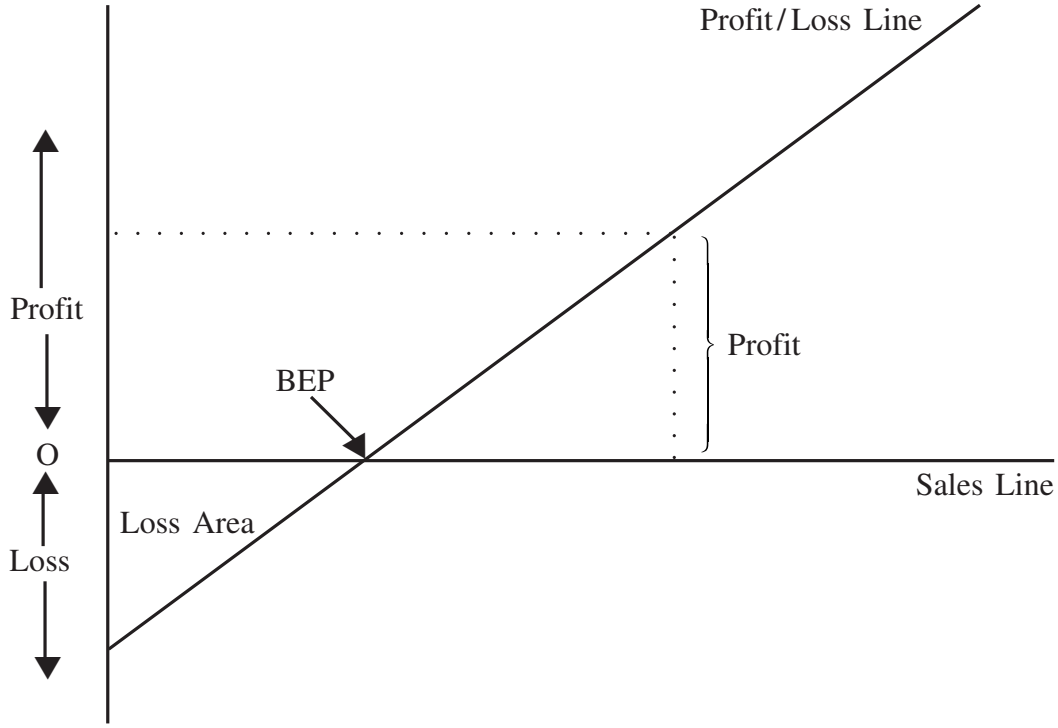


Fig. 2. : Profit/Loss Chart

Different Types of BE Chart

The common BE Chart as has been demonstrated above can be slightly modified so as to suit a specific purpose. There may be a number of such modifications to suit a number of different purposes. These are :

i) Detailed BE Chart,

ii) Cash BE Chart, and

iii) Control BE Chart.

Detailed BE Chart

In this chart, different components of variable costs (like direct materials, direct labour, etc.) are shown in the graph separately. So, there will be a number of variable cost lines – one line drawn above the other (on the basis of cumulative costs). Similar detailing may be made in case of appropriation of profit. The chart which details appropriations of profit (for taxes, dividends, reserves, etc.) is known as *Profit Appropriation BE Chart*. Such detailed BE Chart is very much useful for various managerial decision making and control actions. The basic principles of drawing a break-even chart, however, remain the same.

Figure 3 shows a cash break-even chart and Figure 4, a control break-even chart.

