UNIT 3

INTRODUCTION TO COST ESTIMATION

3.0 INTRODUCTION

Cost estimation may be defined as the process of forecasting the expenses that must be incurred to manufacture a product.

These expenses take into consideration all expenditures involved in design and manufacturing with all the related service facilities such as pattern making, tool making as well as portion of the general administrative and selling costs. Cost estimates are the joint product of the engineer and the costaccountant.

Estimating is the calculation of the costs which are expected to be incurred in manufacturing a component in advance before the component is actually manufactured.

Costing may be defined as a system of accounts which systematically and accurately records every expenditure in order to determine the cost of a product after knowing the different expenses incurred in various department.

3.1 REASONS FOR DOINGESTIMATES

Cost estimates are developed for a variety of different reasons. The most important reasons are shown below.

Should the product be produced? When a company designs a new product, a detailed estimate of cost is developed to assist management in making an intelligent decision about producing the product.

This detailed estimate of cost includes an estimate of material cost, labour cost, purchased components and assembly cost. In addition to product cost, many other elements must be estimated. These include all tooling costs.

A cost estimate must be developed for jigs, fixtures, tools, dies and gauges. Also, the cost of any capital equipment must be entered into the estimate. These figures are usually supplied through quotation byvendors.

An estimate of this nature will include a vast amount of details, because if management approves the project, the estimate now becomes the budget.

Estimates as temporary work standards. Many companies that produce product in high volume, such as automotive companies, will use estimates on the shop floor as temporary work standards.

Temporary work standards are replaced with time studied work standards as rapidly as possible.

3.1.1 Importance ofEstimating

Estimating is of great importance to a concern because it enables the factory owner to decide about the manufacturing and selling policies.

It is obvious that too high estimates will not get jobs to the firm by quoting higher rates according to over estimate whereas under estimating will put the owner to a loss and will lead the concern to utterfailure.

So, estimation should be carried out accurately. The persons preparing estimates should be highly qualified and experienced. They should be chosen from shops or should be first trained in all the shop methods and their estimates preparation.

3.2 OBJECTIVES OR PURPOSE OFESTIMATING

The main purpose or objective of estimating are

To establish the selling price of a product.

To ascertain whether a proposed product can be manufactured and marketed profitably.

To determine how much must be invested in equipment.

(iii) To find whether parts or assemblies can be more cheaply fabricated or purchased from outside (make or buy decision).

(iv) To determine the most economical process, tooling or material for making a product.

(v) To establish a standard of performance at the start of project.

(vi) For feasibility studies on possible new products. To assist in long term financial planning.

To prepare production budget.

To help in responding to tender enquiries.

(xi) To evaluate alternate designs of a product.

(xii) To set a standard estimate of costs.

(xiii) Toinitiateprogramsofcostreductionthatresultineconomicsduetotheuseof new materials, which produce lower scrap losses and which create savings due to revisions in methods of tooling and processing, and

(xiv) To control actual operating costs by incorporating these estimates into the general plan of cost accounting.

3.3 FUNCTIONS OFESTIMATING

(i) To calculate the cost of new material needed to manufacture a product.

(ii) To find the cost of parts to be purchased from outside vendors.

(iii) To find the cost of equipment, machinery, tools, jigs and fixtures etc. required to be purchased to make the product.

(iv) To calculate the direct and indirect labour cost associated with the manufacture of the product, based upon work study.

(v) To calculate various overhead charges associated with the product.

(vi) To decide about the profit to be charged, taking into consideration other manufacturers of same product in the market.

(vii) To calculate the selling price of the product.

(viii) To maintain records of previous estimating activities of the company for future references.

(ix) To decide the most economical method of making the product.

(x) To submit cost estimates with the competent authority for further action.

3.4 COST ACCOUNTING OFCOSTING

It is the determination of an actual cost of a component after adding different expenses incurred in various departments or it may be defined as a system which systematically records all

the expenditures to determine the cost of manufactured products.

The work of cost accountings begins with the pre-planning stage of the product. It ends only after the whole lot of the product has been fully manufactured. Costing progresses with the progress of the product through the plant.

3.5 IMPORTANCE OFCOSTING

Costing is an essential work for the efficient management of any enterprise and gives most useful information for the preparation of financial accounts.

