3.1.1. COST : INTRODUCTION :

When a firm decides to produce a commodity, it has to incur certain money expenses on buying and installing machinery, on purchasing the needed raw materials, in wages, etc. It represents the total money outlay which firm has to make in order to attract different factors of production into the business. It includes normally ,

(a) raw material cost,

(b) wages and salaries,

(c) interest on capital invested in business.
(d) rent on building,
(e) depreciation of machinery, building etc.
(f) cost of management,
(g) other miscellaneous and services bought,
(h) taxes etc.

Cost of production includes not only the payments made for goods and services bought, but also the imputed value of factors which a firm uses but does not pay for. For eg. If the owner manager is using his own building for the firm the rent it would have obtained should be included in the estimate of cost of production. Similarly, interest at current rates on capital invested by the entrepreneur in his own building should be included in the cost.

From the point of view of the community as a whole, these money costs plus the imputed value of the owner's factors of production does not tell the whole story. From the society's point of view, the real cost is more important. Real cost represents the exertions which the members of a society have to undergo to produce a commodity. The workers have to put in their efforts, the capitalists have to invest their capital and wait for the regard, the landlords have to forego the use of their property ; only then can the machinery of production be kept in motion., the production of a commodity thus constitutes the real cost of a commodity to be equal to the money cost. The earnings of several factors of production rarely correspond to the respective efforts and sacrifice undergone by them.

3.1.2. COST CONCEPTS :

The cost information presented by ordinary financial accountants may serve legal and financial accountants. But for decision making, the relevant cost concept will be different form the costs reported by financial accounting. Hence, an understanding of the meaning of cost concepts is essential for clear thinking. The data for making these special cost estimates are found in the financial records of the company though sometimes there may be a need for supplementing them by a special collection of data.

Cost concepts differ because of differences in view point. The financial records describe what was, whereas the cost concepts may aim at projecting

what will happen. These special purpose costs differ form 'actual costs' in content as well as in view point.

3.2.1. FIXED AND VARIABLE COSTS :

Costs are placed in two broad categories-fixed and variable. These are also called overhead and prime costs. Some costs vary more or less proportionately upto certain level of output while others are fixed. The former are known as prime or variable costs and the latter as supplementary costs or fixed costs. The fixed costs have to be met with even if the production is stopped temporarily. Rent on factory and office building, interest on capital etc can be cited as examples of fixed costs. The prime costs are on the other hand, variable. They vary with the output. These costs include the cost of raw materials, cost of casual labour, etc. They are incurred only when the factory is at work.

There are many difficulties in classifying the costs into fixed and variable categories. The difference between the two is not as simple as it appears. There are some costs which fall between the two extremes. They are called semi-variable costs. They are not absolutely variable or absolutely fixed.

The distinction between fixed and variable costs is relevant only for a relatively short period. It is only in the short period that the fixed equipment of a firm cannot be varied. In the long run, there is not such limitation. If the output is to be increased to such an extent that the existing stock of machinery is not sufficient, more of it can be acquired, if sufficient time is allowed for. In fact , it is difficult to think of an item whose quantity cannot be varied given sufficient time. New assets can be created and old ones can be scrapped over time.

Thus in the long run no cost item can be classified as a fixed cost. All costs are variable. Indeed, the distinction between the long run and the short run itself is based on the extent of fixity of the various cost items. Short run may be roughly defined as that period over which certain cost commitments remain fixed. This is certainly a rough definition and varies from industry to industry.

Although, there are many difficulties in classifying costs into fixed and variable costs the classification once made, helps in the decision making process. It is very essential to observe the effect of short run changes in the output sold on costs and profits. In the short run, the firm may continue to produce if all its

variable costs are covered, but in the long run, it is very important to see that all the costs are covered by the sales revenue.

3.2.2. OPPORTUNITY COSTS :

Outlay costs refer to the cost outflow made to aquire assets. These are entered in the financial records of the firm. They include actual expenses incurred to hire the factors of production. Opportunity costs on the other hand take the form of revenue from alternative proposals that are foregone by selecting a particular course of action. They are equal to sacrificed alternatives and hence are not recorded in an alternative avenue. They are equal to sacrificed alternative and hence are not recorded in the financial books. However these costs must be considered for decision making. In military affairs, for example, the cost of sending bombers is not the price of ammunition but the damage they would have done the enemy if they had been sent on a different mission.

Opportunity cost concepts is relevant when the supply of a factor is scarce. In business cost estimates are to be made not on the basis of what the firm is doing but on what the firm could have done. Often it is ignored.

