Cost Accounting
For B.Com Semester IV(CBCS)

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CONTRACT COSTING

Contract Costing

Every clause in a contract, regardless of whether it applies to economic or non-economic issues, can have cost implications.

However,

The importance of contract costing depends on the share of a company's total costs expended on labor.

Contract Costing

Some <u>direct costs</u> such as wages and benefits are easy to measure.

While

Some <u>indirect costs</u> resulting from contract provisions that address such topics as seniority, layoffs, grievances and arbitration procedures are more difficult to estimate.

Contract Costing

More subtle and complex areas to measure are found in the relationship that exists between changes in labor costs and employee attitudes.

Labor Costs and Their Components

Direct Pay

Hourly….Daily….Weekly….Monthly….Incentives….

Commissions….Allowances….Tools….Clothing….

Differentials….Profit Sharing….Premiums….

Benefits

Vacation….Holidays….Sick Leave….Funeral Leave..

Health Insurance….Pensions….Social Security….

Workers Comp…Unemployment Insurance….

Benefits

The 1996 edition of Employee Benefits reported that the average payment for benefits was 42% of payroll in 1995.

Benefits

Generally, employee benefits can be categorized into two broad groups:

- **Time-not-worked benefits**

- **Security and health benefits**

Time-Not-Worked Benefits

Vacation….Holidays….Sick and Funeral Leaves….Jury Duty…. Military Service….Reporting Pay.. Call-in and Call-back Pay…. Wash-up ….Clothes Changing Time….Time Spent on Union Business….

Security and Health Benefits

Life, Medical, and Accident Ins.

Workers Compensation Ins.

Sick Leave - Pensions

Social Security

Unemployment Insurance

Guaranteed Annual Income

Severance Pay Allowances

Comparative Benefit Costs

While benefit costs represent an increasing cost factor in the U.S. economy it should be noted that they are considerably higher in many of the worlds industrial nations.

Japan 76%

Germany 71%

Italy 83%

Data Utilized for Costing Contracts

The data used in the costing of labor contracts can be classified into three major categories:

■ **Demographic**

■ **Accounting**

■ **Financial**

Demographic Data

Supplies a breakdown and a statistical profile of the labor force in terms of such criteria as age, sex seniority, and marital status.

Accounting Data

Provides payroll information on the work force regarding such specifics as direct pay, overtime, vacation, and holiday pay.

Financial Data

Furnishes figures on projected revenues, output, product mix, and nonlabor costs.

Information Sharing

It is suggested that the costing of contracts and the process of negotiation can be facilitated by a sharing if financial information between labor and management.

?????

Methods for Costing Contracts

- Total annual cost of demands

- Annual cost of demands per employee.

- Cost of total demands as a percentage of payroll.

- Cost of demands in cent-per-hour

Methods for Costing Contracts

A note of caution:

The total cost of settlements are not always reflected in labor cost paid out to bargaining unit members.

A frequently overlooked cost implication of new contract terms is the ripple effect it may cause on compensation for the company's nonunion employees.

Methods for Costing Contracts

Additionally it should be noted:

Relatively few labor relations experts have the perspective, information, or skills to provide a comprehensive assessment of the impact of a settlement offer on any given contract.

Methods for Costing Contracts

Additionally it should be noted:

Proper contract costing requires a combined knowledge of accounting, finance, marketing, economics, and production.

Elasticity of Demand

Firms often try to pass on increased contract cost to consumers as higher prices.

The extent to which an individual firm can do this depends on the elasticity of demand for its products.

SPECIAL POINTS IN CONTRACT COSTING

Some of the important points in contract costing are now discussed:

Cost of Materials

Materials include (*i*) materials specifically purchased for the contract; (*ii*) materials issued from store against material requisition notes. The cost of both these types of materials is debited to the contract account.

Materials returned to store. Whenever materials are issued in excess of requirements, as for instance, cement, sand, pipes, bricks, etc., these are later returned to the store accompanied by a Material Return Note which gives the details of the material returned. Such returned materials are credited to contract account.

Materials at site. At the end of each accounting period, value of materials lying unused at site is credited to contract account and is carried forward for charging against the next period.

Cost of Labour

All wages of workers engaged on a particular contract are charged direct to the contract irrespective of the type of work they perform. When several contracts are running at different locations, payroll is normally sectionalised so as to have separate payroll for each contract. Difficulties in costing may be encountered when some workers may have to move from one site to another when a number of small contracts are undertaken. In such situation, it becomes necessary to provide time sheets from which allocations can be made. In order to control labour utilisation and prevent fraud in the payment of wages, surprise visits by head office personnel will be necessary.

Plant Depreciation

There are two different methods of dealing with depreciation of plant in contract account:

(a) Contract account is debited with the cost of the plant installed. At the end of the year or when the plant is no longer required, the plant is revalued and contract account is credited with this revalued or depreciated figure. In case plant is sold on the completion of the contract, the contract account is credited with its sale proceeds. The net effect of the above debit and credit will be that the contract account will stand debited with the amount of depreciation which is the difference between the value of plant debited and value of plant credited. The method is generally used on long contracts which extend over more than one year because depreciated value of the plant is credited to the contract account and brought down as an opening balance in the next period.

(b) Alternatively, contract account is simply debited with the amount of depreciation. It is usual to use this method when plant is sent to contract only for a short period. For example, mobile crane or bulldozer used in a contract may be charged on this basis.

However, when a plant is hired for a contract, a charge for the hire of the plant is debited to the contract as a direct expense.

Subcontract Costs

Work of specialised character, for which facilities are not internally available, is offered to a subcontractor. For example, steel work, glass work, painting, etc., is usually carried out by the subcontractors who are accountable to the main contractor. The cost of such work is charged to the contract account.

Payment based on Architect's Certificate

In case the contract is small, full payment is usually made on the completion of the contract. But in case of large contracts, it may take more than one year to complete. In such a case, if no payment is received until the completion of the contract, the financial resources of the contractor could surely become strained. Therefore, a system of progress payments is agreed by parties. In this system, part payments of the contract amount are paid from time to time on the basis of certificate issued by the architects (acting for the contractee), certifying the value of the work satisfactorily completed. Such payments received by the contractor are usually credited to the personal account of the contractee. It should be noted that such payments are not entered in the Contract Account.

Work-in-progress — Work Certified and Uncertified

When the contract is not completed till the end of the accounting year, the architect is required to value the work-in-progress. Such work-in-progress is classified into work certified and work uncertified.

Work Certified. This is that part of the work-in-progress which has been approved by the contractee's architect or engineer for payment. Work certified is valued at contract price (*i.e* , selling price), and includes an element of profit.

Work Uncertified. This is that part of the work-in-progress which is not approved by the architect or engineer. This is valued at cost and thus does not include an element of profit.

Both work certified and uncertified appear on the credit side of the contract account and also on the assets side of the balance sheet.

Retention Money and Cash Ratio

It is usual practice not to pay the full amount of work certified. The contractee may pay a fixed percentage, say 80% or 90% of the work certified, depending upon the terms of the contract. This is known as *Cash Ratio*. The balance amount not paid is known as *Retention Money*. For example, if cash ratio is 75%, the retention money will be remaining 25%. This retention money is a type of security for any defective work which may be found in the contract later on. This also works as a deterrent for the contractor to leave the contract incomplete, if he finds the contract unprofitable. The retention money may also be adjusted against penalties that become due if the contract is not completed within the stipulated time as per the terms of the agreement.

PROFIT ON INCOMPLETE CONTRACTS

Contracts which are started and finished during the same financial year create no accounting problems. But in case of those contracts which take more than one year to complete, a problem arises whether profit on such contracts should be worked out only on the completion of the contract or at the end of each financial year on the partly completed work. If profit is computed only on the completion of the contract, profit will be high in the year of completion of the contract, whereas in other years of working on contract, profit will be nil. This would result not only in distorted profit pattern but also higher tax liability because income tax at higher rates may have to be paid. Therefore, when contracts extend beyond a year, it becomes necessary to take into account the profit earned (or loss incurred) on the work performed during each year. This helps in avoiding distortion of the year-to-year profit trend of the business. There are two aspects of profit computation:

(a) Computation of notional profit or estimated profit.

(b) Computation of the portion of such profit to be transferred to Profit and Loss Account.

Notional Profit

Notional profit is the difference between the value of work-in-progress certified and the cost of such work-in-progress certified. It is computed as follows (Figures are assumed):

	Value of work certified	20,00,000
Add:	Cost of work not yet certified	1,50,000
		21,50,000
Less:	Cost of work to date	19,00,000
	Notional Profit	2,50,000

If in any year, cost of work done exceeds the value of work certified and uncertified, the result will be a notional loss.

Estimated Profit

Estimated profit represents the excess of the contract price over the estimated total cost of the contract. It is computed as follows (Figures are assumed):

Contract Price	30,00,000
Less: Total cost already incurred	21,00,000
	9,00,000
Less: Estimated additional costs to complete the contract	3,50,000
Estimated Profit	5,50,000

Portion of Notional Profit or Estimated profit to be Transferred to Profit and Loss Account

The portion of the notional or estimated profit to be transferred to P&L Account depends upon the stage of completion of the contract *i.e.,* ratio of work-in-progress certified to total contract work. For this purpose work-in-progress uncertified is not considered. Prudence requires that the total notional profit should not be transferred to P&L Account but a portion of it should be withheld as a reserve to meet any unforeseen future expenses or contingencies.