It enables a business not only to find out what various jobs or processes have costed but also what they should have costed.

It indicates where losses are wastage are occurring before the work is finished, so that immediate action may be taken to avoid such loss or waste. Also all expenditure are localized and thereby controlled in the light of information provided by the cost records.

Costing shows which type of output will yield a profit and which type does not. Thus, it makes up the deficiency.

A planned system of cost accounting will point out the weak spots and thus enable the administration to have a clear picture and show up immediately the essential facts in such a way that the responsible persons can put forth their efforts to bring improvements and reduce costs.

Costing has proved so beneficial that nowadays almost every concern has adopted the cost accounting system.

3.6 AIMS OF COSTACCOUNTING

The purpose of costing are:

1. To compare the actual cost with the estimated cost to know whether the estimate had been realistic o rnot.
2. Wastages and undesirable expenses are pointed out requiring corrective measures.
3. The costing data helps in changing the selling price because of change in material cost of labour cost etc.
4. It helps to locate the reasons for the increase or decrease of loss of profits of a company.
5. It helps in determining the discount on catalogue or market price of the product.
6. The actual cost helps the company to decide whether to continue with the manufacture of a product or to buy it from outside.
7. It helps the enterprise to prepare its budget.
8. The costing data helps to formulate policies and plans for the pricing of a new job.
9. It helps in regulating from time to time the production of a job so that it may be profitable to the company.

3.7 METHODS OFCOSTING

(a) Process costing.
(b) Job costing.
(c) Batch costing.
(d) Hybrid costing systems.

(a) Processcosting

Process cost sheet						
Accounting Period……..						
Date Ref. Mat. Labour Over/head Cost-Center-I				*Cost Center-2*		
(OH)	*Mat.*	*Labour*	*O.H.*	*Mat.*	*Labour*	*O.H.*

• This method is employed when a standard product is being made which involves a number of distinct processes performed in a definite sequence.

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• In oil refining, chemical manufacture, paper making, flour milling, and cement manufacturing etc., this method is used.

• The object i.e., record and trace cots for each distinct stage.

• While costing, the by-products of each process should be considered.

• This method indicates the cost of a product at different stages as it passes through various processes.

• The total time spent and materials used on each process, as well as services such as power, light and heating are all charged. For this purpose cost sheet may be employed.

The process cost sheet is a summary of all operations for the month. The current operating charges are entered on the sheet showing

1. The transfer cost from the previous operation.
2. The costs incurred by each operation showing materials, labour and overhead in separate columns.

This separation of transfer cost and conversion cost is extremely important for the charges incurred by a department are its measures of efficiency.

The sheet can be used as a basis for:

1. Closing entries at the end of each month.
2. Operating statements, without need to lookup the ledger accounts.

Within the cost ledger an account is kept for each process. The direct material, direct labour and factory overhead costs are transferred from the process cost sheet. There are debited to the process account, and then any completed units are credited to cover the transfer to the next process. The balance on the account represents the work-in-progress at the end of the period, which, of course, becomes the opening balance for the next period.

(b) Job costing or order costing

• Job costing is concerned with finding the cost of each individual job or contract.

Examples are to be found in general (job order) engineering industries, shipbuilding,

building contracts, etc.

- The main features of the system is that each job has to be planned and costed separately.
- Overhead costs may be absorbed on jobs on the basis of actual costs incurred or on predetermined costs.
- The process of determining in advance what a job or order will cost is known as estimating.

It involves consideration of the following factors for each job/order:

1. Materials requirements and prices to arrive at the direct material cost.
2. Labour hours and rates to determine labour costs.
3. Over head costs.
4. Percentage added to total cost to cover profit.

A record of above costs per unit time is kept in separate cost sheets.

(c) Batch costing

- Batch costing is a form of job costing. Instead of costing each component separately, each batch of components are taken together and treated as a job. Thus, for example, if 100 units of a component, say a reflector are to be manufactured, then the costing would beas far a single job. The unit price would be ascertained by dividing the cost by 100.

- Besides maintaining job cost sheets it may also be necessary to keep summary sheets on which the cost of each component can be transferred and the cost of the finished product can be calculated. This applies in general engineering where many hundreds of components may go towards making the finished machine or other product.

