

PROCESS & OPERATION COSTING

Learning Objectives

After studying this chapter, you should be able to

- Understand the meaning of Process and Operation costing
- Understand the accounting treatment required for normal and abnormal process losses
- Understand the treatment for abnormal gain
- Understand the treatment of inter process profit in the process accounts

9.1 Meaning of Process Costing

Process Costing is a method of costing used in industries where the material has to pass through two or more processes for being converted into a final product. It is defined as “a method of Cost Accounting whereby costs are charged to processes or operations and averaged over units produced”. A separate account for each process is opened and all expenditure pertaining to a process is charged to that process account. Such type of costing method is useful in the manufacturing of products like steel, paper, medicines, soaps, chemicals, rubber, vegetable oil, paints, varnish etc. where the production process is continuous and the output of one process becomes the input of the following process till completion.

9.1.1 Basic features: Industries, where process costing can be applied, have normally one or more of the following features:

1. Each plant or factory is divided into a number of processes, cost centres or departments, and each such division is a stage of production or a process.
2. Manufacturing activity is carried on continuously by means of one or more process run sequentially, selectively or simultaneously.
3. The output of one process becomes the input of another process.
4. The end product usually is of like units not distinguishable from one another.
5. It is not possible to trace the identity of any particular lot of output to any lot of input materials. For example, in the sugar industry, it is impossible to trace any lot of sugar bags to a particular lot of sugarcane fed or *vice versa*.
6. Production of a product may give rise to Joint and/or By-Products.

9.2 Cost Accounting

9.1.2 Costing Procedure: The Cost of each process comprises the cost of :

- (i) Materials
- (ii) Labour
- (iii) Direct expenses, and
- (iv) Overheads of production.

Materials - Materials and supplies which are required for each process are drawn against material requisitions from stores. Each process for which the above drawn materials will be used should be debited with the cost of materials consumed on the basis of the information received from the Cost Accounting department. The finished product of first process generally become the raw materials of second process; under such a situation the account of second process, be debited with the cost of transfer from the first process and the cost of any additional material required under this second process.

Labour - Each process account should be debited with the labour cost or wages paid to labour for carrying out the processing activities. Sometimes the wages paid are apportioned over the different processes after selecting appropriate basis.

Direct expenses - Each process account should be debited with direct expenses like depreciation, repairs, maintenance, insurance etc. associated with it.

Overheads of production - Expenses like rent, power expenses, lighting bills, gas and water bills etc. are known as production overheads. These expenses cannot be allocated to a process. The suitable way out to recover them is to apportion them over different processes by using suitable basis. Usually, these expenses are estimated in advance and the processes debited with these expenses on a pre-determined basis.

9.2 Operation Costing

It is defined as the refinement of process costing. It is concerned with the determination of the cost of each operation rather than the process. In those industries where a process consists of distinct operations, the method of costing applied or used is called operation costing. Operation costing offers better scope for control. It facilitates the computation of unit operation cost at the end of each operation by dividing the total operation cost by total output units.

Operation costing is just a variant of unit or output costing. The expenses of operating a service for a particular period are grouped under suitable headings and their total is divided by the number of service units for the same period and thus cost per unit of service is obtained.

The cost for a further period may be estimated on the basis of estimated service units and the estimated costs. This will help in fixing the price to be charged for the service units and the estimated cost.

Illustration 1: (Preparation of process cost accounts)

From the following data, prepare process accounts indicating the cost of each process and the total cost. The total units that pass through each process were 240 for the period.

	Process A (₹)	Process B (₹)	Process C (₹)
Materials	1,500	500	200
Labour	800	2,000	600
Other expenses	260	720	250

Indirect expenses amounting to ₹ 850 may be apportioned on the basis of wages. There was no opening or closing stock.