Rules. There are no hard and fast rules in this regard. However, the following general rules may be followed :

1. When work-in-progress certified is less than 1/4 of the contract price, no profit is transferred to Profit and Loss Account. This is based on the principle that no profit should be taken into account unless the contract has reasonably advanced.

2. When work-in-progress certified is 1/4 or more but less than 1/2 of the contract price, then generally 1/3 of the profit is transferred to Profit and Loss Account. The balance amount is treated as reserve. Thus, profit to be transferred to Profit and Loss Account is computed by the following formula:

Transfer to P&L A/c = Notional profit $\times \frac{1}{3}$

Alternatively, a more common practice is to further reduce this amount by the cash ratio.

Transfer to P&L A/c = Notional profit $\times \frac{1}{3} \times \dfrac{\text{Cash received}}{\text{Work certified}}$

3. When work certified is 1/2 or more but less than 9/10 of the contract price, (*i.e.,* 50% to 90%), then the profit to be transferred to P & L Account is computed as follows:

Transfer to P&L A/c = Notional profit $\times \dfrac{2}{3}$

Here also a more common practice is to further reduce this amount by cash ratio. This is shown below :

Transfer to P&L A/c = Notional profit $\times \dfrac{2}{3} \times \dfrac{\text{Cash received}}{\text{Work certified}}$

4. When contract is near completion then the estimated profit should be calculated on the whole contract. The proportion of estimated profit to be transferred to Profit and Loss Account is computed by any one of the following formulas:

(a) Estimated profit $\times \dfrac{\text{Work certified}}{\text{Contract price}}$

(b) Estimated profit $\times \dfrac{\text{Work certified}}{\text{Contract price}} \times \dfrac{\text{Cash received}}{\text{Work certified}}$

(c) Estimated profit $\times \dfrac{\text{Cost of work to date}}{\text{Estimated total cost of work}}$

(d) Estimated profit $\times \dfrac{\text{Cost of work to date}}{\text{Estimated total cost of work}} \times \dfrac{\text{Cash received}}{\text{Work certified}}$

5. Loss on Uncompleted Contracts. In the event of a loss on uncompleted contracts, this should be transferred in full to the Profit and Loss Account, whatever be the stage of completion of the contract.

PROBLEMS AND SOLUTIONS

The following expenditure was incurred on a contract of ` 12,00,000 for the year ending 31-12-2015.

	`
Materials	2,40,000
Wages	3,28,000
Plant	40,000
Overheads	17,200

Cash received on account of the contract to 31st Dec., 2015 was ` 4,80,000, being 80% of the work certified. The value of materials in hand was ` 20,000. The plant had undergone 20% depreciation.

Prepare Contract Account. *(B. Com., Madurai)*

Solution:

Contract Account for the year ending 31st December, 2015

Particulars	`	Particulars	`
To Materials	2,40,000	By Materials in hand	20,000
To Wages	3,28,000	By Plant in hand (40,000 less 20%)	32,000
To Plant	40,000		
To Overheads	17,200	By Work-in-progress	
To Notional Profit c/d	26,800	Work certified $\left(4,80,000 \times \dfrac{100}{80}\right)$	6,00,000
	6,52,000		6,52,000
To Profit & Loss A/c (26,800 × 2/3 × 80%)	14,293	By Notional Profit b/d	26,800
To Reserve	12,507		
	26,800		26,800

*Note: Profit transferred to Profit and Loss Account is computed by the following method:

Notional Profit × 2/3 × Cash ratio.

How much of profit, if any, you would consider in the following case:

Contract price	` 20,00,000
Cost incurred	` 11,20,000
Cash received	` 10,80,000
Work not certified	` 1,20,000

Deduction from bills by way of security deposit is 10%.   (*Adapted*)

Solution:

Cash received is $100 - 10\% = 90\%$ of the bills or work certified. Thus work certified:

$$= 10,80,000 \times \frac{100}{90} = `\ 12,00,000$$

Notional profit $\qquad$ = (Work certified + Uncertified) – Cost incurred

$$= (12,00,000 + 1,20,000) - 11,20,000 = `\ 2,00,000.$$

Work certified is $\dfrac{12,00,000}{20,00,000} \times 100 = 60\%$ of the contract price, profit to be transferred

to P&L A/c is computed as follows:

Notional profit $\times$ 2/3 $\times$ cash ratio

$$= 2,00,000 \times 2/3 \times 90\% = `\ 1,20,000.$$

The following were the expenses on a contract which commenced on 1st January 2015.

`

Materials purchased	1,10,000
Material at the end	1,250
Direct wages	15,000
Plant issued	5,000
Direct expenses	8,000

The contract price was ` 1,50,000. It was duly received when the contract was completed on 31-3-2015. Charge indirect expenses at 15% on wages and provide ` 1,000 for depreciation on plant. Prepare the contract account and contractee's account.

Solution:

Contract Account for the year ending 31-12-2015

Particulars	`	Particulars	`
To Materials	1,10,000	By Contractee's A/c (Contract price)	1,50,000
To Direct wages	15,000	By Materials at the end	1,250
To Direct expenses	8,000	By Plant at the end (5,000 – 1,000)	4,000
To Indirect expenses (15% on 15,000)	2,250		
To Plant issued	5,000		
To Profit and Loss A/c	15,000		
	1,55,250		1,55,250

Contractee's Account for the year ending 31-12-2015

Particulars	`	Particulars	`
To Contract A/c	1,50,000	By Bank	1,50,000
	1,50,000		1,50,000

Note: As the contract is fully complete, entire profit is transferred to profit and loss account.

The Indian Construction Co. Ltd. has undertaken the construction of a bridge over the River Yamuna for a Corporation. The value of the contract is ` 15,00,000 subject to retention of 20% until one year after certified completion of the contract, and final approval of the Corporation's engineer. The following are the details as shown in the books on 30th June, 2015.

	`		`
Labour on site	4,05,000	Materials on hand on June 30th, 2015	6,300
Materials direct to site	4,20,000	Wages accrued on June 30th, 2015	7,800
Materials from stores	81,200	Direct expenses accrued on June 30th 2015	1,600
Hire and use of plant	12,100	Works not yet certified at cost	16,500
Direct expenses	23,000	Amount certified by the Corporation's	
General overhead allocated to the		engineer	11,00,000
contract	37,100	Cash received on account	8,80,000

Prepare (a) Contract Account, (b) Contractee's Account, and (c) show how it would appear in the Balance Sheet.

(B.Com., Delhi)

Solution:

Contract Account for the year ending 30th June, 2015

Particulars	`	Particulars	`
To Materials direct to site	4,20,000	By Materials on hand	6,300
To Materials from store	81,200	By Work-in-progress:	
To Labour on site	4,05,000	Certified	11,00,000
To Hire and use of plant	12,100	Uncertified	16,500
To General overhead	37,100		
To Wages accrued	7,800		
To Direct expenses	23,000		
To Direct expenses accrued	1,600		
To Notional profit c/d	1,35,000		
	11,202,800		11,202,800
To P&L A/c	72,000	By Notional Profit c/d	1,35,000
$\left(1,35,000 \times \dfrac{2}{3} \times \dfrac{8,80,000}{11,00,000}\right)$			
To Reserve	63,000		
	1,35,000		1,35,000

Contractee's Account

Particulars	`	Particulars	`
To Contract A/c	8,80,000	By Cash	8,80,000
	8,80,000		8,80,000

Balance Sheet as on 30th June, 2015

Liabilities	`	Assets		`
Wages accrued	7,80,000	Work certified	11,00,000	
Direct expenses accrued	1,600	Work uncertified	16,500	
			11,16,500	
		Less: Cash received	8,80,000	
			2,36,500	
		Less: Reserve	63,000	1,73,500

Modern Contractors have undertaken the following two contracts on Ist January, 2015:

	Contract A `	Contract B `
Materials sent to sites	85,349	73,267
Labour engaged on sites	74,375	68,523
Plants installed at sites at cost	15,000	12,500
Direct expenditure	3,167	2,859
Establishment charges	4,126	3,852
Materials returned to store	549	632
Work certified	1,95,000	1,45,000
Cost of work not certified	4,500	3,000
Materials in hand 31st Dec., 2015	1,883	1,736
Wages accrued 31st Dec., 2015	2,400	2,100
Direct expenditure accrued 31st Dec., 2015	240	180
Value on plant 31st Dec., 2015	11,000	9,500

The contract prices have been agreed at ` 2,50,000 for contract A and ` 2,00,000 for contract B. Cash has been received from the contractees as follows: Contract A ` 1,80,000 and Contract B ` 1,40,000.