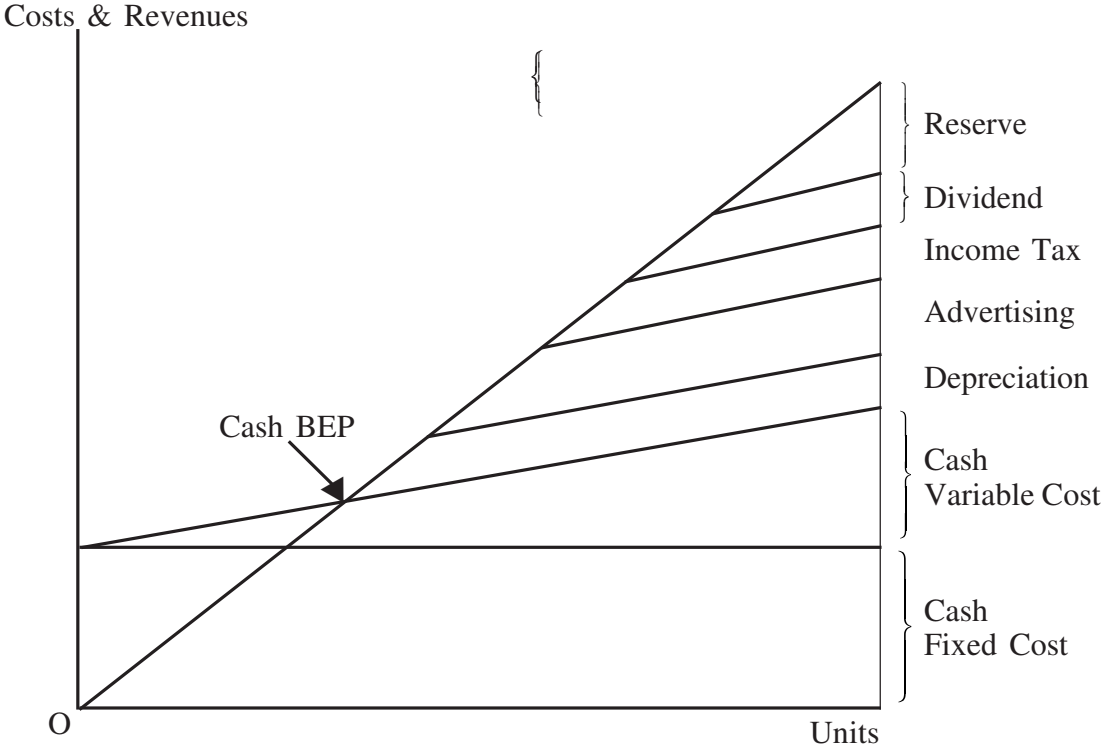


Fig. 3. : Cash BE Chart

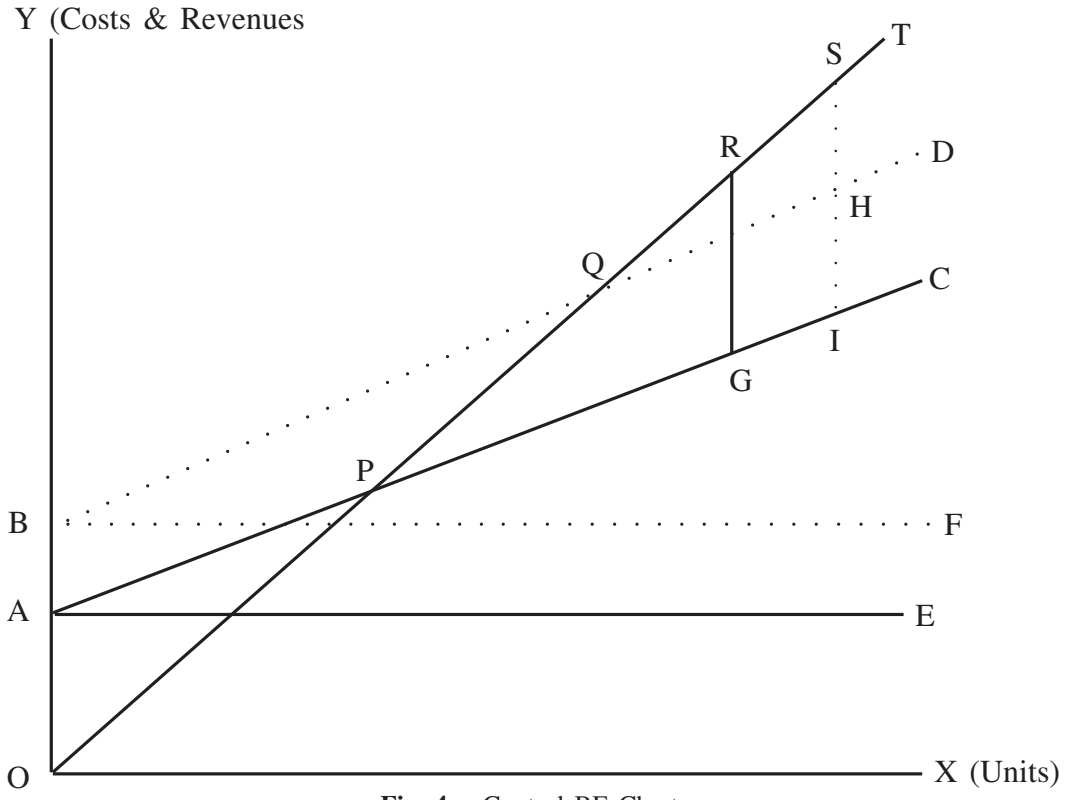


Fig. 4. : Control BE Chart

Abbreviations used

AE = Budgeted Fixed Cost		BF = Actual Fixed Cost
AC = Budgeted Total Cost Line		BD = Actual Total Cost Line
OT = Sales Line	Q = Actual BEP	P = Budgeted BEP
S = Acutal Sale	R = Budgeted Sale	SH = Actual Profit
RG = Budgeted Profit	HI = Profit Variance	

Both cash and control break-even charts serve many useful purposes. For a firm running short of cash position, cash break-even Chart gives important information on cash position relative to various levels of activities. Hence, it facilitates cash management. Control break-even chart, by showing details of budgeted and actual figures, helps management control on costs and revenues.

7.9 Advantages of Marginal Costing

The advantages of marginal costing are :

i) It is simple to understand and operate. There is no complexity involving allocation, apportionment and absorption of overheads; no adjustment is, therefore, necessary for under- or over-absorption of overhead.

ii) The BE Chart (with its different variants) can help management to readily visualize the effects on profits of various changing factors like selling price, variable as well as fixed costs, volume of sales, etc. It thus helps the management in taking quick and right decisions very easily.

iii) Closing stock valuation at marginal cost avoids so-called illogical carry forward of a portion of current period's fixed cost to the next period.

iv) Marginal costing is considered to be a flexible technique in the sense that it can be operated along with other techniques of control like budgetary control and standard costing.

7.10 Limitations of Marginal Costing

Marginal costing suffers from the following limitations :