3.2.3. OUT-OF-POCKET COSTS AND BOOK COSTS :

Out of pocket expenses refer to costs which require payments to outsiders when the firm purchases an asset or disburses the salaries. This causes an immediate outflow of eash. Book costs are costs which do not require current cost expenditure. The salary of the owner manager is shown as a cost in the books but often it does not involve immediate cost outflow. Similarly, interest on the owner's capital, also is another example of book costs. Depreciation of machinery is again book cost. But in the initial years of purchase, the firm may not need that money and hence cash may remain within the firm. For all practical purposes, the book costs are costs which are to be borne by the firm, but since they do not involve immediate cash outflow, they would not adversely affect the cash position. The output of pocket costs are also known as explicit costs and book costs are called implicit costs or imputed costs. Both implicit and explicit costs are important and should be considered while making decisions. Negligence of implicit costs leads to faulty business decisions. When they are

ignored, to that extent profits are over estimated, a rosy picture will be painted leading to wrong decisions.

3.2.4. REPLACEMENT COSTS AND HISTORICAL COSTS :

Historical costs state the cost of an asset at the price originally paid for it, whereas replacement costs state the prices that would have to be paid currently. Costs which are shown in the conventional financial accounts are based on historical estimates. But during periods of inflation (or deflation) historical costs do not fairly project the cost that is relevant for management decision. If the price of the asset does not undergo any change over a period of time, historical and replacement costs will be the same. During periods of substantial price variations, historical costs are poor indicators of actual costs.

3.2.5. PAST AND FUTURE COSTS :

Conventional financial records contain actual costs that are incurred in the past and they are known as 'past costs'. Management on studying these costs may check and find out factors responsible for excessive cost if any, though it cannot do anything to reduce them since they are already incurred.

Most of the managerial uses to which cost information is put actually require forecasts 'future costs' rather than actual past costs. Management decisions are always forward looking and they want to compare future cost situation. Future costs are subject to management control. If the cost estimates show that the future costs are high, the firm may try to reduce them or it may find ways of meeting them.

Management needs to estimate the future costs for number of reasons like expense control , projection of future income statements, appraisal of capital expenditure, decisions about new products, pricing etc. The fact that the future is uncertain does not detract from the necessity for making explicit forecasts of costs. Even with crude tools, it is often possible to make an accurate projection than that which is obtained when historical cost is used.

3.2.6. SEPARABLE AND COMMON COSTS:

There are some costs which can be identified easily with a particular unit, a department, or a process of production. In accounting terminology, these separable costs are called direct costs and non-separable as Indirect costs. There are some costs which are common to all. These costs cannot be traced or

identified with a product , department or a process of production. For example, the cost incurred in the raw materials can be traced to the finished product and this cost is a separable or traceable costs. Expenses like electricity bills, factory rent, salaries of the supervisory personnel, etc cannot be identified with any particular unit of output. They are known as common costs or indirect costs.

When the entrepreneur wants to know the cost per unit of output, it becomes essential to apportion the common costs among the output on some basis. There are normally no rules for apportioning the common costs among several units of output discretion has to be used to allocate such costs.

The common costs create more problems in cases where the firm produces many products. Such knowledge becomes essential for the firm when the manager wants to decide whether it is profitable or not to produce, whether to discontinue, expand, or modify production.

3.2.7. ACCOUNTING COSTS AND ECONOMIC COSTS :

The accountant classifies costs for the legal and record keeping purpose whereas the economist prepares cost estimates for providing guidelines to the management for basic decision making. The accountants report on what has happened and try to provide information which will protect the interests of shareholders etc. Such accounting information is not directly suitable for decision making. For example in measuring the cost of equipment, the accountant considers the acquisition cost of these resources . The acquisition costs of an asset minus depreciation gives the value of an asset according to the accounting procedures. But such value may not truly represent the current and past market price. Because,

(1) there may be difference between the current market price and the past market price,

(2) the depreciation allowed by the accounting procedures may be different form the true depreciation and

(3) change in the value of money due to passage of time is ignored.

The economist on the other hand, tends to take a look at the future revenues that accrue to the firm and to discount these future earnings to know their present value. While purchasing an asset, the managerial economist

compares its price with the implicit value though they are relevant for decision making. For short run managerial decisions, a distinction between fixed and variable costs is very essential. Because of these limitations , accounting costs are not directly useful for managerial decisions. They must be supported by the economic cost classification.