Prepare Contract Accounts, Contractees Accounts and show how the work-in-progress shall appear in the Balance Sheet of the contractor. *(B.Com., Delhi; Bangalore)*

Solution:

Contract 'A' Account for the year ending 31st Dec., 2015

Particulars	`	Particulars		`
To Materials sent to site	85,349	By Materials (returned to stores)		549
To Labour	74,375	By Materials in hand		1,883
To Plant	15,000	By Plant in hand		11,000
To Direct expenditure	3,167	By Work-in-progress:		
To Establishment charges	4,126	Work certified	1,95,000	
To Wages accrued	2,400	Work uncertified	4,500	
				1,99,500
To Direct expenses accrued	240			
To Notional Profit c/d	28,275			
	2,12,932			2,12,932
To Profit & l.oss A/c	17,400 *	By Notional Profit b/d		28,275
To Balance c/d (Reserve)	10,875			
	28,275			28,275

*Note: Proportion of profit transferred to Profit and Loss Account has been calculated by the following formula:

$$\text{Notional profit} \times \frac{2}{3} \times \frac{\text{Cash received}}{\text{Work certified}} = 28,275 \times \frac{2}{3} \times \frac{1,80,000}{1,95,000} = ` \; 17,400$$

A Contractee's Account

	Particulars	`		Particulars	`
2015 Dec.31	To Balance c/d	1,80,000	2015 Dec. 31	By Cash	1,80,000
		1,80,000			1,80,000
			2016 Jan. 1	By Balance b/d	1,80,000

Contract 'B' Account for the year ending 31st Dec., 2015

Particulars	`.	Particulars		`.
To Materials	73,267	By Materials returned to store		632
To Labour	68,523	By Materials in hand		1,736
To Plant	12,500	By Plant in hand		9,500
To Direct expenditure	2,859	By Work-in-progress:		
To Establishment charges	3,852	Work certified	1,45,000	
To Wages accrued	2,100	Work uncertified	3,000	1,48,000
To Direct expenditure accrued	180	By Loss transfer to P&L A/c		3,413
	1,63,281			1,63,281

B Contractee's Account

	Particulars	`		Particulars	`
2015 Dec.31	ToBalance c/d	1,40,000	2015 Dec. 31	By Cash	1,40,000
		1,40,000			1,40,000
			2016 Jan. 1	By Balance b/d	1,40,000

Balance Sheet as on Dec. 31, 2015

Liabilities		`	Assets		`.
Wages accrued (2,400 + 2,100)		4,500	Plant less Depreciation (27,500 – 7,000)		20,500
Direct expenses accrued (240 + 180)		420	Materials in hand		3,619
			Work-in-progress:		
Profit on contract A	17,400		**Contract A**		
Less: Loss on contract B	3,413	13,987	Work certified	1,95,000	
			Work uncertified	4,500	
				1,99,500	
			Less: Profit in reserve	10,875	
				1,88,625	
			Less: Cash received	1,80,000	8,625
			Contract B		
			Work certified	1,45,000	
			Work uncertified	3,000	
				1,48,000	
			Less: Cash received	1,40,000	8,000

Compute a conservative estimate of profit on a contract (which is 80% complete) from the following particulars. Illustrate at least four methods of computing the profit transferable to P&L A/c.

Total expenditure	85,000
Estimated further expenditure to complete the contract (including contingencies)	17,000
Contract price	1,53,000
Work certified	1,00,000
Work not certified	8,500
Cash received	81,600

Solution:

Calculation of Notional Profit	`	Calculation of Estimated Profit		`
Work certified	1,00,000	Contract price		1,53,000
Uncertified	8,500	*Less:* Expenditure incurred	85,000	
	1,08,500	Estimated further expenditure	17,000	1,02,000
Less: Expenditure incurred	85,000			
Notional profit	23,500	Estimated profit		51,000

Methods of computing the profit to be transferred to P&L A/c

1. Notional Profit $\times \dfrac{2}{3} \times$ Cash ratio $= 23{,}500 \times \dfrac{2}{3} \times \dfrac{81{,}600}{1{,}00{,}000}$ = ` 12,784 (approx.)

2. Notional Profit $\times \dfrac{2}{3} = 23{,}500 \times \dfrac{2}{3}$ = ` 15,667 (approx.)

3. Estimated Profit $\times \dfrac{\text{Work certified}}{\text{Contract price}} \times$ Cash ratio $= 51{,}000 \times \dfrac{1{,}00{,}000}{1{,}53{,}000} \times \dfrac{81{,}600}{1{,}00{,}000}$ = ` 27,200

4. Estimated Profit $\times \dfrac{\text{Total cost to date}}{\text{Estimated total cost}} \times$ Cash ratio $= 51{,}000 \times \dfrac{85{,}000}{1{,}02{,}000} \times \dfrac{81{,}600}{1{,}00{,}000}$ = ` 34,680

An expenditure of ` 3,88,000 has been incurred on a contract upto the end of 31st December, 2015. The value of work certified is ` 4,40,000. The cost of work uncertified is ` 12,000. It is estimated that contract will be completed by 31st March, 2015 and an additional expenditure of ` 80,000 will have to be incurred to complete the contract. The total estimated expenditure on the contract is to include a provision of 2.5 per cent for contingencies. The contract price is ` 5,60,000 and ` 4,00,000 has been realised in cash upto 31st December, 2015. Calculate the proportion of profit to be taken to Profit and Loss Account as on 31st December, 2015 under different methods.   (*B.Com. Hons., Delhi; M.Com. Madras*)

Solution:

Calculation of Notional Profit		Estimated Profit on Full Contract		
	`			`
Value of work certified	4,40,000	Contract price		5,60,000
Add: Cost of work not certified	12,000	Less: Cost to date	3,88,000	
	4,52,000	Further cost	80,000	
		Contingencies	12,000 *	
Less: Cost to date	3,88,000			4,80,000
Notional Profit	64,000	Estimated profit		80,000

$$* \ (3,88,000 + 80,000) \times \frac{2.5}{97.5} = \text{`} \ 12,000 \text{ for contingencies.}$$

Profit to be transferred to Profit and Loss Account

Method (*i*) $\frac{2}{3}$ × Notional profit $= \frac{2}{3}$ × 64,000   = ` 42,667

Method (*ii*) $\frac{2}{3}$ × Notional profit × $\dfrac{\text{Cash received}}{\text{Work certified}} = \frac{2}{3}$ × 64,000 × $\dfrac{4,00,000}{4,40,000}$ = ` 38,788

Method (*iii*) Estimated profit × $\dfrac{\text{Work certified}}{\text{Contract price}}$ = 80,000 × $\dfrac{4,40,000}{5,60,000}$ = ` 62,857

Method (*iv*) Estimated profit × $\dfrac{\text{Work certified}}{\text{Contract price}}$ × $\dfrac{\text{Cash received}}{\text{Work certified}}$

       = 80,000 × $\dfrac{4,40,000}{5,60,000}$ × $\dfrac{4,00,000}{4,40,000}$ = ` 57,143

Elite Ltd. was engaged on one contract during the year 2015. The contract price was ` 2,00,000. The Trial Balance extracted from the books on 31st December, 2015 stood as follows:

	`	`
Share capital	—	40,000
Sundry creditors	—	4,000
Building	17,000	—
Cash at bank	4,500	—
Contract account:		
Materials	37,500	—
Plant	10,000	—
Wages	52,500	—
Cash received from contractee (80% of certified work)	—	80,000
Expenses	2,500	—
	1,24,000	1,24,000

Of the plant and materials charged to the contract, plant costing ` 1,500 and materials costing ` 1,200 were destroyed by an accident.

On 31-12-2015, plant costing ` 2,000 was returned to stores and material at site was valued at ` 1,500. Cost of uncertified work was ` 1,000. Charge 10% depreciation on plant.

Prepare Contract Account for the year 2015 and Balance Sheet as on 31-12-2015.

(B.Com., Bangalore)

Solution:

Contract Account for the year ending 31st Dec., 2015

Particulars	`	Particulars	`
To Materials	37,500	By Plant returned to store	
To Wages	52,500	(2,000 *less* 10% Depreciation)	1,800
To Expenses	2,500	By Plant at site	5,850
To Plant installed	10,000	By Plant destroyed	1,500
To Notional profit c/d	10,350	By Materials lost	1,200
		By Materials at site	1,500
		By Work-in-progress:	
		Certified*	1,00,000
		Uncertified	1,000
	1,12,850		1,12,850
To P&L A/c	5,250	By Notional profit b/d	5,250
$\left(10,350 \times \dfrac{2}{3} \times \dfrac{80,000}{1,00,000}\right)$			
To Reserve	4,830	By Notional profit b/d	5,250
	10,350		10,350

Balance Sheet as on 31st Dec., 2015

Liabilities		`	Assets		`
Share Capital		40,000	Building		17,000
Sundry Creditors		4,000	Bank		4,500
			Plant in store		
Profit and Loss A/c	5,520		Plant at site		
Less : Plant destroyed	1,500		Materials at site		
	4,020		Work-in-progress:		
Less : Materials lost	1,200	2,820	Certified	1,00,000	
			Uncertified	1,000	
				1,01,000	
			Less: Cash received	80,000	
				21,000	
			Less: Reserve	4,830	16,170
		46,820			46,820

PROCESS COSTING

Meaning

It is a method of costing adopted to find out the cost of those goods which are manufactured stages. Each stage is called a process. The output of each process becomes the input for the ne process and so on. The product becomes a finished product only after it passes through all the process