(d) Hybrid costing systems

- Many costing systems do not fall nearly into the category of either job costing or process costing. Often systems use some features of both main costing systems.
- Many engineering companies use batch costing, which treats each batch of components as a job and then finds the average cost of a single unit.
- Another variation is multiple costing, used when many different finished products are made.

Many components are made which are subsequently assembled into the completed article, which may be bicycles, cars, etc. Costs have to be ascertained for operations, processes, units and jobs, building together until the total cost is found.

- Different names may be used to describe either process costing or job costing. Thus, for example, unit costing is the name given to one system where there is a natural unit, such as sack of flour, a barrel of beer etc.
- In unit costing method, the expenses on various items are charged per unit quantity or production.
- Operation costing is a variation of unit costing, and is used when production is carried out on a large scale, popularly known as mass production.
- Operation costing is the term applied to describe the system used to find the cost of performing a utility service such as transport, gas, water or electricity.
- In this method, the cost per unit is found on the basis of operating expenses incurred on various items of expenditure.
- Unit costing, operation costing and operating costing are variations of process costing.
- Contract or terminal costing is the name given to job costing employed by builders and constructional engineers.
- All these methods ascertain the actual cost.

Departmental costing method

In big industries like steel industry or automobile industry each department is producing independently one or more components. Departmental costing method is used in such industries and the actual expenditure of each department on various products is entered on the separate cost sheet and the costing for each department is separately undertaken.

3.8 DIFFERENCE BETWEEN COST ESTIMATING AND COSTACCOUNTING

Point of comparison	*Cost estimating*	*Cost accounting*
1. Type of cost	It gives an expected cost of the product based on the calculations by means of standard formulae or certain established rules.	It gives actual cost of the product based on the data collected from the different expenditures actually done for a product.
2. Duration of process	It is generally carried out before actual production of a product. Due to certain unforeseen or unexpected expenses coming to light at a later stage, estimate may be modified or revised.	It usually starts with the issue of order for production of a product and ends after the product is dispatched for sale. For sale commitments like free repair or replacement, the process continues upto the expiry period of guarantee or warranty because the overhead expenses incurred in the above case will be included in the production cost.
3. Nature of quality	A qualified technical person or engineer having a thorough knowledge of the drawings and manufacturing process is required. Thus, it is a technical work, instead of a clerical one.	It can be done by a person qualified for accounts instead of a technical person. The cost accountant develops his knowledge of technical person. The cost accountant develops his knowledge of technical terms and process while working. Thus, this work instead of being of technical nature is more of a clerical nature.
4. Main objectives	*(i)* To set standard for, with actual cost. *(ii)* To help in setting up market price for a proposed product to be manufactured. *(iii)* To decide whether it is economical to buy or manufacture a product under prevailing market conditions. *(iv)* To facilitate in filling up of tenders or quotation of products for supply. After receipt of supply order from the buyers the production will be started.	*(i)* To help in comparison of cost with estimates to know if they are over, under realistic as well as to know where the actual costs involve unnecessary wastage of men, materials, machines and money. *(ii)* To facilitate the budget preparation as well as to provide cost data for future estimates of new products of their pricing plans. *(iii)* To facilitate in deciding output targets time to time. *(iv)* To facilitate in meeting certain legal obligations or regulations.

3.9 DIFFERENCE BETWEEN FINANCIAL ACCOUNTING ANDCOST ACCOUNTING

• Accounting information is vital for showing the indebtedness of a business accounting uses words and figures to communicate the transactions which have been entered into.

• Both financial accounting and cost accounting are concerned with the recording of transactions so as to enable to calculate profit (or loss) for one or more transactions and to show the assets and liabilities owned or incurred by the business.

• Financial accounting is concerned with the external transactions and, therefore, record all dealings with the outside world. Any purchase or sale of goods and services and fixed assets, whether for cash or on credit are covered.

• Cost accounting, on the other hand, deals with the internal affairs of a business .It attempts to show the results of the operations carried out and emphasizes throughout the measurement and achievement of efficiency.

• Fixed assets, workers and materials are brought together with the object of transforming the resources employed and thereby obtaining a saleable product or service.