i) Only fixed and variable costs are recognized under marginal costing. When segregation of semi-variable costs involves difficulty leading to approximation of costs, the reliability of cost data becomes questionable.

ii) Some of the assumptions for a BE Chart do not conform to reality. Sometimes the BE Chart may also show a confusing multiple BEPs.

iii) Exclusion of fixed cost for the purpose of valuation of closing stock is also criticized by some authors on the ground that fixed cost is also a real cost necessary to manufacture product and so the product should bear a legitimate portion of fixed cost.

iv) Marginal costing technique is not suitable for application in case of Contract Working where high volume of work-in-progress is a common feature. Valuing Work-in-progress at marginal cost only will result in loss every year and profit only on completion of contract.

v) It helps in control by comparison only; it fails to provide a yardstick for control.

7.11 Computation of Break-Even Analysis and Margin of Safety

Problem 1

ABC Co. Ltd. has prepared the following budget estimates for the year 2005-06 :

Sales units	10,000
Fixed Cost	Rs. 40,000
Sales Value	Rs. 1,20,000
Variable Cost	Rs. 6 per unit

Required :

i) Find the P/V Ratio, Break-even Point, and Margin of Safety;

ii) Calculate the revised P/V Ratio, Break-even Point, and Margin of Safety and show the effects on them in each of the following cases :

a) 10% decrease in selling price,

b) 10% increase in sales volume,

c) 10% increase in variable cost, and

d) Rs. 10,000 increase in fixed cost.

Solution 1

Present selling price = Rs. 1,20,000/10,000 units = Rs. 12 per unit

Contribution = Selling price – Variable Cost per unit = Rs. (12 – 6) = Rs. 6 per unit

i) P/V Ratio = (Contribution per unit/Selling price) × 100 = (6/12) × 100 = 50%

Break-even Point = Fixed Cost/(P/V) Ratio = Rs. 40,000/0.5 = Rs. 80,000

Margin of Safety = Actual Sales – BE Sales = Rs. (1,20,000 – 80,000) = Rs. 40,000