3.2.8 EXPLICIT (OR PAID OUT) AND IMPLICIT (OR IMPUTED) COSTS :

Explicit costs are those expenses which are actually paid by the firm (paid-out costs). These costs appear in the accounting records of the firm. On the other hand, implicit or imputed costs are theoritical costs in the sense tht they go unrecognised by the accounting system. These costs may be defined as the earnings of those employed resources on borrowed funds is an explicit cost and enters the accounting record, which belong to the owner himself. But the amount of interest which the employee could have earned (and which he forgoes when he uses his capital in his firm) is his implicit cost. Similarly, the amount of rent, wages, utility expenses etc., which are paid out are the explicit costs of the firm, while the wages, rent in the firm, etc., which are due to the entrepreneur for employing his own resources in the firm, are all implicit costs. The explicit costs are important for the calculation of profit and loss account, but for economic decision making the firm takes into account both the explicit as well as the implicit costs.

3.2.9. MARGINAL, AVERAGE AND TOTAL COSTS :

Total cost of a firm for producing is sum-total of all the explicit plus implicit expenditure incurred for producing a given level of output. It represents the money value of the total resources required for production of goods and services by the firm. Average cost equals the total cost divided by the number of units produced. Marginal costs are the incremental or additional costs incurred when there is a small addition to the existing output of goods and services. In other words, marginal cost of 'n'th unit (Mc_n) is the difference between the total costs of nth unit (Tc_n) and total cost of (n-1)th unit (Tc_{n-1}), i.e., $Mc_n = Tc_n - Tc_{n-1}$.

The detailed discussion of total cost, average cost, and marginal cost is given under the section 3.3.

3.3. COST-OUTPUT RELATIONSHIP :

The cost of production of a commodity depends on many forces like the output level, prices of the factors of production, productivity of the factors of production etc. Of all these cost determinants, the cost output relationship is very important.

In section 3.2., we have studied the nature of the types of costs, fixed and variable. The fixed costs remain constant while the variable costs vary long with output. However, the rate of change in the variable cost for given changes in the level of output may not always be the same. The distinction between the fixed and variable costs remain significant only in the short run while in the long run all costs are variable. This distinction is important for understanding the cost output relationship. Let us now consider a hypothetical firm. The data are given in the Table :

COST OF PRODUCTION OF A FIRM

Units of output	Total fixed cost	Total Variable cost	Total cost 2+3	Average Fixed cost	Average Variable cost	Average cost 5+6	Marginal cost
1	2	3	4	5	6	7	8
0	30	0	30	-	0	0	-
1	30	10	40	30	10	40	10
2	30	18	49	15	9	24	8
3	30	24	54	10	8	18	6
4	30	32	62	7.5	8	15.5	8
5	30	50	80	6	10	16	18
6	30	72	102	5	12	17	22

Total cost of a given output is the sum of total fixed and total variable costs. The total fixed cost remains constant but the total variable cost increases along with an increase in the output, though the rate of increase is not constant in fig.1 (i).

In figure 1(i), S.S., is the total cost curve and it includes the total fixed cost (represented by the distance between the curve ST and the horizontal axis), and the total variable cost (represented by the distance between the curve SS and S).

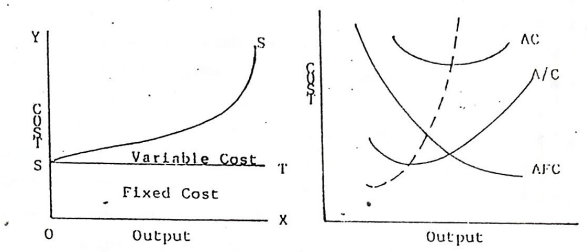


fig.1(i) fig.1(ii)

AVERAGE COST :

Average cost is the total cost divided by the number of units produced or it is the total of average fixed cost and average variable cost. In fig .1(ii) the average fixed cost, average variable cost and the average cost are shown. Since the total fixed cost is always constant, average fixed cost is a falling curve in the shape of a rectangular hyperbola. Average variable cost first falls with an increase in the output and then it rises, is high since the fixed cost is high and hence the first average cost is spread over more units of output and hence the average cost decreases. However this fall in the average cost is due to various advantages in large scale production. However, when output increases beyond a limit, as more and more units of a variable factor of production are used a long with a fixed factor of production, the marginal product of that variable factor first increases, then remains constant and finally starts diminishing. Diminishing returns set in due to difficulties of managing a larger output. Therefore variable and the average costs increase. This is the reason why average cost curves are u-shaped.