Example: R/M

Passes through →

FG

Various Process

1	2	3
Input R/M	Input R/M	Input R/M
Output	Output	Output
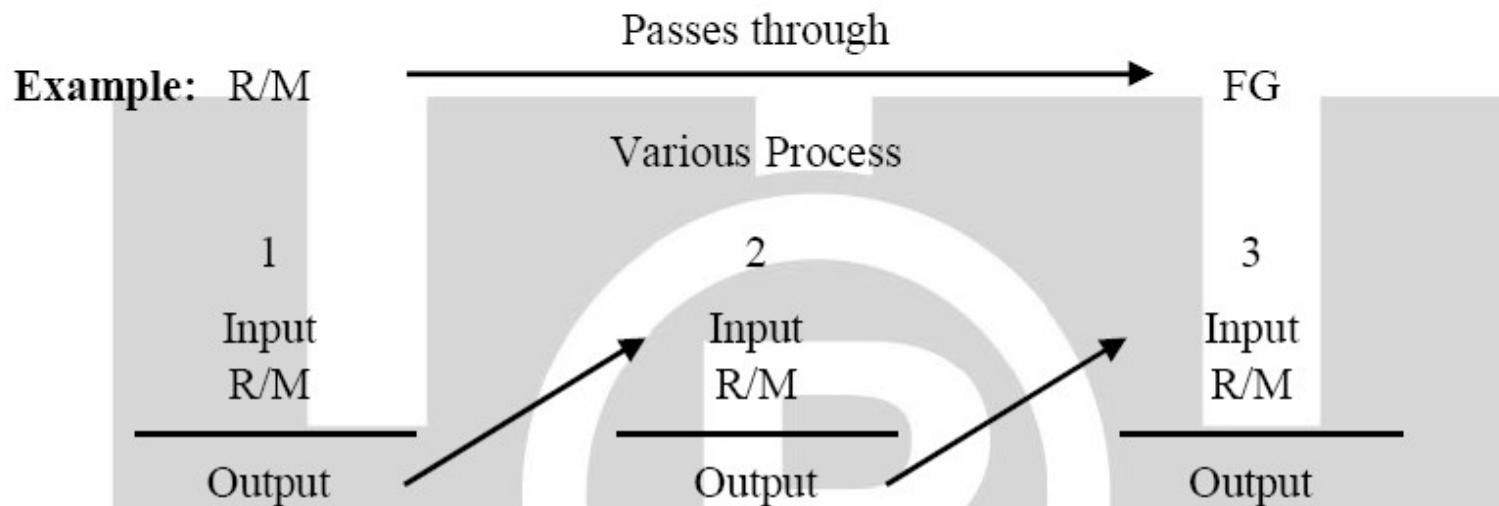
The raw material introduced in the first process loses its identity and the output is transferred the next process.

Example: Process costing is applicable to product like sugar industry, oil industry, pap industry. etc. On account of processing, certain losses occur at each process. There are two types losses in process costing.

Example:

Input   20 Kgs

(−) Output   18 Kgs

────────────────────────

= Loss 2 Kgs

Abnormal loss   Normal loss
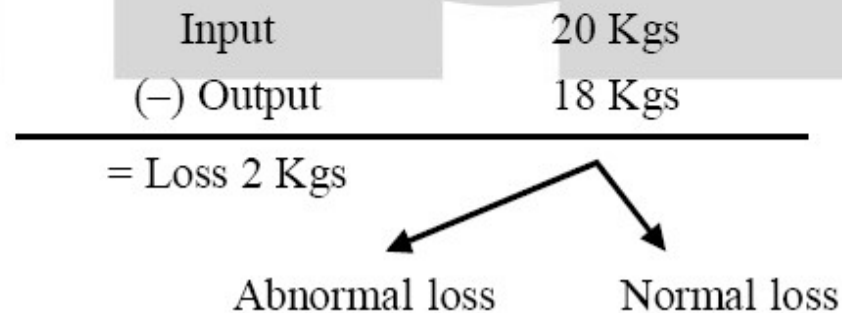
A. Normal Loss

1. It is a loss due to internal factors like heating, boiling, evaporation, etc.
2. It is an expected loss.
3. It is a predetermined % on the input quantity.
4. It is unavoidable and therefore it is uncontrollable loss.
5. It is normally of two types: (a) Scrap: It has realisable value. (b) Weight loss: It has no realisable value because it is an invisible process.
6. It is credited to Process A/c and calculated as a % on the input quantity.

B. Abnormal Loss

1. It is loss due to external factors like natural calamity, loss by fire or theft, strikes, breakdown of machine, etc.

2. It is unexpected loss.

3. It is avoidable to some extent and therefore controllable.

4. It is credited to Process A/c as balancing figure in the quantity column.

5. The amount column is calculated by using the formula:

$$\text{Abnormal Loss (Amt.)} = \frac{\text{Dr} - \text{Cr (Amt Col.)}}{\text{Dr} - \text{Cr (Qty to \%)}} \times \text{Abnormal Loss (Qty)}$$

C. Abnormal Gain/Profit

1. When actual loss is less than the expected loss, it is called an abnormal gain.
2. It is due to superior quantity of R/M, efficient labour, advanced technology, etc.
3. Recorded on debit side of Process A/c as a balance figure in the quantity column.
4. The amount column in calculated by using the formula:

$$\text{Abnormal Gains (Amt.)} = \frac{\text{Dr} - \text{Cr (Amt column)}}{\text{Dr} - \text{Cr (Qty column)}} \times \text{Abnormal Gain (Qty)}$$

[PRO FORMA]

Dr.   Process 1 A/c   **Cr.**

Particulars	Qty	Amt	Particulars	Qty.	Amt.
To R/M Introduced	X X	X X	By Normal Loss A/c		
To DM		X X	(1) Scrap	X X	X X
To DL		X X	(2) Weight loss	X X	Nil
To DE		X X			
To Factory Exp.		X X			
To Manufacture Exp.		X X	By Abnormal loss	X X (Balancing)	(Formula)
To Abnormal Gain	X X (Balancing)	(Formula)			
			By Output c/d or transferred to Process 2 A/c (C.P.U.)	X X	X X X (Balancing)
	X X	X X		X X	X X

Notes:
- R/M is introduced in the first process.
- The output of first process becomes input raw material for the next process and so on.
- The output of last process is finally transferred to FINISHED GOODS STOCK ACCOUNT.
- Cost per Unit, i.e., (C.P.U.) must be calculated for each Process A/c.

Dr. Process 2 A/c **Cr.**

Particulars	Qty	Amt	Particulars	Qty	Amt
To Input from Process 1 A/c	X X	X X	By Normal Loss	X X	X X
To DM		X X	By Abnormal Loss	X X (Balancing)	(Formula)
To DL		X X			

Process Costing 3

To DE		X X	By Output transferred to Finished Stock A/c (C.P.U.)	X X	X X X
To Factory Exp		X X			
To Manufacturing Exp		X X			
To Abnormal Gain	X X	(Formula)			
	X X	X X	X X	X X	X X

Features of Process Costing

- 1. Process costing is used by the industries where the goods are produced through the sequence of several processes. Process costing is suitable for industries like paint, oil refining, rubber, chemicals, sugar, paper, soap-making, textiles, etc. This method is also employed where it is not possible to ascertain the prime cost of specific order.

- 2. Units of production are uniform and homogeneous. As a result, unit cost of each process is obtained by averaging the total cost of each process.

- 3. Costs are ascertained for each process at the end of the cost period.

- 4. Costs follow the production process, i.e., costs incurred in one process are transferred to the next process along with the output.

Features of Process Costing

- 5. The entire production activity is characterised by a number of stages of production, i.e., processes. Each process includes a number of operations. The boundaries of the process are determined by similarity of work performed, supervision and physical location of men and machines in the plant.

- 6. The products and processes are standardised.

- 7. Production is in continuous flow and the output of Process I becomes the input of Process II and so on until the finished product is obtained.

- 8. Total cost of the process is adjusted with normal losses, abnormal losses, abnormal gains and scrap of the process.

Advantages of Process Costing

- 1. Due to the simplicity of cost records, process costing involves less efforts and expenses on accounting.

- 2. Production activity in process costing is standardised. Hence, managerial control and supervision becomes easier.

- 3. It is convenient and easy to compute the cost of different processes as well as finished product at short intervals, say, daily, weekly or monthly.

- 4. In case of process costing, it is possible to allocate expenses to different processes on rational basis. This results into more accurate costing.

- 5. In process costing, products and processes are standardised. Hence, it is easy to apply standard costing.

Limitations of Process Costing

- 1. Value of work-in-progress is computed on the basis of estimates which results in further inaccuracies.

- 2. Once an error is committed in one process, it is carried over to the subsequent processes.

- 3. Since process cost is the average cost, it may not be accurate for analysis, evaluation and control of the performance of various departments.

- 4. The cost obtained at the end of the accounting period is historical in nature and is of little use for effective managerial control.

- 5. Process costing does not evaluate the efficiency of individual workers or supervisors.

Distinction between Job Costing and Process Costing

Process costing and job costing are two principal methods of cost accounting. The main points of distinction between job costing and process costing may be listed as under:

Points of Distinction	Job Costing	Process costing
1. Time period	Costs are complied after the completion of the job. Job cost is a terminal cost.	Costs are complied at the end of the each process. Process cost is a period cost.
2. Accumulation	Since each job is separate and independent of others, costs are determined for each job.	Since products are manufactured in a continuos flow and lose their individual entity, costs are accumulated for each process.
3. Applicability	It is applicable to goods manufactured to consumer's specifications.	It is applicable to production for mass consumption through the sequence of several processes.
4. Nature	Cost incurred on jobs need to be identified separately for each job. It is very expensive and requires lot of clerical work.	Cost incurred on units need not be identified separately. It is very simple and less expensive.
5. Unit cost	Total cost of a job is divided by the number of units produced in the job to ascertain unit cost of a job. Cost of a job cannot be ascertained by averaging.	Unit cost is ascertained by dividing total cost of each process by production of each process. Cost of an unit is computed by averaging the total cost.