ii) Revised figures and the effects

Particulars	**Alternatives**			
	(a)	**(b)**	**(c)**	**(d)**
Selling Price (Rs.)	10.80	12.00	12.00	12.00
Variable Cost p.u. (Rs.)	6.00	6.00	6.60	6.00
Contribution p.u. (Rs.)	4.80	6.00	5.40	6.00
P/V Ratio (%) [(C/S × 100)]	44.44	50.00	45.00	50.00
Effect	declined	No effect	Declined	No effect
Fixed Cost (Rs.)	40,000	40,000	40,000	50,000
Break-even Point (Rs.) [FC/(P/V) Ratio]	[(40,000 × 10.8)/4.8] = 90,000	[(40,000 × 12.0)/6.0] = 80,000	[(40,000 × 12.0)/5.4] = 88,889	[(50,000 × 12.0)/6.0] = 1,00,000
Effect	Increased	No effect	Increased	Increased
Sales Volume (Units)	10,000	11,000	10,000	10,000
Totol Sales (Rs.) (Volume × Price)	1,08,000	1,32,000	1,20,000	1,20,000
Margin of Safety (Rs.) (Total Sales – BE Sales)	18,000	52,000	31,111	20,000
Effect	Declined	Increased	Declined	Declined

Note : Students may find out the effect in quantitative term and express in percentage form.

Problem 2

Following figures are available from the records of XYZ Co. Ltd. as on 31st March—

	2004	2005
Sales	Rs. 2,00,000	Rs. 2,50,000
Profit	Rs. 40,000	Rs. 60,000

Calculate :

a) P/V ratio and fixed cost,
b) Break-even sales,
c) Required sales for a profit of Rs. 1,00,000,
d) Profit or loss if sales were Rs. 3,00,000.

Solution 2

(a) P/V Ratio = [(Change in Profit)/(Change in Sales)] × 100
= Rs. (60,000 – 40,000)/Rs. (2,50,000 – 2,00,000) × 100
= (Rs. 20,000/Rs. 50,000) × 100
= 40%

Fixed Cost = Contribution – Profit
= (P/V Ratio × Sales) – Profit

For 2004 : (40% × Rs. 2,00,000) – Rs. 40,000
= Rs. 40,000.

For 2005 : (40% × Rs. 2,50,000) – Rs. 60,000
= Rs. 40,000

(b) Break-even Sales = Fixed Cost/P/V Ratio
= Rs. 40,000/40% = Rs. 1,00,000.

(c) *Required sales for a profit of Rs. 1,00,000*

Desired profit = Rs. 1,00,000

Fixed cost = Rs. 40,000

Required contribution = Fixed cost + Required Profit
= Rs. 40,000 + Rs. 1,00,000 = Rs. 1,40,000

Required Sales = Required Contribution/P/V Ratio
= Rs. 1,40,000/40% = Rs. 3,50,000

(d) *Profit/Loss if sales were Rs. 3,00,000*

Profit/Loss (–) = Contribution – Fixed Cost
= Sales × P/V Ratio – Fixed Cost
= Rs. 3,00,000 × 40% – Rs. 40,000
= Rs. 1,20,000 – Rs. 40,000
= Rs. 80,000.

Problem 3

A firm which deals in a single product is having the following expenses and revenues :

	Per Unit Rs.
Selling Price	50.00
Variable Cost	27.50
Salesmen's Commission	2.50
Total Variable Cost	30.00

Annual fixed expenses are :-	Rs.
Rent	72,000
Salaries	3,00,000
Advertising	1,00,000
Other fixed expenses	28,000
	5,00,000

Required :

(a) Calculate break-even point both in units and in value.

(b) Determine the profit or loss if 30,000 units of the product are sold.

(c) Calculate break-even point if selling price is reduced by 10%, sales commission is discontinued, and salesman are offered with an additional fixed annual salary of Rs. 60,000.

(d) Calculate the amount of net profit for an annual sale of 40,000 units of the product and the manager is paid commission @ 20 paise per unit on all sales in excess of break-even sales.

Solution 3

(a) Selling Price Rs. 50

Variable cost p.u. Rs. 30

Contribution p.u. = Rs. (50 – 30) = Rs. 20

Total fixed cost Rs. 5,00,000.

Break-even point (in units) = Fixed Cost / Contribution p.u.

= Rs. 5,00,000 / Rs. 20 p.u.

= 25,000 units.

Break-even point (in value) = Break-even units × Selling price

= 25,000 units × Rs. 50 p.u.

= Rs. 12,50,000.

(b) Profit\Loss when sales volume is 30,000 units

Sales volume 30,000 units

Sales value = 30,000 units × Rs. 50 p.u.

= Rs. 15,00,000.

P\V Ratio = (Contribution\Sales) × 100

= (Rs. 20\Rs. 50) × 100 = 40%.