Here we have to remember that though the general behavior of the average cost function is described above, the exact behavior may vary from product to product. Particularly the output level upto which the average cost

decreases, remains constant and then increases, depends upon the nature of the product. For capital intensive products the first phase may be longer in general, in relation to labour intensive products.

MARGINAL COST :

Marginal Cost is the addition to total cost due to an increase of output by one unit. The difference between the cost of n+1 units and n units is marginal cost is falling and, when marginal cost is more than average, the average cost is rising. There are certain mathematical relations between average and marginal.

They may be costs or revenue or returns. Consider AC and MC. When AC is falling, MC will be less than AC (MC may also decrease or increase or but MC >AC). If AC is rising MC will be greater than AC (MC may also increase or decrease or remain constant but MC≤ AC. If AC is constant MC will also be constant fig.A, B, C reveal these relations.

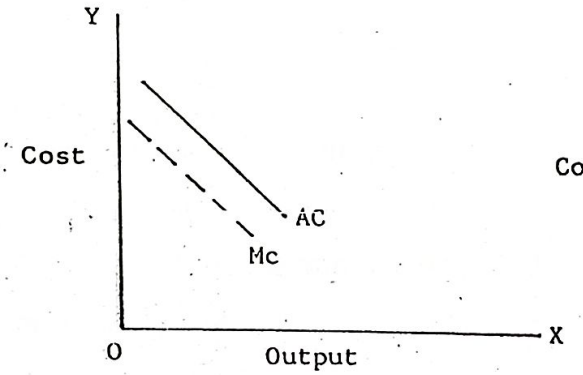


Fig.A

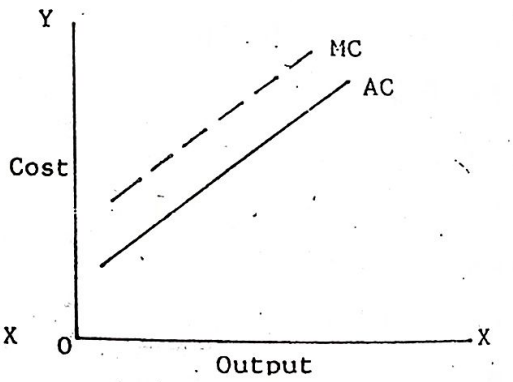


Fig B

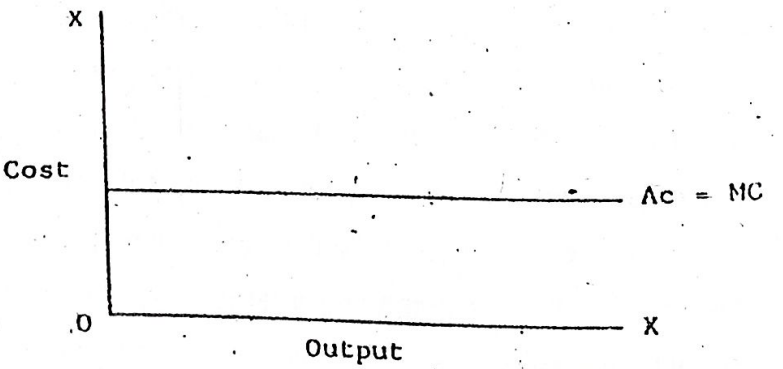


Fig C

If AC is a straight line and diminishes MC will be exactly at half way on the perpendicular drawn on Y axis. If AC is u shaped MC cuts AC at its lowest point (fig.D). If it is inverted u, MC cuts at its highest point (fig.E).

Meaning of Cost Accounting and Cost Accountancy

Cost Accounting is the classifying, recording and appropriate allocation of expenditure for the determination of the costs of products or services, and for the presentation of suitably arranged data for purposes of control and guidance of management. It includes the ascertainment of the cost of every order, job, contract, process, service or unit as may be appropriate. It deals with the cost of production, selling and distribution. It is thus the provision of such analysis and classification of expenditure as will enable the total cost of any particular unit of production or service to be ascertained with reasonable degree of accuracy and at the same time to disclose exactly how such total cost is constituted (*i.e.* the value of material used, the amount of labour

and other expenses incurred) so as to control and reduce its cost. Thus, cost accounting relates to the collection, classification, ascertainment of cost and its accounting and control relating to the various elements of cost. It establishes budgets and standard costs and actual cost of operations, processes, departments or products and the analysis of variances, profitability and social use of funds.