6. Work-in-progress	There may or may not be work-in-progress at the beginning or at the end of the accounting period.	There is always work-in-progress at the beginning or end of the accounting period since units of production remain in continuous flow.
7. Transfer of cost	There are usually no transfers of cost from one job to another job.	Costs of one process is transferred to subsequent process.
8. Managerial control	Since production is not in continuous flow, job costing requires close supervision and managerial control.	Since production is standardised and continuous, managerial control is easier.

Preparation of Process Cost Accounts

For each process, a separate process account is maintained. The following situations might arise while preparing process accounts:

(i)   Process costing with no process loss and no stock,

(ii)   Process costing having process losses,

(iii)   Process costing having abnormal gain,

(iv)   Process costing having stocks.

A product passes through 3 process. The following cost is given below:

Particulars	Total `	1 `	2 `	3 `
Direct Material	8,482	2,000	3,020	3,462
Direct Labour	12,000	3,000	4,000	5,000
Expenses (direct)	726	500	226	—
Production Overhead	6,000	?	?	?
Output		920 units	870 units	800 units
Normal loss		10%	5%	10%
Sale price of scrap p.u.		3	` 5	` 6

(1,000 unit at the Rate ` 5 were introduced in Process 1.)

Production overheads is allocated to each process on the basis of 50% cost of Direct Labour. Prepare necessary Process A/c. Also calculate cost p.u. for each process.

Solution:

Dr.   **Process 1 A/c**   Cr.

Particulars	Qty	Amt	Particulars	Qty	Amt
To R.M. Introduced (1000 × ` 5)	1,000	5,000	By Normal loss $\begin{bmatrix} 1,000 \times \\ 100 \times \text{` 3 p.u.} \end{bmatrix}$10%	100	300
To DM	–	2,000			
To DL	–	3,000			
To Direct Expenses	–	500			
To Production Overheads	-	1,500			
To Abnormal Gain (C.P.U. = ` 13)	20	260 (Formula)	By Output transferred to Process 2 A/c (C.P.U. = ` 13)	920	11,960
	1,020	**12,260**		**1,020**	**12,260**

Working Note 1:

$$\text{Abnormal Gain (Amt)} = \frac{\text{Dr} - \text{Cr (Amt Column)}}{\text{Dr} - \text{Cr (Qty Column)}} \times \text{Abnormal Gain (Qty)}$$

$$= \frac{12,000 - 300}{1,000 - 100} \times 20$$

$$= \frac{11,700}{900} \times 20 = \text{` } 260$$

Dr.   Process 2 A/c   **Cr.**

Particulars	Qty	Amt	Particulars	Qty	Amt
To Input from Process A A/c		11,960	By Normal loss		
	920	17,960	(5% × 920)	46	
To DM	–	3,020	(46 × ` 5)		230
To DL	–	4,000	By Abnormal loss	04	96
To Direct Expenses	–	226	(C.P.U. = ` 24)		(Formula)
To Production Overheads		2,000	By Output transferred to		
			Process 3 A/c	870	20,880
			(C.P.U. = ` 24)		
	920	21,206		920	21,206

Dr.   Process 3 A/c   **Cr.**

Particulars	Qty	Amt	Particulars	Qty	Amt
To Input from Process B A/c			By Normal loss		
	870	20,880	(870 × 10%)	87	
To DM		3,462	(87 × ` 6)		522
To DL		5,000	By Output transferred to		
To Direct Expenses		–	F.G. Stock A/c	800	32,000

To Production Overheads		2,500	(C.P.U. = ` 40)			
To Abnormal Gain (C.P.U. = ` 40)	17	680 (Formula)				
	887	**32,522**			**887**	**32,522**

Working Note 2: Abnormal Loss (Amt) $= \dfrac{Dr - Cr \text{ (Amt Column)}}{Dr - Cr \text{ (Amt Column)}} \times$ Abnormal Loss (Qty)

$$= \dfrac{21,206 - 230}{920 - 46} \times 04 \quad = \dfrac{20,976}{874} \times 4 \quad = \text{ ` } 96$$

Working Note 3: Abnormal Gain $= \dfrac{Dr - Cr \text{ (Amt Column)}}{Dr - Cr \text{ (Qty Column)}} \times$ Abnormal Gain (Qty)

$$= \dfrac{31,842 - 522}{870 - 87} \times 04 \quad = \text{ ` } 680$$

A product passes through 3 process in each process. 2% of the gross weight is lost and 10% is scrap which in case of A and B realised @ ` 100 per quintal and in case of Process C @ ` 200 per quintal.

Particulars	A	B	C
Material	8,000 quintal @ ` 500/quintal	1,000 quintal @ ` 200/quintal	900 quintal @ ` 650/quintal
Labour	` 50,000	25,000	20,000
Direct expenses	20,500	10,800	17,200
General expenses related to material	7,000	1,500	4,300
Cost of tins	—	10,750	—
Packing of tins	—	—	4,500

Indirect expenses are ` 5,000 which are to be apportioned to all the three process in the ratio of combined cost of material and wages. Calculate the C.P.U. of each process.

Solution:

* Calculation of Indirect Expenses

	DM	DL	(DM + DL) Combined Cost	Indirect Expenses
A	40,00,000	50,000	40,50,000	4,150
B	2,00,000	25,000	2,25,000	230
C	5,85,000	20,000	6,05,000	620
Total			48,80,000	5,000

Note: To calculate the Indirect Expenses for process A, B, C, cross multiply the total of combined cost with Indirect expenses:

In this question, output is not given for process A, B, and C. Therefore, output is calculated as a balancing figure for each Process A/c.

Dr.   **Process A A/c**   **Cr.**

Particulars	Qty	Amt	Particulars	Qty	Amt
To RM introduced (8,000 × 500)	8,000	40,00,000	By Normal loss (Scrap 10% × 8,000) (800 × 100)	800	80,000
To DL		50,000	Weight loss	160	NIL
To DE		20,500	(2% × 8,000)		
To GE		7,000			
To Indirect expenses		4,150	By Output transferred to Process B A/c (C.P.U. = ` 568.42)	7,040	40,01,650
	8,000	40,81,650		8,000	40,81,650

Dr.   **Process B A/c**   **Cr.**

Particulars	Qty	Amt	Particulars	Qty	Amt
To Input from Process A A/c	7,040	40,01,650	By Normal loss (Scrap 10% of 8040) (804 × 100)	804	80,400
To DM (1,000 × 200)	1,000	2,00,000			
To DL		25,000			
To DE			Weight loss (2% of 8040)	161	Nil
To GE		1,080			
To Indirect expenses		230	By Output transferred to Process C A/c (C.P.U. = ` 589.33)	7,075	41,69,530
To Cost of tin		10,750			
	8,040	42,49,930		8,040	42,49,930

Dr. Process C A/c **Cr**

Particulars	Qty	Amt	Particulars	Qty	Amt
To Input from Process B A/c	7,075	41,69,530	By Net loss		
To DM (900 × 650)	900	5,85,000	(Scrap 10% of 7,975)	798	
To DL		20,000	(798 × 200)		1,59,600
To DE		17,200	Weight loss	160	Nil
To GE		4,300	(2% of 7,975)		
To Indirect expenses		620			
To Packing		4,500	By Output transferred	7,017	46,41,550
			to F.G. A/c		
			(C.P.U. = ` 661.47)		
	7,975	**48,01,150**		**7,975**	**48,01,150**

A chemical company produces a product with 2% of weight loss in each process and 10% of scrap loss in each process for which ` 100 p.u. for process 1 and 2 is realised and ` 20 p.u. for process 3 is realised.

The input quantity for each process is 1,000 units, 140 units and 1,348 units respectively.

Particulars	Process 1	Process 2	Process 3
Direct material	1,20,000	28,000	1,07,840
Manufacturing wages	20,500	18,520	15,000
General expenses	10,300	7,240	3,100
Stock kept for sale	25%	50%	100%
Passed to next process	75%	50%	Nil

Solution:

Dr. Process 1 A/c Cr.

Particulars	Qty	Amt	Particulars	Qty	Amt
To DM (RM Introduced)	1,000	1,20,000	By Normal loss		
To Manufacturing wages		20,500	(a) Weight loss	20	Nil
To General Expenses		10,300	(2% of 1000)		
			(b) Scrap		
			(10% of 1000	100	
			100 × ` 100)		10,000
			By Output c/d	880	1,40,800
			(C.P.U. = 160)		
	1,000	**1,50,800**		**1,000**	**1,50,800**
To Output b/d	880	1,40,800	By Sales (220 × ` 160)	220	35,200
			By Output transferred to P-2 A/c (C.P.U. = ` 160)	660	1,05,600
	880	**1,40,800**		**880**	**1,40,800**

Note: When the question is silent, the goods sold will be recorded at cost price. Alternatively, it is recorded at COST + PROFIT = SALES.
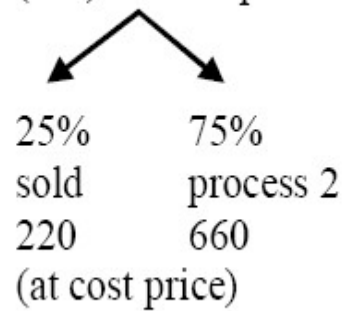
- Cost Price means cost per unit of respective Process A/c.
- In this question for process 2 and 3, scrap and weight loss is calculated on total input raw material quantity.