Contribution for a sales value of Rs. 15,00,000

= Rs. 15,00,000 × 40% = Rs. 6,00,000.

Profit\Loss (–) = Contribution – Fixed Cost

= Rs. (6,00,000 – 5,00,000) = Rs. 1,00,000.

(c) Revised BEP

Revised selling price = Rs. 50 – 10% of Rs. 50 = Rs. 45

Revised variable cost p.u. = Rs. (30.00 – 2.50) = Rs. 27.50

Revised Contribution p.u. = Rs. (45.00 – 27.50) = Rs. 17.50

Revised fixed cost = Rs. (5,00,000 + 1,60,000) = Rs. 6,60,000

Revised BEP = Revised Fixed Cost\Revised Contribution p.u.

= Rs. 5,60,000\Rs. 17.50 p.u. = 32,000 units.

(d) Profit\Loss

Existing BEP (in units) = 25,000 units [as in (a) above]

Proposed sales target = 40,000 units

Excess sale above BEP = (40,000 – 25,000) units = 15,000 units

Revenue from excess sale above BEP

= 15,000 units × Rs. 50 p.u. = Rs. 7,50,000

Total Variable Cost for this excess sale

= 15,000 units × Rs. 30.20 = Rs. 4,53,000

Net Profit = Rs. (7,50,000 – 4,53,000) = Rs. 2,97,000.

7.12 Select Readings

Banerjee, B., Cost Accounting, World Press Pvt. Ltd.

Lal, Jawahar, Cost Accounting, Tata Mc Graw Hill Publishing Co.Ltd.

Horngren, Foster and Datar, Cost Accounting—A Management Emphasis, Prentice Hall

7.13 Sample Questions

a) Long answer type

1. How can you prepare a multi-product break-even chart ? What are the basic assumptions in a break-even chart ?
2. Major distinction between marginal costing and absorption costing is manifested in the valuation of closing stocks. Explain the differences between the two methods in the light of the above statement.

b) Short answer type

1. Write short notes on the following :

   i) P/V Ratio, ii) Margin of Safety, iii) Importance of contribution in marginal costing, iv) Irrelevance of fixed cost in product costing under marginal costing technique, v) Advantages of break-even analysis.
2. Answer the following :
   i) How does a P/V Chart differ from a Break-even chart ?
   ii) Why is it necessary to segregate semi-variable costs into fixed and variable elements ?

c) Objective type

1. Answer the following :
   i) Is there any difference between P/V Ratio and Marginal Income Ratio ?
   ii) Can Angle of Incidence be computed ?
   iii) Can fixed cost be included in marginal cost ?
   iv) Can there be more than one break-even point of a firm ?
   v) Can marginal costing provide any yardstick for control purpose ?
2. Fill in the blanks :
   i) At BEP, total contribution equals total ---------- costs.
   ii) Break-even analysis assumes that within the relevant range unit ---------- costs remain unchanged.
   iii) Margin of Safety ---------- with the increase in sales volume.
   iv) If profit is 10% and P/V Ratio is 40%, the Margin of Safety is ---------- %.
   v) When production is stopped, the loss equals to ---------- .

7.14 Hints for Solution (for objective type questions only)

1. (i) and (ii) No, (iii) and (iv) Yes, (v) No.
2. (i) Fixed, (ii) Variable, (iii) Increases, (iv) 25%, (v) Fixed Cost.

Unit 8 □ Marginal Costing and Management Decisions

Structure

8.1 Introduction

While the concept and principles of marginal costing have been discussed in the earlier unit, this unit deals with the application of marginal costing technique for various decisions making of the management.

8.2 Decision making using Marginal Costing

All the decision situations the management of a firm has to face may be divided into two categories—*Strategic and Tactical*. Strategic decisions are long term decisions. Long term decision making is usually included in the functions of top level management. Various types of Investment decisions, Product diversification decisions, etc. fall in the category of strategic decision. The concepts and techniques involving time value of money and return on investment *inter alia* do usually play the pivotal roll in those types of long term decision making. Tactical decisions, on the other hand, are short term decisions. The short term decisions are taken by the middle and lower level managers. Despite some of the limitations as mentioned in the earlier unit, marginal costing technique has been in effective use in such short term decision making situations. In fact, all its (marginal costing) supremacies center around its uniqueness in identifying and using the behaviour patterns or the variability characteristic of the costs. Some of

the many tactical decision making situations where marginal costing technique is effectively used are :

i) Introduction of a new product,
ii) Make or buy,
iii) Problems of limiting factors,
iv) Dropping of a product line,
v) Fixation of selling prices,
vi) Selection of a profitable product-mix,
vii) Alternative Courses of action, and
viii) Closing down or suspension of activities.