Cost Accountancy is the application of costing and cost accounting principles, methods and techniques to the science, art and practice of cost control and the ascertainment of profitability. It includes the presentation of information derived therefrom for purposes of managerial decision-making. Thus, *cost accountancy is the science, art and practice of a cost accountant.* It is *science* because it is a body of systematic knowledge having certain principles which a cost accountant should possess for proper discharge of his responsibilities. It is an *art* as it requires the ability and skill with which a cost accountant is able to apply the principles of cost accountancy to various managerial problems. *Practice* includes the continuous efforts of a cost accountant in the field of cost accountancy. Such efforts also include the presentation of information for the purpose of managerial decision-making and keeping statistical records.

5
Unit Costing

Unit Costing is a method of costing by units of production and is adopted where production is uniform and a continuous affair, units of output are identical and the cost units are physical and natural. The cost per unit is determined by dividing the total cost during a given period by the number of units produced during that period. This method of costing is generally adopted where an undertaking is engaged in producing only one type of product or two or more products of the same kind but of varying grades or quality. The industries where this method of costing is used are collieries, sugar mills, cement works, brick works, paper mills etc. In all these cases, work is a natural unit of cost *e.g.*, a tonne of coal, a quintal of sugar, a tonne of cement, 1,000 bricks, 1 kg of paper and so on.

Collection of Costs

The cost in such industries is collected under the following headings :

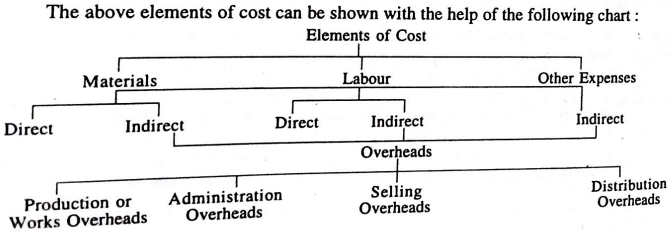
(*i*) *Material.* As there will be only one product and the process of manufacture is also simple, the raw material, if any, is directly charged to the production of the period in total. The items of stores issued for maintenance and other purposes are analysed by cost centres through the requisition slips. Normal loss of material is adjusted by inflating the issue price of materials.

(*ii*) *Labour.* The labour costs are collected periodically through payrolls which are prepared separately for each section of the work. The purpose of such analysis is only to localise the cost to specific cost centres or to departmental managers, so that the cost can be effectively controlled. Labour—direct and indirect—should be identified separately. The direct labour cost is collected separately and forms a part of prime cost whereas indirect labour is charged to the factory overheads.

(*iii*) *Direct Expenses.* These are also separately found out as they become a part of prime cost.

(*iv*) *Overheads.* These are classified into three broad categories : factory overheads, administration overheads and selling and distribution overheads. These are usually charged at a predetermined rate.

The above elements of cost can be shown with the help of the following chart :



By grouping the above elements of cost, the following *divisions of cost* are obtained :

1. Prime Cost = Direct Materials + Direct Labour
2. Works or Factory Cost = Prime Cost + Works or Factory Overheads
3. Cost of Production = Works Cost + Administration Overheads
4. Total Cost or Cost of Sales = Cost of Production + Selling and Distribution Overheads

The difference between the cost of sales and selling price represents profit or loss.

Cost Sheet or Statement of Cost

Cost sheet is a statement designed to show the output of a particular accounting period alongwith break-up of costs. The data incorporated in cost sheet are collected from various statements of accounts which have been written in cost accounts, either day-to-day or regular records.

There is no fixed form for preparation of cost sheet but in order to make the cost sheet more useful it is generally presented in columnar form. The columns are for the total cost of current period, per unit for the current period, total cost and per unit cost for a preceding period and total and per unit cost for the budget period and so on. The information to be incorporated in cost sheet would depend upon the requirement of management for the purpose of control.

Cost sheet is a memorandum statement. Therefore, it does not form part of double entry cost accounting records. Inspite of this, the relationship between cost sheet and financial accounts which are maintained on double entry system is very important as cost sheet derives its data from financial accounting. In case predetermined rates are not used, the entire data required for preparation of cost sheet is derived from financial accounting. Therefore, periodically it becomes necessary to reconcile the information obtained from cost accounting and financial accounting separately.

Expenses Excluded from Costs

The total cost of a product should include only those items of expenses which are a charge against profit. *Items of expenses which are relating to capital assets, capital losses, payments by way of distribution of profits and matters of pure finance should not form a part of the costs.* Examples of such expenses are—income-tax, dividends, abnormal wastage of material, abnormal idle time, interest on capital given or received, expenses of raising capital, discount on shares and debentures, profit or loss from the sale of asset or investments, excessive depreciation, appropriation of profits, writing off goodwill, preliminary expenses and underwriting commission ; cash discount, debentures interest, incomes which are not connected with business *i.e.*, transfer fees, rent, interest, dividend received and capital expenditure.