Dr. Process 2 A/c **Cr.**

Particulars	Qty	Amt	Particulars	Qty	Amt
To Input from Process 1 A/c	660	1,05,600	By Normal loss:		
To DM	140	28,000	(a) Weight loss	16	Nil
To Manufacture wages		18,520	(2% of 800)		
To General expenses		7,240	(b) Scrap		
			(10% × 800	80	
			80 × 100)		800
			By Output c/d	704	1,51,360
			(C.P.U. = 215)		
	800	**1,59,360**		**800**	**1,59,360**
To Output b/d	704	1,51,360	By Sales (352 × 215)	352	75,680
			By Output transferred to P-3 A/c (C.P.U. = 215)	352	75,680
	704	**1,51,360**		**704**	**1,51,360**

Dr. | Process 3 A/c | **Cr.**

Particulars	Qty	Amt	Particulars	Qty	Amt
To Input from Process 2 A/c	352	75,680	By Normal loss:		
To DM	1,348	1,07,840	(a) Weight loss	34	Nil
To Manufacture wages		15,000	(12% of 1,700)		
To General expenses		3,100	(b) Scrap		
			(10% × 800	170	
			80 × 100)		3,400
			By Output c/d	1,700	2,01,620
			(C.P.U. = 132.5)		
	1,700	**2,01,620**		**1,700**	**2,01,620**
To Output b/d	1,496	1,98,220	By Sales A/c	1,496	1,98,220
			(100 Sold)		
			(1,496 × ` 132.5)		
	1,496	**1,98,220**		**1,496**	**1,98,220**

Working Note 1:

(P-1)   output 880   (P-2)   output 704   (P-3) output 1496

25%	75%		50%	50%		100% Sold
sold	process 2		352	352		(at cost price)
220	660		(Sold Process 3			
(at cost price)			at cost price)			
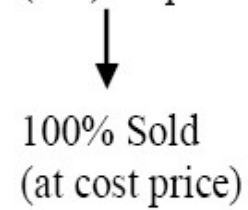
The following details are extracted from the costing records of an oil refinery for the week ended September 30.

Purchase of 500 tonnes of copra ` 2,00,000.

	Crushing (`)	Refining (`)	Finishing (`)
Cost of Labour	2,500	1,000	1,500
Electric Power	600	360	240
Sundry Material	100	2,000	–
Repairs to Machinery and Plant	280	330	140
Steam	600	450	450
Factory Expenses	1,320	660	220
Cost of Casks	–	–	750

300 tonnes of crude oil was produced.

250 tonnes of oil was produced by refining process.

248 tonnes refined oil was finished for delivery.

Copra stock sold ` 400.

175 tons of copra residue sold ` 11,000.

Loss in weight in crushing 25 tonnes.

45 tonnes by-product was obtained from refining process valued at ` 6,700.

You are required to show the accounts in respect of each of the following stages of manufacture for the purpose of arriving at the cost per tonne of each process and also the total cost per tonne of finished oil.

(a) Copra Crushing Process A/c

(b) Refining Process A/c

(c) Finishing Process A/c

Solution:

Dr.   **Crushing Process A/c**   Cr.

Particulars	Units	Amount	Particulars	Units	Amount
To Purchase of Copra	500	2,00,000	By Loss	25	—
To Labour		2,500	By Sales of Copra	175	11,000
To Electricity		600	By Sale of Copra Sacks		400
To Sundry Material		100	By Units Transferred to Refining Process (646.67)	300	1,94,000
To Repairs		280			
To Steam		600			
To Factory Expenses		1,320			
	500	**2,05,400**		**500**	**2,05,400**

Dr.   **Refining Progress A/c**   **Cr.**

Particulars	Units	Amount	Particulars	Units	Amount
To Units Transferred from Crushing Process	300	1,94,000	By Loss	5	—
To Labour		1,000	By By-product	45	6,700
To Electricity		360	By Units Transferred to Finishing Process A/c (768.4)	250	1,92,100
To Sundry Material		2,000			
To Repairs		330			
To Steam		450			
To Factory Expenses		660			
	300	1,98,800		300	1,98,800

Dr.　　　　　　　　　　　　　　　**Finishing Process A/c**　　　　　　　　　　　　　　　**Cr.**

Particulars	Units	Amount	Particulars	Units	Amount
To Units Transferred Refining Process A/c	250	1,92,100	By Loss by Units Transferred to Finished Stock A/c (787.90)	2	—
To Labour		1,500		248	1,95,400
To Electricity		240			
To Sundry Material		—			
To Repairs		140			
To Steam		450			
To Factory Expenses		220			
To Cost of Sacks		750			
	250	1,95,400		250	1,95,400

$$\text{Total Cost per tonne of finished oil} = \frac{1,95,400}{248} = 787.90$$

In a process engineering factory, a product has to pass through three distinct processes before it is ready for sale. From the information appended below, work out the selling price if the management decides to have a mark up of 25% over its works cost.

1. Stages of Production	I	II	III
2. Input of Raw Materials at ` 4 per kg.	1,00,000 kg.		
3. Normal Loss on input of each stage	5%	5%	5%
4. Delivered to Net Process (kg.)	90,000	80,000	—
5. Direct Labour cost (Rupees)	14,000	15,000	30,000
6. Variable overheads % on Direct labours	150	120	100
7. Fixed Overheads % on Direct Labour	250	140	200
8. Finished Stocks held back at the stage (units)	4,000	4,000	—

For the purpose of this exercise, abnormal loss, if, any, may be charged to the respective stages.

Solution:

Dr.   **Process I A/c**   Cr.

Particulars	Units	Amount	Particulars	Units	Amount
To Raw Materials	1,00,000	4,00,000	By Normal Loss	5,000	—
To Direct Labour		14,000	By Abnormal Loss	1,000	—
To Variable Overheads		21,000	By Units Transferred to Process II	90,000	4,50,000
To Fixed Overheads		35,000	By Closing Stock (5)	4,000	20,000
	1,00,000	**4,70,000**		**1,00,000**	**4,70,000**

Process II A/c

Particulars	Units	Amount	Particulars	Units	Amount
To Units Transferred from Process I	90,000	4,50,000	By Normal Loss	4,500	—
To Direct Labour		15,000	By Abnormal Loss (Bal. fig.)	1,500	—
To Variable Overheads		18,000	By Units Transferred to Process III	80,000	4,80,000
To Fixed Overheads		21,000	By Closing Stock (6)	4,000	24,000
	90,000	5,04,000		90,000	5,04,000

Note: It is given in question that cost of Abnormal loss to be charged to that particular stage only, i.e., not to be shown separately. Therefore, total cost is divided by actual number of units of output, to arrive at PCPU.

Product 'P' passes through three processes for completion. The following are the relevant details:

(a) Elements of Cost

Particulars	Process			
	Total (`)	No. 1 (`)	No. 2 (`)	No. 3 (`)
Direct Materials	8,482	2,000	3,020	3,462
Direct Labour	12,000	3,000	4,000	5,000
Direct Expenses	726	500	226	–
Production Overhead	6,000	–	–	–

(b) 1,000 units at ` 5 each were issued to Process No. 1.

(c) Output from each process was:

Process No. 1   920 units

Process No. 2   870 units

Process No. 3   800 units

(d) Normal Loss per process was estimated as:

Process No. 1   10% of units introduced

Process No. 2   5% of units introduced

Process No. 3   10% of units introduced

(e) The loss in each process represented scrap which could be sold to merchant at value as follows:

Process No. 1   ` 3 per unit

Process No. 2   ` 3 per unit

Process No. 3   ` 6 per unit

(f) There was no stock of materials or works-in-progress in any department at the beginning or end of the period. The output of each process passes direct to the next process and finally stock. Production overhead is allocated to each process on the basis of 50% of the cost of direct labour.

Solution:

Dr.   Process No. 1 A/c   Cr.