Solution:

Dr.		Process 'A' Account			Cr.	
Particulars	Per unit (₹)	Total (₹)	Particulars	Per unit (₹)	Total (₹)	
To Material	6.25	1,500	By Process 'B' A/c	11.50	2,760	
" Labour	3.34	800	(Transfer to Process-B)			
" Other expenses	1.08	260				
" Indirect expenses*	0.83	200				
	11.50	2,760		11.50	2,760	

Dr.		Process 'B' Account			Cr.	
Particulars	Per unit (₹)	Total (₹)	Particulars	Per unit (₹)	Total (₹)	
To Process-A A/c	11.50	2,760	By Process 'C' A/c	27.00	6,480	
" Material	2.08	500	(Transfer to Process-C)			
" Labour	8.34	2,000				
" Other expenses	3.00	720				
" Indirect expenses*	2.08	500				
	27.00	6,480		27.00	6,480	

Dr.		Process 'C' Account			Cr.	
Particulars	Per unit (₹)	Total (₹)	Particulars	Per unit (₹)	Total (₹)	
To Process-B A/c	27.00	6,480	By Finished Stock A/c	32.00	7,680	
Material	0.83	200	(Transferred)			
" Labour	2.50	600				

9.4 Cost Accounting

" Other expenses	1.04	250		
" Indirect expenses*	0.63	150		
	32.00	7,680	32.00	7,680

* Apportionment of Indirect expenses among Process-A, Process-B and Process-C

Total Wages to processes (A +B +C) = ₹ 800 + ₹ 2,000 + ₹ 600 = ₹ 3,400

Apportionment to:

Process- A = $\frac{₹850}{₹3,400} \times ₹800 = ₹200$; Process- B = $\frac{₹850}{₹3,400} \times ₹2,000 = ₹500$ and

Process- C = $\frac{₹850}{₹3,400} \times ₹600 = ₹150$

9.3 Treatment of Normal Process Loss, Abnormal Process Loss And Abnormal Gain In Cost Accounting

Loss of material is inherent during processing operation. The loss of material under different processes arises due to reasons like evaporation or a change in the moisture content etc. Process loss is defined as the loss of material arising during the course of a processing operation and is equal to the difference between the input quantity of the material and its output.

There are two types of material losses viz. (i) Normal loss and (ii) Abnormal loss.

(i) **Normal Process Loss:** It is defined as the loss of material which is inherent in the nature of work. Such a loss can be reasonably anticipated from the nature of the material, nature of operation, the experience and technical data. It is unavoidable because of nature of the material or the process. It also includes units withdrawn from the process for test or sampling.

Treatment in Cost Accounts : The cost of normal process loss in practice is absorbed by good units produced under the process. The amount realised by the sale of normal process loss units should be credited to the process account.

(ii) **Abnormal Process Loss:** It is defined as the loss in excess of the pre-determined loss (Normal process loss). This type of loss may occur due to the carelessness of workers, a bad plant design or operation, sabotage etc. Such a loss cannot obviously be estimated in advance. But it can be kept under control by taking suitable measures.

Treatment in Cost Accounts: The cost of an abnormal process loss unit is equal to the cost of a good unit. The total cost of abnormal process loss is credited to the process account from which it arises. Cost of abnormal process loss is not treated as a part of the cost of the

product. In fact, the total cost of abnormal process loss is debited to costing profit and loss account.

(iii) Abnormal Process Gain: Sometimes, loss under a process is less than the anticipated normal figure. In other words, the actual production exceeds the expected figures. Under such a situation the difference between actual and expected loss or actual and expected production is known as abnormal gain. So abnormal gain may be defined as an unexpected gain in production under the normal conditions.

Treatment in Cost Accounts: The process account under which abnormal gain arises is debited with the abnormal gain and credited to abnormal gain account which will be closed by transferring to the Costing Profit and Loss account. The cost of abnormal gain is computed on the basis of normal production.

To be more clear about the above concepts we consider the following illustration.

Illustration 2: (Treatment of normal loss, abnormal loss and abnormal gain)

A product passes through three processes. The output of each process is treated as the raw material of the next process to which it is transferred and output of the third process is transferred to finished stock.

	1 st Process (₹)	2 nd Process (₹)	3 rd Process (₹)
Materials issued	40,000	20,000	10,000
Labour	6,000	4,000	1,000
Manufacturing overhead	10,000	10,000	15,000

10,000 units have been issued to the 1st process and after processing, the output of each process is as under:

	Output	Normal Loss
1 st Process	9,750 units	2%
2 nd Process	9,400 units	5%
3 rd Process	8,000 units	10%

No stock of materials or of work-in-progress was left at the end. Calculate the cost of the finished articles.