SPECIMEN OF COST SHEET OR STATEMENT OF COST

units :

		Total Cost Rs.	*Cost per unit*
Direct Materials			
Direct Labour			
Direct Expenses			
	Prime Cost		
Add : Works Overheads			
	Works Cost		
Add : Administration Overheads			
	Cost of Production		
Add : Selling and Distribution Overheads			
	Total Cost or Cost of Sales		

Illustration 1. Calculate Prime Cost, Factory Cost, Cost of Production, Cost of Sales and Profit from the following particulars :

	Rs.		Rs.
Direct materials	1,00,000	Depreciation :	
Direct wages	30,000	Factory Plant	500
Wages of foreman	2,500	Office Premises	1,250
Electric power	500	Consumable stores	2,500
Lighting : Factory	1,500	Manager's salary	5,000
Office	500	Directors' fees	1,250
Storekeeper's wages	1,000	Office stationery	500
Oil and water	500	Telephone charges	125
Rent : Factory	5,000	Postage and Telegrams	250
Office	2,500	Salesmen's salaries	1,250
Repairs and Renewals :		Travelling expenses	500
Factory Plant	3,500	Advertising	1,250
Office Premises	500	Warehouse charges	500
Transfer to Reserves	1,000	Sales	1,89,500
Discount on shares		Carriage outward	375
written off	500	Income-tax	10,000
		Dividend	2,000

Solution

STATEMENT OF COST AND PROFIT

		Rs.	Rs.
	Direct materials		1,00,000
	Direct wages		30,000
	Prime Cost		1,30,000
Add :	Factory Overheads :		
	Wages of foreman	2,500	
	Electric power	500	
	Storekeeper's wages	1,000	
	Oil and water	500	
	Factory rent	5,000	
	Repairs and Renewals—Factory Plant	3,500	
	Factory lighting	1,500	
	Depreciation—Factory Plant	500	
	Consumable stores	2,500	17,500
	Factory Cost		1,47,500
Add :	Administration Overheads :		
	Office rent	2,500	
	Repairs and Renewals—Office Premises	500	
	Office lighting	500	
	Depreciation : Office premises	1,250	
	Manager's salary	5,000	
	Directors' fees	1,250	
	Office stationery	500	
	Telephone charges	125	
	Postage and Telegrams	250	11,875
	Cost of Production		1,59,375

Add :	Selling and Distribution Overheads :		
	Carriage outward	375	
	Salesmen's salaries	1,250	
	Travelling expenses	500	
	Advertising	1,250	
	Warehouse charges	500	
			3,875
	Cost of Sales		1,63,250
	Profit		26,250
	Sales		1,89,500

Notes : (1) Transfer to reserves, income-tax and dividend are excluded from cost accounts being items of appropriation of profit, so these items have not been included in cost.

(2) Discount on shares written off being an item of non-operating nature is excluded from cost.

Treatment of Stock

Stock requires special treatment while preparing a cost sheet. Stock may be of raw materials, work-in-progress and finished goods.

Stock of Raw Materials

If opening stock of raw materials, purchases of raw materials and closing stock of raw materials are given, then with the help of the following, raw materials consumed can be calculated :

		Rs.		
	Opening Stock of Raw Materials	×	×	×
Add :	Purchases of Raw Materials	×	×	×
		×	×	×
Less :	Closing Stock of Raw Materials	×	×	×
	Cost of Raw Materials Consumed	×	×	×

Stock of Work-in-Progress

Work-in-progress means units on which some work has been done but which are not yet complete. Work-in-progress is valued at prime cost or works cost basis, but the latter is preferred. Instructions in this respect should be carefully noted from the language of the question. If it is valued at works or factory cost then opening and closing stock will be adjusted as follows :

		Rs.		
	Prime Cost	×	×	×
Add :	Factory Overheads Incurred	×	×	×
Add :	Work-in-Progress (Beginning)	×	×	×
		×	×	×
Less :	Work-in-Progress (Closing)	×	×	×
	Factory or Manufacturing or Works Cost	×	×	×

10

Marginal Costing

Fixed expenses remain constant in aggregate amount and do not vary with the increase or decrease in production upto a particular level of output. Just contrary to this variable expenses increase or decrease in proportion to increase or decrease in output and remain constant per unit of output. Fixed expenses per unit continue to vary with the increase or decrease in production because these expenses remain constant upto a certain level of production. Thus, fixed overheads lead to different costs per unit at different levels of production. On account of this, a special technique known as marginal costing has been developed which excludes fixed overheads entirely from cost of production and gives us the same cost per unit upto a particular level of output. Thus, under this technique fixed expenses are not allocated to cost units but are charged against "fund" which arises out of excess of selling price over total variable costs.