Particulars	Units	Amount	Particulars	Units	Amount
To Units introduced	1,000	5,000	By Normal loss	100	300
To Direct Material		2,000	By Units Transferred to	920	11,960
			Process No. 2 A/c (13)		
To Direct Labour		3,000			
To Direct Expenses		500			
To Production overheads		1,500			
To Abnormal Gain	20	260			
	1,020	**12,260**		**1,020**	**12,260**

Working Note:

Input	1,000
(−) Normal Loss	100
Expected	900
Actual	920
Abnormal Gain	20

$$\text{PCPU} = \frac{\text{Total Expenses} - \text{Scrap}}{\text{Expected No. of Units}}$$

$$= \frac{12,000 - 300}{900} = 13/\text{-}$$

Dr. Process No. 2 A/c **Cr.**

	Units	Amount		Units	Amount
To Units Transferred from Process No. 1	920	11,960	By Normal Loss	46	138
To Direct Materials		3,020	By Abnormal Loss	4	96
To Direct Labour		4,000	By Units Transferred to Process No. 3 A/c (24.10)	870	20,972
To Direct Expenses		226			
To Production overheads		2,000			
	920	**21,206**		**920**	**21,206**

Working Note:

Input	920
(–) Normal Loss	46
Expected	874
Actual	870
Abnormal Loss	4

$$\text{PCPU} = \frac{\text{Total Expenses} - \text{Scrap}}{\text{Expected No. of Units}}$$

$$= \frac{21,206 - 138}{874} = 24.10 \text{ (approx.)}$$

Dr. Process No. 3 A/c **Cr.**

Particulars	Units	Amount	Particulars	Units	Amount
To Units Transferred from Process No. 2	870	20,972	By Normal Loss	87	522
To Direct Material		3,462	By Units Transferred to Finished Stock A/c (40.11)	800	32,094
To Direct Labour		5,000			
To Direct Expenses		—			
To Production Overheads		2,500			
To Abnormal Gain	17	682			
	887	**32,616**		**887**	**32,616**

Working Note:

Input	870
(–) Normal Loss	87
Expected	783
Actual	800
Abnormal Loss/gain	17

$$\text{PCPU} = \frac{\text{Total Expenses} - \text{Scrap}}{\text{Expected No. of Units}}$$

$$= \frac{31,934 - 522}{783} = 40.11 \text{ (approx.)}$$

Dr.   **Abnormal Gain A/c**   **Cr.**

Particulars	Units	Amount	Particulars	Units	Amount
To Normal Loss A/c	20	60	By Process No. 1 A/c	20	260
To Normal Loss A/c	17	102	By Process No. 3 A/c	17	682
To Costing P & L A/c		780			
	37	942		37	942

Dr.   **Abnormal Loss A/c**   **Cr.**

	Units	Amount		Units	Amount
To Process No. 2 A/c	4	96	By Normal Loss	4	12
			By Costing P & L A/c (Loss)		84
	4	96		4	96

Joint Product and By-Products

Joint Product and By-products

In several industries more than one product emerge from the manufacturing process. These products are sometimes produced intentionally while in some cases they emerge out of the main manufacturing process. Such products are termed as either joint products or by-products. Though sometimes these terms are used interchangeably, there is a major difference between the two and therefore it is necessary to understand clearly the difference between them. Similarly there is a difference between the accounting of the two and hence it is essential to define clearly the concepts of joint products and by-products. In this chapter, these aspects are discussed in detail along with the accounting treatment of the joint products and by products.

The difference between the joint products and by-products should be understood clearly. Joint products can be defined as distinctly different major products that are inevitably produced simultaneously from common inputs or by common processing. Thus from this definition the following features of joint product emerge.

❖ Joint products are the result of utilization of the same raw material and same processing operations. The processing of a particular raw material may result into the output of two or more products.

❖ All the products emerging from the manufacturing process are of the same economic importance. In other words, the sales value of those products may be more or less same and none of them can be termed as the major product.

❖ The products are produced intentionally which implies that the management of the concerned organization has intention to produce all the products.

❖ Some of joint products may require further processing or may be sold directly after the split off point.

❖ The manufacturing process and raw material requirement is common up to a certain stage of manufacturing. After the stage is crossed, further processing becomes different for each product. This stage is known as 'split off' point. The expenditure incurred up to the split off point is called as joint cost and the apportionment of the same to different products is the main objective of the joint product accounting.

❖ The management has little or no control over the relative quantities of the various products that will result.

❖ Joint products are commonly produced in industries like, chemicals, oil refining, mining, meat-packing, automobile etc. In oil refining, fuel, oil, petrol, diesel, kerosene, lubricating oil are few examples of the joint products.

❖ By-Product: The term 'by-products' is sometimes used synonymously with the term 'minor products'. The by-product is a secondary product, which incidentally results from the manufacture of a main product. By–products are also produced from the same raw material and same process operations but they are secondary results of operation. The main difference between the joint product and by-product is that there is no intention to produce the by-product while the joint products are produced

intentionally. The relationship between the by-product and the main product changes with changes in economic or industrial conditions or with advancement of science. What was once a by-product of an industry may become a main product and one time main product may become a by-product subsequently. For example, during the Second World War, glycerin, a by-product in soap making was in such a demand that it became virtually the main product while the soap was reduced to the by product. What is by-product of one industry may be a main product of another industry. Normally in continuous process industry, the by–products emerge. Some of the examples of by-products are given below:

❖ In sugar manufacturing, bagasse [residual of sugarcane after the juice is extracted], molasses [residual of sugarcane juice after the impurities are taken out] and press mud are the three by-products, which emerge at different stages of manufacturing.

❖ In cotton textile, the cotton-seed, which is taken out before the manufacturing process, is a by-product.

➢ The term 'multi product' or 'co-products is occasionally used synonymously with the term joint products. However the difference between the multi-products and co-products is that co-products do not necessarily arise from the same process. Similarly change in the production of the co-product will not necessarily result in change in the production of the other. In this chapter, we have focused on joint product and by-products only.

Important Terms

➢ *Split Off Point:* This is a point up to which, input factors are commonly used for production of multiple products, which can be either joint products or by-products. After this point, the joint products or by-products gain individual identity. In other words, up to a certain stage, the manufacturing process is the same for all the products and a stage comes after which, the individual processing becomes different and distinct. For example, in a dairy, several products like, milk, ghee, butter, milk powder, ice-cream etc. may be produced. The common material is milk. The pasteurization of milk is a common process for all the products and after this process, each product has to be processed separately. This point is of special significance in the accounting of joint product and by-products because the joint cost incurred before this point is to be apportioned appropriately in the joint products.

➢ *Joint Costs:* Joint cost is the pre separation cost of commonly used input factors for the production of multiple products. In other words, all costs incurred before or up to the split off point are termed as joint costs or pre separation costs and the apportionment of these costs is the main objective of joint product accounting. Costs incurred after the split off point are post separation costs and can be easily identified with the products.

➤ Methods of Apportionment of Joint Costs to Joint Products: The following methods are used for apportionment:

I. *Physical Quantity Method:* Under this method, cost apportionment is made in proportion to the volume of production. These physical measures may be units, pounds, liters, kilos, tones, gallons etc. The following example will clarify the point.

Product	Quantity - kg	Proportion to total	Cost allocated	Cost per kg
A	30, 000	1/2	Rs.1,80,000	Rs.6
B	20, 000	1/3	Rs.1,20,000	Rs.6
C	10, 000	1/6	Rs.60,000	Rs.6
Total	60, 000		Rs.3,60,000	Rs.6

II. *Average Unit Cost Method:* Under this method, the joint cost is apportioned to the joint products by computing the average unit cost of the product units. The average unit cost is computed by dividing the total manufacturing cost by the total number of units produced of all products. This method is useful where all the products produced are uniform with each other in all the respects. This method will not be useful if the production units are not similar with each other.

III. *Weighted Average Method:* Under this method, weights are assigned to each unit based upon size of the units, difference in type of labor employed, material consumption, market share, efforts of labor required and so on. The joint cost is apportioned on the basis of the weights assigned to each product. This method is highly useful if the weights assigned are on objective basis. If subjective element creeps in, the method may not give accurate results.

IV. *Selling Price Method:* Under this method, the joint cost is apportioned on the basis of sales value at the split off point. The logic is that a product should bear the share of the joint cost according to its sale price. If sales price is higher than that of the other products, more share of joint cost should be charged to that product and if it is comparatively less than that of other products, less share of joint cost should be charged to the same. Though logically this method seems to be sound, in practice, charging higher share of joint cost to the product with higher sales value may not be justified due to the fact that lesser efforts are required for manufacturing of the same.

Accounting for by-products

By-products are jointly produced products of minor importance and do not have separate costs until the split off point. They are not produced intentionally but are emerging out of the manufacturing process of the main products. The following methods are used for accounting of by-products. The methods are broadly divided into Non-Cost Methods and Cost Methods.

Non-Cost Methods: The following methods are included in this category.

I. *Other income or miscellaneous income method:* Under this method, sales value of by-products is credited to the Profit and Loss Account and no credit is given in the cost accounts. The credit to the profit and loss account is treated as other income or miscellaneous income. No effort is made for ascertaining the cost of the product. No valuation of inventory is made and all costs and expenses are charged to the main product. This is the least scientific method and is used where the sales value of the by-product is negligible.

II. *Total sales less total cost:* Under this method, sales value of by-product is added to the sales value of the main product. Further the total cost of the main product including the cost of the by-product is deducted from the sales revenue of the main product and by-product. All costs and expenses are charged to the main product.

III. **Total cost less sales value of by-product:** In this method, the total cost of production is reduced by the sales value of the by-product. This method seems to be more acceptable because like waste and scrap, by-product revenue reduces the cost of major products.

IV. **Total cost less sales value of by-products after setting off selling and distribution overheads of by-products:** Sales value of the by-product minus the selling and distribution overheads of by-product is deducted from the total cost. Selling and distribution overheads are charged against by-products actually sold.

V. **Reverse cost method:** This method is based on the view that the sales value of the by-product contains an element of profit. It is agreed that this element of profit should not be credited to the profit and loss account. The cost of by-product is arrived at by working backwards. Selling price of the by-product is deflated by an assumed gross profit margin. Thus under this method, sales value of the by-product is first reduced by, an estimated profit margin, selling and distribution expenses and then the post split off costs and then the cost of the main product is thus reduced by this net figure.

➢ *Cost Methods:* The following methods are included in this category.