• Generally special attention is paid to the control aspect of the quantities and prices of the resources necessary for the transformation.

3.10 ELEMENTS OF COSTINTRODUCTION

The total cost is made up of three main elements (figure 3.1).

1. Material.
2. Labour.
3. Expenses.

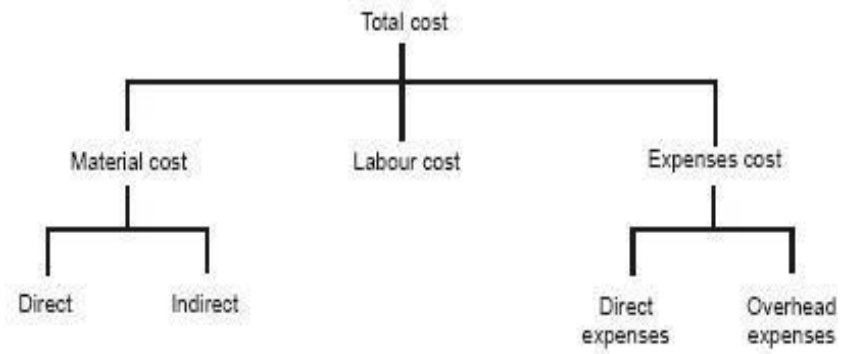

Fig. 3.1

3.11 MATERIALCOST

Material cost consists of the cost of materials which are used in the manufacture of product. It is divided into the following:

3.11.1 Direct Material Cost

It is the cost of those materials which are directly used for the manufacture of the product and become a part of the finished product.

The procedure for calculating the direct material cost is as follows:

(i) From the product drawing, make a list of all the components required to make the final product.

(ii) Calculate the volume of each component from the drawing dimensions after adding machining allowances, wherever necessary.

(iii) The volume of component multiplied by the density of material used gives the weight of the material per component.

(iv) Add process rejection and other allowances like cutting allowance to get the gross weight per component.

(v) Multiply the gross weight by the rate of material per unit weight to get the cost of raw material per component.

(vi) The cost of raw material for all the components is, similarly, calculated and added up which gives the cost of direct material for the product.

3.11.2 Indirect Material Cost

In addition to direct materials a number of other materials are necessary to help in the conversion of direct materials into final shape. Though these materials are consumed in the production, they don't become part of the finished product and their cost cannot be directly booked to the manufacture of a specific product. Such materials are called indirect materials.

The indirect materials include oils, general tools, greases, sand papers, coolants, cotton waste etc. The cost associated with indirect materials is called indirect material cost.

Depending upon the product manufactured, the same may be direct materials for one concern and indirect materials for others.

3.12 LABOURCOST

It is the expenditure made on the salaries, wages, overtime, bonuses, etc. of the employees of the enterprise. It can be classified as

3.12.1 Direct Labour Cost

Direct labourer is one who actually works and processes the materials to convert it into the final shape. The cost associated with direct labour is called direct labour cost.

The direct labour cost can be identified and allocated to the manufacture of a specific product. Examples of the direct labour are the workers operating lathes, milling machines or welders, or assemblers in assembly shop. The direct labour cost may be allocated to a product or job on the basis of time spent by a worker on a job.

3.12.2 Determination of Direct Labour Cost

Determination of labour is much more complicated problem than calculating material cost. To find the labour cost one must have the knowledge of all the operations which are carried out for production of the product, tools and machines to be used and the departments in which the product is to be manufactured.

For calculating time required for a particular job following considerations should be taken into account:

(a) Setup time.

(b) Operation time.

(i) Handling time.

(ii) Machining time.

(c) Tear downtime

(d) Down (or) lost time.

(e) Miscellaneous allowances:

(i) Personal allowance.

(ii) Fatigue allowance.

(iii) Tool sharpening and changing allowance.

(iv) Checking allowance.

(v) Other oiling and cleaning.
(vi) Filling coolant reservoirs.
(vii) Disposing of scraps and surplus stocks.

Setup time

Before starting any operation, first we have to set the job, tools and other auxiliary equipment. So, set up time is the time required for setting and fixing the jobs and tools on the machine.

Time to study the drawings, blueprints, time to make adjustment for getting the required size are all included in set up time. This time is also known as setting time.