We, however, take up first four items only.

8.3 Introduction of a New Product

There may be proposal for introduction of a new product to the existing product/s (product diversification). It may be thought of for utilizing the existing unused capacity or resources, capturing a new market or for any other similar purposes. Though such a situation involves a long term decision making, with the objective of temporary utilization of unused capacity and resources, decision making with the help of marginal costing may ease out the problem in the short run.

Decision on such an issue is based on whether the new product can make any contribution towards fixed cost and profit. It is, however, assumed that introduction of the new product does not involve any additional fixed cost. Anyway, if the new product can add to the existing contribution, the introduction is recommended. However, if the new product involves any specific additional fixed cost, the amount of specific fixed cost is also to be deducted from the expected contribution of the proposed new product to determine the additional profit.

Problem 1

You are given the following information in respect of product A produced by a company :

	Rs.
Sales	10,000
Direct materials	4,000
Direct labour	2,000
Variable overhead	1,000
Fixed Overheads	2,000

A new product, product B, is proposed to be introduced to increase sales by Rs. 2,000. The estimated costs are :

Direct materials	Rs. 1,000
Direct Labour	400
Variable Overheads	300

The fixed cost of the company will not change.

Advise management.

Profitability of Product B

Sales		Rs. 2,000	
Less : Marginal Costs :			
	Direct materials	1,000	
	Direct labour	400	
	Prime cost	1,4000	
	Variable overhead	300	1,700
	Contribution		300

Thus, addition of Product B will increase the profit position of the firm by Rs. 300.

8.4 Make or Buy Decision

This is another important decision making situation which management is often confronted with. If a company has idle capacity that can be used for making a product or a component part rather than buying it from the outside market, such a decision situation is called make or buy decision. It may also be referred to as outsourcing or insourcing decision. In such a decision, when variable costs are involved, variable or marginal costs of manufacture are compared with cost of buying it from outside to take a decision. If, however, it involves any additional fixed cost specific to this proposal of manufacturing, that is to be added to the marginal cost of manufacture for comparison with the quoted price. The decision rule is simple : accept the proposal of 'making' if the marginal cost (plus the specific fixed cost, if any) is lower than the quoted price for 'buying'.

Problem 2

Ever Green Ltd. produces a product 'A'. The output in 2004 are 1,20,000 units. The cost sheet based on this product is as under :

	Rs.	Rs.
Selling Price		100
Direct materials	21	
Component 'X'	9	

Direct wages (@ Rs. 4 per hour)	20	
Factory Overheads (50% fixed)	24	
Selling & Dist. Overheads (75% variable)	12	
Administration Overheads (fixed)	4	90
Profit		10

The company at present manufactures component X, one unit for each unit of product A. The cost details for 10,000 units of component X are as under :

	Rs.
Direct materials	24,000
Direct labour	30,000
Variable Overheads	18,000
Fixed Overheads	18,000
Total	90,000

The fixed overheads specific for component X is fixed for any volume of its production. The component X is, however, available for purchase at the market at Rs. 8 each. The company is now considering a proposal to discontinue the manufacturing of component X and instead buy it from the market.

Shall the company make or buy the component ? When :

(a) There is no alternative use of spare capacity;

(b) Spare capacity can be rented at Re. 1 per hour.

Solution 2

a) **When there is no alternative use of spare capacity**

1. Cost of buying component X :	Rs.
(1,20,000 units @ Rs. 8)	9,60,000
2. Cost of making component X :	
Variable costs	
(1,20,000 units @ Rs. 7.20)	8,64,000
Fixed Costs	18,000
	8,82,000

Cost of buying is higher than the cost of making by Rs. (9,60,000 – 8,82,000) or Rs. 78,000. So, making the component in the own factory of the company is recommended.

b) **When spare capacity can be rented**

1. Relevant cost of buying :	Rs.
Cost of buying component X (as above)	9,60,000
Less Savings in specific fixed cost	18,000
	9,42,000

Less	Income from rent of spare capacity [Released labour hour × Hourly rent = 90,000 hours @ Re. 1 per hour]	90,000
		8,52,000
2.	Net or effective cost of making component X (as above)	8,82,000

Relevant cost of buying is lower than the effective cost of making by Rs. 30,000. So, buying the component X from the market is recommended.