I. *Replacement or opportunity cost method:* If the by-products are consumed captively, they are valued at the opportunity cost method or replacement cost method. This means the cost which would have been incurred had the by-product been purchased from outside. For example, bagasse, which is one of the main by-product of sugar industry and which is used for the factory as a fuel in the boiler is valued at the market value, i.e. the price that would have been paid if it would have been purchased from outside.

II. *Standard cost method:* Under this method, the by-product is valued at the standard cost determined for each product. The standard cost may be based on technical assessment. Standard cost of the by-product is credited to the process account of the main product. Accordingly, the cost control of main product can be exercised effectively.

III. *Joint cost proration:* Where the by-product is of some significance, it is appropriate that the joint costs should be apportioned between the main products and by-products on a most suitable and acceptable method. Thus in this method, no distinction is made between the joint product and by-product. Industries, where the by-products are quite important, use this method. For example, in a petroleum refinery, gas was earlier considered as a by-product. Now it has assumed the importance like petrol, diesel etc. and is being treated as joint product. Accordingly, the joint cost is prorated between the joint product and the by-product.

Problems and Solutions:

1. X Ltd. manufactures Product A, which yields two by-products B and C. The actual joint expenses of manufacture for a period were Rs.8, 000.

   It was estimated that the profits on each product as a percentage of sales would be 30%, 25% and 15% respectively. Subsequent expenses were as follows:

Particulars	Product A	Product B	Product C
Materials	Rs.100	Rs.75	Rs.25
Direct wages	200	125	50
Overheads	150	125	75
Total	450	325	150
Sales	Rs. 6,000	Rs. 4,000	Rs. 2,500

   Prepare a statement showing the apportionment of the joint expenses of manufacture over the different products. Also presume that selling expenses are apportioned over the products as a percentage to sales.

Solutions:

Statement showing the Apportionment of Cost

Particulars	Product A	Product B	Product C
Sales	Rs. 6,000	Rs. 4000	Rs. 2,500
Less: Profit [30%, 25%, 15% respectively]	1,800	1,000	375
Cost of Sales	4,200	3,000	2,125
Less: Selling Expenses *	192	128	80
Cost of Production	4,008	2,872	2,045
Less: Subsequent Expenses [As given]	450	325	1,50
Apportionment of Joint Costs [Rs.8000]	3,558	2,547	1,895

* Selling expenses are apportioned in the following manner

Total cost of sales: [Rs. 4200 + Rs. 3000 + Rs. 2125] = Rs. 9325

Total cost of production

[Total joint cost Rs. 8000 + subsequent expenses Rs. 925] = Rs. 8925

Apportioned in the ratio of sales: 12:8:5

In manufacturing the main product A, a company processes the resulting waste material into two by-products, M1 and M2. Using the method of working back from sales value to an estimated cost, you are required to prepare a comparative Profit and Loss Statement of the three products from the following data.

I] Total cost up to separation point was Rs.1, 36, 000

II] Additional data

Particulars	Product A	Product M1	Product M2
Sales [All production]	Rs.3,28,000	Rs.32,000	Rs.48, 000
Cost after separation	—	Rs.9,600	Rs.14, 400
Estimated net profit percentage to sales value	—	20%	30%
Estimated selling expenses as percentage of sales value	20%	20%	20%

Solution:

Statement showing Apportionment of Joint Costs

Particulars	By-product M1 – Rs.	By-product M2 –Rs.
Sales Value	32,000	48,000
Less: Estimated net profit:		
For M1: 20% of sales value	6,400	
For M2: 30% of sales value		14,400
Total cost of sales	25,600	33,600
Less: Estimated selling expenses [20% of sales value]	6,400	9,600
	19,200	24,000
Less: Cost after separation	9,600	14,400
Total cost up to separation	9,600	9,600

❖ Total cost up to separation point of main process: Rs.1, 36, 000

❖ Cost up to separation point as shown above:

❖ By-product M1: Rs.9, 600

❖ By-product M2: Rs.9, 600

❖ Total cost up to separation of the by-products: Rs.19, 200

❖ Cost up to separation for main product M2: Rs.1, 16, 800

Statement Showing Comparative Profit And Loss Account

Particulars	Total – Rs.	Main Product A –Rs.	By-Product M1- Rs.	By-Product M2 – Rs.
Cost up to separation	1,36,000	1,16,800	9,600	9,600
Cost after separation	24,000	v-	9,600	14,400

Particulars	Total – Rs	Main Product A –Rs	By-Product M1- Rs.	By-Product M2 – Rs.
Total cost [1]	1,60,000	1,16,800	19,200	24,000
Sales [2]	4,08,000	3,28,000	32,000	48,000
Gross profit [2-1]	2,48,000	2,11,200	12,800	24,000
Less: Selling expenses 20% of sales value	81,600	65,600	6,400	9,600
Net profit	1,66,400	1,45,600	6,400	14,400

In a concern engaged in process industry, four products emerge from a particular process of oper The total cost of input for the period ended 30th September 2002 is Rs.2, 53, 500. The details of o additional cost after 'split off point' and sales value of the products are appended below.

Product	Output - kg	Additional process-ing cost after split-off point – Rs.	Sales value Rs.
A	8, 000	60, 000	1,68,000
B	5, 000	10, 000	1,10,000
C	3, 000	—	60,000
D	4, 000	20, 000	90,000

If the products are sold at 'split off point' without further processing, the sales value would been,

A: Rs.1, 15, 000

B: Rs.90, 000

C: Rs.55, 000

D: Rs.80, 000

You are required to prepare a statement of profitability based on the products being sold:

I]   After further processing, and

II] At the split off point.

Solution:

Statement of Profitability after Further Processing

Product	Sales Value Rs.	Additional Processing Cost – Rs.	Equivalent Sales Value at Split off Point – Rs.	Share in Joint Cost Rs. *	Total Cost Rs.	Profit Rs
A	1, 68, 000	60, 000	1, 08, 000	81, 000	1, 41, 000	27, 000
B	1, 10, 000	10, 000	1, 00, 000	75, 000	85, 000	25, 000
C	60, 000	---	60, 000	45, 000	45, 000	15, 000

D	90, 000	20, 000	70, 000	52, 500	72, 500	17, 500
Total	4, 28, 000	90, 000	3, 38, 000	2, 53, 500	3, 43, 500	84, 500

*Joint cost is apportioned on the basis of equivalent sales value at the split off point.

Statement of Profitability if sold at Split off Point

Product	Sales Value – Rs.	Joint Cost Rs.#	Profit – Rs.
A	1, 15, 000	85, 743	29, 257
B	90, 000	67, 103	22, 897
C	55, 000	41, 007	13, 993
D	80, 000	59, 647	20, 353
Total	3, 40, 000	2, 53, 500	86, 500

Joint cost has been apportioned on the basis of sales value of different products.

JB Ltd. produces four joint products, A, B, C and D, all of which emerge from the processing of one raw material. The following are the relevant data:

Production for the period:

Joint Product	Number of Units	Selling Price per Unit Rs
A	500	18.00
B	900	8.00
C	400	4.00
D	200	11.00

The company budgets for a profit of 10% on sales value. The other estimated costs are:

Carriage inwards: Rs.1, 000

Direct wages: Rs.3, 000

Manufacturing overheads: Rs.2, 000

Administration overheads: 10% of the sales value

You are required to,

I] Calculate the maximum price that may be paid for the raw material

II] Prepare a comprehensive cost statement for each of the products allocating the materials and other costs based up on: Number of units and Sales value.

Solution:

Note: First, the total cost of joint products will have to be find out and then the maximum price can be computed. For computing the total cost, the sales value is computed.

❖ Computation of Sales Value

Joint Product	Number of Units	Selling Price Per Unit – Rs.	Sales Value Rs.
A	500	18	9,000
B	900	8	7,200
C	400	4	1,600
D	200	11	2,200
Total			20,000

❖ Total Cost of Joint Products:

❖ Total Sales: Rs.20,000 – Rs.2,000 [Budgeted profit 10% of sales] = Rs.18,000

I] Computation of Maximum Price that may be paid for Raw Material:

Particulars	Amount – Rs.	Amount – Rs.
Cost of joint products [As shown above]		18,000
Less: Other Costs: ❖ Carriage inwards ❖ Direct wages ❖ Manufacturing overheads ❖ Administration overheads	1, 000 3, 000 2, 000 2, 000	
Total		8,000
Maximum price to be paid for the raw material		10,000

II] [a] Comprehensive Cost Statement Based on Units

Particulars	Joint Product A	Joint Product B	Joint Product C	Joint Product D	Total
Units	500	900	400	200	2000
	Rs.	Rs.	Rs.	Rs.	Rs.
Raw Material	2500	4500	2000	1000	10000
Carriage	250	450	200	100	1000
Direct wages	750	1350	600	300	3000
Manufacturing overheads	500	900	400	200	2000
Administration overheads	500	900	400	200	2000
Total cost	4500	8100	3600	1800	18,000

[b] Comprehensive Cost Statement [Based on Sales Value]

Particulars	Joint Product A	Joint Product B	Joint Product C	Joint Product D	Total
Units	500	900	400	200	2000
	Rs.	Rs.	Rs.	Rs.	Rs.

Raw Material	4500	3600	800	1100	10000
Carriage	450	360	80	110	1000
Direct wages	1350	1080	240	330	3000
Manufacturing overheads	900	720	160	220	2000
Administration overheads	900	720	160	220	2000
Total cost	8100	6480	1440	1980	18, 000