Meaning of Marginal Cost

The Chartered Institute of Management Accountants, England, defines the term 'marginal cost' as follows :

Marginal Cost is the amount at any given volume of output by which aggregate costs are changed if the volume of output is increased or decreased by one unit. In this context a unit may be a single article, a batch of articles, an order, a stage of production capacity or a department. It relates to the change in output in the particular circumstances under consideration.

For example, if variable costs per unit are Rs. 10 and fixed expenses are Rs. 1,50,000 per annum, an output of 30,000 units per annum results in the following expenditure :

		Rs.
Variable cost of 30,000 units @ Rs. 10		= 3,00,000
Fixed cost		= 1,50,000
	Total cost	= 4,50,000

If output is increased by one unit, the following expenditure will be incurred :

		Rs.
Variable cost of 30,001 units @ Rs. 10		= 3,00,010
Fixed costs		= 1,50,000
	Total cost	4,50,010
Less : Total cost for output of 30,000 units		4,50,000
Marginal cost of 1 unit		10

Meaning of Marginal Costing

According to CIMA Terminology *Marginal Costing* is the ascertainment of marginal costs and of the effect on profit of changes in volume or type of output by differentiating

Break Even (or Cost Volume Profit) Analysis

Break even analysis is a logical extension of marginal costing. It is based on the same principles of classifying the operating expenses into fixed and variable. Now-a-days it has become a powerful instrument in the hands of policy makers to maximise profits.

There may be *change in the level of production due to many reasons*, such as competition, introduction of a new product, trade depression or boom, increased demand for the products, scarce resources, change in the selling prices of products, etc. In such cases management must study the effect on profit on account of the changing levels of production. A number of techniques can be used as an aid to management in this respect. One such technique is the break even analysis.

The term 'break even analysis' is interpreted in the narrower as well as broader sense. Used in its *narrower sense*, it is concerned with finding out the break even point, *i.e.*, level of activity where the total cost equals total selling price. Used in its *broader sense*, it means that system of analysis which determines the probable profit at any level of production. The break even analysis establishes the relationship of costs, volume and profit ; so this analysis is also known as 'Cost Volume Profit Analysis'.

The study of break even analysis can be made by (*i*) mathematical relationship between cost volume profit and (*ii*) by preparing break even charts.

In order to understand mathematical relationship between cost, volume and profit, it is desirable to understand the following four concepts, their calculation and applications.

(*i*) Contribution
(*ii*) Contribution/Sales (C.S.) or Profit Volume (P/V) Ratio
(*iii*) Break Even Point
(*iv*) Margin of Safety.

Margin of Safety

Margin of safety is the difference between the actual sales and the sales at break even point. One of the assumptions of marginal costing is that output will coincide sales, so margin of safety is also the excess production over the break even point's output. Sales or output beyond break even point is known as margin of safety because it gives some profit, at break even point only fixed expenses are recovered. Margin of safety can also be expressed in percentage. For example, if present sales are Rs. 4,00,000 and break even sales are Rs. 3,00,000, margin of safety is Rs. 1,00,000 *i.e.*, Rs. 4,00,000 – Rs. 3,00,000 or 25% $\left(i.e. \frac{1,00,000}{4,00,000} \times 100\right)$. Thus, formula for the calculation of margin of safety is :

Margin of Safety (M/S) = Present Sales – Break Even Sales

Margin of Safety can also be calculated with the help of the following formula :

$$\text{Margin of Safety (M/S)} = \frac{\text{Profit}}{\text{P/V Ratio}}$$

Margin of safety is that sales or output which is above break even point. All fixed expenses are recovered at break even point ; so fixed expenses have been excluded from the formula of margin of safety given above. Margin of safety is that sales which gives us profit after meeting fixed costs ; so formula of its calculation takes only profit.

If the margin of safety is large, it is an indicator of the strength of a business because with a substantial reduction in sales or production, profit shall be made. On the other hand, if the margin is small, a small reduction in sales or production will be a serious matter and lead to loss. The margin of safety at break even point is nil because actual sales volume is just equal to the break even sales.