Man (or) handling time

This is the time the operator spends loading and unloading the work, manipulating the tools and the machine and making measurements during each cycle of operation.

Machinery time

This is the time during each cycle of operation that the machine is working or the tools are cutting.

Example

Let us take the example of a drill press operation which has the following sequence of elements of handling and machining

Pick up part	
Place the jig	
Fit in the jig	Handling time
Position under drill	
Advance drill to work	
Drill hole through part	Machining time
Clear the drill from the work	
Move jig into clear position	
Release part from jig	Handling time
Remove part from jig	

Tear down time

Tear down time is the time required to remove the tools from the machine and to clean the tools and the machine after the last component of the batch has been machined. This time is usually small.

It will seldom run over 10 minutes on the average machine in the shop. It may require only a few minutes to tear down a set up on a drilling press and 10 to 15 minutes on the turret lathe. In exceptional case, it may go up to as high as 30 minutes on very large boring mills and large milling machines.

Down (or) lost time

This is the unavoidable time lost by the operator due to breakdowns, waiting for the tools and materials etc.

Miscellaneous allowances (allowances in estimation)

A worker cannot work for 8 hours continuously without rest. Also efficiency decreases as the time passes due to fatigue etc. He also requires for tool sharpening, checking measurements and personal calls. All these allowances come under this category. These allowances generally consumes 15 to 20% of total time.

(a) Personnal allowances

This is the time allowed for a worker for his personal needs like going to rest rooms, smoking, having a cup of tea, going to Lavatories to take water for personal cleanliness etc. This is generally about 5% of the total working time.

(b) Fatigue

The efficiency of the worker decreases due to fatigue (or) working at a stretch and also due to working conditions such as poor lighting, heating (or) ventilation. The efficiency is also affected by the psychology of the worker. It may be due to domestic worries, job securities etc. For normal work, the allowance for fatigue is about 5% of the total time. This allowance can be increased depending upon the type and nature of work and working conditions.

(c) Total sharpening and changing allowance

It is the time required to remove the tool and its holder, to walk up to the grinder to grind the tools, to come back to the machine and then to fix the tool again in the machine.

(d) Checking allowance

It is the time taken for checking the dimensions. Rough dimensions take less while accurate dimensions require more time. This allowance should be considered only when the operator is doing checking only and no work on the machine. If the checking is done during machining time it should not be considered. The checking times for the various instruments are given below to check one dimension.

With rule	0.10	minute
Vernier caliper	0.50	minute
Inside caliper	0.10	minute
Outside caliper	0.05	minute
Inside micrometer	0.30	minute
Outer micrometer	0.15	minute
Depth micrometer	0.20	minute
Dial micrometer	0.30	minute
Thread micrometer	0.25	minute
Plug gauge	0.20	minute
Snap gauge	0.10	minute

(e) Oiling and cleaning

It is the time required for cleaning the machine and to lubricate its various parts for smooth functioning of the machine.

(f) Filling coolant reservoirs

It is the time required for filling the reservoirs of the coolant which are used for cooling the jobs and tools.

(g) Disposing off scraps and surplus stocks

It is the time consumed for disposing off the scraps and other surplus stocks.

The miscellaneous allowances should be added to the set up, the operation and tear down times to complete the element.

3.12.3 Indirect Labour Cost

Indirect labourer is one who is not directly employed in the manufacturing of the product but his services are used in some indirect manner.

The indirect labour includes supervisors, foreman, storekeeper, gatekeeper, maintenance, staff, crane driver etc. The cost associated with indirect labour is called indirect labour cost.

The indirect labour costs cannot be identified with a particular job or product but are charged on the total number of products made during a particular period in a plant.

3.13 EXPENSES

Apart from material and labour cost in each factory there are several other expenditures such as cost of special layouts, designs, etc. hire of special tools and equipments; depreciation charges of plants and factory building; building rent; cost of transportation, salaries and commissions to salesman etc.

All these expenditures are known as overheads or expenses. So, from above it is clear that

3.13.1 Direct Expenses

Direct expenses also known as chargeable expenses include any expenditure other than direct material or direct labour incurred on a specific cost unit. These are the expenses which can be charged directly to a particular job and are done for that specific job only. For example, hire of special tools and equipment, cost of special jigs and fixtures or some special patterns and its maintenance cost,

costs of layouts, designs and drawings or experimental work on a particular job etc.