Note **:**Released labour hour from spare capacity :

Labour hour for making 10,000 units of X

= (Rs. 30,000 / Rs. 4 per hour) = 7,500

Therefore, released labour hour for not making 1,20,000 units of X

= (7,500 hrs. / 10,000 units) × 1,20,000 units = 90,000 hours.

8.5 Problems of Limiting Factor

Limiting factor is any factor that limits the activities of an entity. This is also known as the *key factor*. Examples of limiting factor are :

i) Low market demand of a product (in terms of quantities and / or value),

ii) Shortage of raw material,

iii) Shortage of the required grade of labour,

iv) Shortage of machine hours etc.

Under normal condition *product selection* decision is guided by the P/V ratio; the guiding principle is—the higher the P/V ratio, the more profitable is the product and vice versa.

But in case of existence of a limiting factor, the firm has to optimise the use of resources which are in short supply to maximise profit or minimise loss. So, the decision regarding the selection of product amongst the alternatives should be guided by the amount of contribution per unit of limiting factor the higher the contribution per unit of limiting factor, the more profitable is the product and vice versa.

When a number of limiting factors becomes operative simultaneously, we have to take the help of linear programming technique to decide on the optimum product- or sales-mix.

Problem 1

Super Quality Ltd. seeks your advice to decide on the most profitable product-mix with their three products : Good, Better and Best. You are supplied with the following information :

Products :	Good	Better	Best
1. Unit Cost data :			
Direct materials (Rs.)	320	240	160
Variable overhead (Rs.)	16	40	24
2. Information on direct labour :			
Dept. A (@ Rs. 8 per hour)	6 hrs.	10 hrs.	5 hrs.
Dept. B (@ Rs. 16 per hour)	6 hrs.	15 hrs.	11 hrs.
3. Annual budget data :			
Annual production (units)	5,000	6,000	10,000
Selling price per unit (Rs.)	624	800	525
Fixed overheads Rs. 16,00,000			
4. Sales Department's estimate of the maximum possible sales in the coming year (units)	6,000	8,000	10,000

Given that there is a constraint on the supply of labour in Department A and its manpower cannot be increased beyond its present level.

i) Suggest the most profitable production and sales mix.

ii) Prepare a statement of profitability on the basis of the product-mix suggested by you.

Solution 3

(i) Determination of the most profitable product mix

Products	Good	Better	Best	Total
1. Labour hours available at present in Dept. A (Production units x Hours p.u.)	30	60	50	140
2. Contribution as above (Rs. '000)	720	1,200	1,250	3,170
3. Contribution per labour hour (Rs.)	24	20	25	---
4. Rank on the basis of Contribution per labour hour (Key factor)	II	III	I	---

To optimise the use of labour hours, available labour hours would be distributed based on the above rank subject, of course, to the overall constraint of market demand. This is shown in the statement that follows.

Products (Rankwise)	Maximum Possible Sales (Units)	Labour Hours in Dept. A			Maximum Production Suggested (Units)
		Balance Available	Required		
			Per Unit	For units in Col. (2)	
(1)	(2)	(3)	(4)	(5)	(6)
Best	10,000	1,40,000	5	50,000	10,000
Good	6,000	90,000[1]	6	36,000	6,000
Better	8,000	54,000[1]	10	80,000	5,400[2]

Notes **:** 1. Balance of Dept. A labour hours available for production of :

Good = (1,40,000 – 50,000) = 90,000 hours

Better = (90,000 – 36,000) = 54,000 hours

2. Maximum Possible Production of Better

= Available hours / Required hours p.u.

= 54,000 / 10 = 5,400 units.

Most profitable production and sales-mix :

Good	6,000 units
Better	5,400 units
Best	10,000 units

(ii) Profitability Statement for suggested production and sales mix

Products	Good	Better	Best	Total
Production / Sales (units)	6,000	5,400	10,000	21,400
Contribution for present production-mix as computed above (Rs. '000)	720	1,200	1,200	3,170
Present Production-mix (Rs. '000)	5	6	10	21
Contribution per unit (Rs.)	144	200	125	---
Contribution for suggested Production-mix (Rs. '000)	864	1,080	1,250	3,194
Fixed Overheads (Rs. '000)				1,600
Profit (Rs. '000)				1,594

8.6 Dropping a Product

Such a decision based on apparent profitability of the products following adsorption costing principle may be misleading. Hence decision should be based on product profitability following contribution concept under marginal costing. A product

remains profitable so long as it has positive contribution. Drop out decision is justified only when a product has negative contribution or when it can be replaced by a more profitable one.