Efforts should be made by the management to increase the margin of safety so that more profit may be earned. This margin can be increased by taking the following steps :

(*i*) Increase the level of production.

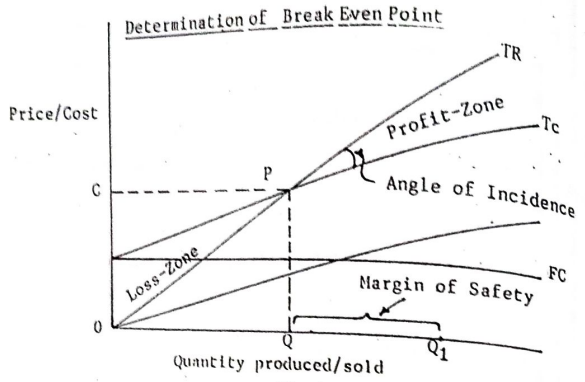


Fig.1.

The determination of Break-Even-Point enables the manufacturer to take a decision as to how much is to be produced to avoid losses. Only after the production level crosses the break-even level, the accrual of profits starts. Hence it is a very important technique for the decision market. It refers to a system of analysis that can be used to determine the probable profit at any level of operations.

1.1. ASSUMPTIONS :

The following are the assumptions underlying Break-Even Analysis:

1. Costs can be perfectly classified into their fixed and variable components.

2. Selling price does not change as volume changes.

3. There is no closing stock.

4 There is only one product or in the case of Multi-product firm, the product mix remains the same.

The figure 1, represents the determination of break-even point. The volume of production is on X axis, and price / costs are taken as the Y axis.

Fixed costs remains the same in the short-run and hence fixed costs line is parallel to X axis. Variable costs (VC) vary in proportion to the volume of

production and hence VC line increases almost in 22-5^0 in tune with volume of production. The total cost (aggregating FC & VC) increases from the FC point onwards on Y axis indicating that even if there is no production, we have to incur the total fixed costs. The TC line is almost parallel to VC line. Now the total revenue line starts from '0' point and increases in 45^0 interesting TC line at point 'P' indicating zone below BEP in loss zone and above BEP is profit zone. OQ is the quantity demanded at OC price at break-even point.

The angle formed at the BEP i.e., point of TR & TC intersecting is called angle of incidence. The larger the angle the higher is the quantum of profit once the fixed costs are absorbed.

The margin of safety represents the amount by which the actual volume of sales exceeds those at the break-even point. Assuming that the present level of sales (in the above given figure) is OQ1 the margin of safety would be OQ1-OQ. In other words if the present level of sales is 5000 Units and BEP level is at 2000 Units, the margin of safety would be 3000 Units.

DETERMINATION OF BREAK-EVEN POINT :

BEP can be determined in terms of sales Volume (Units)and also sales value (Rs.).

Formula :

Total Revenue = Total Cost + Profit

= Fixed Cost (FC) + Variable Cost (VC) + Profit

TR - VC = FC + Profit

= Contribution

BEP (in terms of Sales Volume)

$$= \frac{\text{Fixed Cost}}{\text{Selling Price per Unit (SP)} - \text{Contribution maxin per Unit (C)}}$$

Where contribution maxim per Unit = SP - VC

For example, if the fixed costs are Rs. 12,000/- selling price per unit is Rs. 5/- and Variable cost per Unit is Rs. 3/-, the B.E.P. in terms of sales volume is :

4.4. MANAGERIAL SIGNIFICANCE :

The following are the examples where in BEA can be advantageously made use of :

1. Ascertainment of profit on a particular level of sale volume.

2. Calculation of sales required to earn a particular level of profit.

3. Comparisons to be made in respect of lines product, sales area, method of sale, separate companies and individual businesses.

4. Estimation of the volume of sales required to maintain the present level of profit in case selling prices, fixed cost / (or) variable cost increase or decrease.

4.5. LIMITATIONS :

The assumptions out lined above forms the essential limitations also. If any of the variables such as FC, VC or TR changes, the BEP changes. All costs are not perfectly classifiable into fixed costs and variable costs. In case of multi-product firms, single chart cannot be of any use. Series of break-even charts are to be prepared. Total cost lines and total revenue lines are not always straight. In the case of volatile business conditions, the Break-even chart is not of any use.

Hence BEA should be used with all the awareness of these limitations. Despite these limitations, BEA has been very valuable tool in the hands of decision makers particularly in the area of modern financial management.