3.13.2 Indirect Expenses (Overheads)

These are known as overhead charges, burden or on cost. All the expenses over and above prime cost are indirect expenses. Overhead is the sum of indirect labour cost, indirect material cost and other expenses including service which cannot be conveniently charged to specific cost unit. These can be further classified as

1. Production expenses/Factory expenses.
2. Administrative expenses.
3. Selling expenses.
4. Distribution expenses.

(i) Production expenses

These expenses cover all indirect expenditures incurred by the undertaking from the receipt of the order until its completion ready for dispatch. Production expenses are also known as factory on cost, production overhead, factory overhead, work on cost, works overhead etc. Some examples of factory expenses or production expenses are:

(i) Rent, rates and insurance chargeable against the works.

(ii) Indirect labour example: supervision such as salaries of foreman, supervisors, factory manager etc.

(iii) Consumable stores and all forms of indirect material such as cotton waste, grease, oil etc.

(iv) Depreciation, maintenance and repair of buildings, plant, machine tools etc.,

(v) Power such as steam, gas, electricity, hydraulic or compressed air, internal transport etc.

(ii) Administrative expenses

These expenses include all the expenses on managerial or administerial staff for the planning and policy making work. Some examples of administrative expenses are:

(i) Salaries of directors and managing directors.

(ii) Salaries of cost, finance and secretary office staff including clerks and peons.

(iii) Expenses of direct amenities like telephone, coolers and other modern equipments.

(iv) Travelling expenses for attending meetings etc.

(v) Charges for electric consumption for light, heating and cooling.

(vi) Stationary, auditing expenses.

(vii) Insurance of building and employees, repairs, maintenance and depreciation of building and furniture.

(iii) Selling expenses

These consist of the expenditures spent towards securing orders, and finding or retaining markets for the products manufactured. Following is the list of selling expenses:

(i) Advertising and publicity expenses.

(ii) Salaries of the sales department staff including sales manager, salesman etc.

(iii) Travelling expenses of sales engineers.

(iv) Cost of preparing tenders and estimates.

(v) Expenses of making blocks and posters.

(vi) Sales stock storage charges.

(iv) Distribution expenses

These are the expenses which are paid for the distribution of the product. It includes the expenditure made on holding finished stock, packing cost and dispatching them to the customer. This type of expenses include

(i) Finished stock storages.

(ii) Lost of packing.

(iii) Loading, unloading charges, freight and warfare.

(iv) Expenses of transportation and vehicles.

(v) Salaries of dispatch clerks and labourers.

3.14 COST OF PRODUCT (LADDER OFCOST)

The elements of cost can be combined to give following types of cost:

1. Prime cost: It consists of direct material cost, direct labour cost and direct expenses.
   Prime cost = Direct material cost + Direct labour cost + Direct expenses.
   Prime cost is also called as direct cost.
2. Factory cost: It consists of prime cost and factory expenses.
   Factory cost = prime cost + factory expenses.
   Factory cost is also named as works cost.
3. Office cost: It consists of factory cost and administrative expenses. Office cost = Factory cost + Administrative expenses
   It is also named as manufacturing cost (or) cost of production.
4. Total cost: It includes manufacturing cost and selling and distribution expenses. Total cost = Manufacturing cost + selling and distribution expenses.

Selling price

If the profit is added in the total cost of the product, it is called selling price. The customers get the articles by paying the price which is named as selling price. Selling

price = Total cost + Profit

= Total cost – Loss

Making price (or) catalogue price: Some percentage of discount allowed to the distributors of product is added into the selling price. The result obtained is called the market price (or) catalogue price (figure 3.2).

				Profit (or) Loss	
			Selling + Distribution expenses		
		Administrative expenses	Office cost (or) production	Total (or) selling cost	Selling price (or) Market price
	Factory expenses	Factory cost (or)	(or) Manufacturing cost	(or)	Catalogue price
Direct material	Prime cost (or)	Works cost	(or)		
Direct labour	Direct cost				
Direct expense					

Fig. 3.2: Ladder of cost