Problem 4

The following is the budget estimate of a company for the year 2004-05 :

Products	A	B
Sales	6,000	16,000
	Rs./Unit	Rs./Unit
Selling price	30	64
Direct materials	12	18
Direct wages @ Re. 1 per hour	8	16
Variable overheads	4	6
Fixed overheads :		
Attributable to the product	2	6
Apportioned General fixed cost	6	6
Total Cost	32	52
Profit/Loss	(–) 2	12

Do you recommend dropping of Product A ? Justify your answer.

	Product A	
	Rs.	Rs. 30
Selling Price		
Less : Managerial costs :		
Direct materials	12	
Direct wages	8	
Variable overheads	4	24
Contribution per unit		6

Loss of contribution if product

A is dropped (Rs. 6 × 6,000) = Rs. 36,000

There will be a savings of specific fixed cost of Rs. 12,000 (6,000 @ Rs. 2). But if product A is dropped, then the entire general fixed cost will have to be borne by product B. Therefore, discontinuing product A will lead to reduction in overall prosition by Rs. 24,000 (i.e. Rs. 36,000 – 12,000). In other words, the position will be as follows :

Present Prosition :

Product B : 16,000 × Rs. 12 = 1,92,000

Product A : 6,000 × (–)2 = (–) 12,000

1,80,000

Less : Net loss		24,000	
If product A is dropped			
Position from product B		1,56,000	

The above statement can be verified from the following :

		Rs.
Contribution from Product B		
(Rs. 64 – 40) × 16,000 =		3,84,000
Less : Specific Fixed cost : 16,000 @ Rs. 6 =	96,000	
General Fixed cost :		
6,000 @ Rs. 6 = 36,000		
16,000 @ Rs. 6 = 96,000	1,32,000	2,28,000
Profit		Rs. 1,56,000

8.7 Select Readings

Banerjee, B., *Cost Accounting*, World Press Pvt. Ltd.

Lal, Jawahar, *Cost Accounting*, Tata Mc Graw Hill Publishing Co.Ltd.

Horngren, Foster and Datar, *Cost Accounting, A Managerial Emphasis*, Prentice Hall

8.8 Sample Questions

a) Long answer type

1. What are the most important areas of management decisions where marginal costing can be applied more suitably and effectively ? Mention the basic points in each of the cases.
2. i) What factors will have to be considered in taking decisions for 'Make or Buy' ?
   ii) For product-mix decisions, what criteria can be used to select products that will maximize net income ?

b) Short answer type

1. i) Under what circumstances a decision to drop a product from the product lines is necessary ?
   ii) Is 'making' a product preferable to 'buying' it from the market when cost is the same in both the cases ?
2. i) Briefly explain the importance of contribution approach in CVP analysis.
   ii) Write a note on 'Key factor'.

c) Objective type

1. **Answer the following :**
   i) Can there be more than one limiting factor at a time ?
   ii) Can the problem with dual limiting factors be tackled by marginal costing technique ?
   iii) Is P/V ratio a suitable criterion for comparing product profitability in the presence of machine capacity as limiting factor ?
   iv) Is fixed cost traceable to a product a relevant cost while taking decision to drop that product ?
   v) Is it so that a product-mix denotes the ratio in which various products are produced and/or sold ?
2. **Fill in the blanks :**
   i) Under total cost method, a loss making or less profitable product may appear to be more-profitable owing to arbitrary apportionment of _____ costs.
   ii) In case one of the resources is in short supply, selection of profitable product should be based on _____ per unit of that resource.
   iii) Limiting factor is also known as _____ factor.
   iv) Loss of _____ from displaced work is the opportunity cost of making a component in the factory.
   v) Tactical decisions are usually _____ term decisions.

8.9 Hints for Solution (for objective type questions only)

(c) 1. (i) and (ii) Yes, (iii) No, (iv) Yes, (v) Yes.

2. (i) fixed, (ii) contribution, (iii) key, (iv) contribution, (v) short.

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