Solution:

Dr.		1 st Process Account				Cr.
Particulars	Units	Total (₹)	Particulars	Units	Total (₹)	
To Material	10,000	40,000	By Normal Loss A/c (2% of 10,000 units)	200	--	

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" Labour	--	6,000	" Abnormal Loss A/c (₹ 5.7142 × 50 units)	50	286
" Manufacturing OH	--	10,000	" 2 nd Process A/c (₹ 5.7142 × 9,750 units)	9,750	55,714
	10,000	56,000		10,000	56,000

Cost per unit of completed units and abnormal loss:

$$\frac{\text{Total Cost}}{\text{Inputs} - \text{Normal loss}} = \frac{₹56,000}{10,000 \text{ units} - 200 \text{ units}} = ₹ 5.7142$$

Dr. **2nd Process Account** *Cr.*

Particulars	Units	Total (₹)	Particulars	Units	Total (₹)
To 1 st Process A/c	9,750	55,714	By Normal Loss A/c (5% of 9,750 units)	488	--
" Material	--	20,000	" 3 rd Process A/c (₹ 9.6862 × 9,400 units)	9,400	91,051
" Labour	--	4,000			
" Manufacturing OH	--	10,000			
" Abnormal Gain A/c (₹ 9.6862 × 138 units)	138	1,337			
	9,888	91,051		9,888	91,051

Cost per unit of completed units and abnormal gain:

$$\frac{\text{Total Cost}}{\text{Inputs} - \text{Normal loss}} = \frac{₹89,714}{9,750 \text{ units} - 488 \text{ units}} = ₹ 9.6862$$

Dr. **3rd Process Account** *Cr.*

Particulars	Units	Total (₹)	Particulars	Units	Total (₹)
To 2 nd Process A/c	9,400	91,051	By Normal Loss A/c (10% of 9,400 units)	940	--
" Material	--	10,000	" Abnormal Loss A/c (₹13.8358 × 460 units)	460	6,364

" Labour	--	1,000	" Finished Stock A/c (₹13.8358 × 8,000 units)	8,000	1,10,687
" Manufacturing OH	--	15,000			
	9,400	1,17,051		9,400	1,17,051

Cost per unit of completed units and abnormal loss:

$$\frac{\text{Total Cost}}{\text{Inputs} - \text{Normal loss}} = \frac{₹1,17,051}{9,400 \text{ units} - 940 \text{ units}} = ₹13.8358$$

Illustration 3 (Preparation of process accounts)

RST Limited processes Product Z through two distinct processes – Process I and Process II. On completion, it is transferred to finished stock. From the following information for the year 2011-12, prepare Process I, Process II and Finished Stock A/c:

Particulars	Process I	Process II
Raw materials used	7,500 units	--
Raw materials cost per unit	₹ 60	--
Transfer to next process/finished stock	7,050 units	6,525 units
Normal loss (on inputs)	5%	10%
Direct wages	₹ 1,35,750	₹ 1,29,250
Direct Expenses	60% of Direct wages	65% of Direct wages
Manufacturing overheads	20% of Direct wages	15% of Direct wages
Realisable value of scrap per unit	₹ 12.50	₹ 37.50

6,000 units of finished goods were sold at a profit of 15% on cost. Assume that there was no opening or closing stock of work-in-progress.

Solution

Process I A/c

Particulars	Units	(₹)	Particulars	Units	(₹)
To Raw material used (₹60 × 7,500 units)	7,500	4,50,000	By Normal loss (5% of 7,500 units) × ₹12.5	375	4,688
To Direct wages	--	1,35,750	By Process II A/c (₹96.7947 × 7,050 units)	7,050	6,82,403

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To Direct expenses	--	81,450	By Abnormal loss (₹96.7947 × 75 units)	75	7,259
To Manufacturing overhead		27,150			
	7,500	6,94,350		7,500	6,94,350

Cost per unit of completed units and abnormal loss: $\frac{\text{Total Cost} - \text{Realisable value from normal loss}}{\text{Inputs units} - \text{Normal loss units}}$

$$= \frac{₹6,94,350 - ₹4,688}{7,500 \text{ units} - 375 \text{ units}} = \frac{₹6,89,662}{7,125 \text{ units}} = ₹96.7947$$

Process II A/c

Particulars	Units	(₹)	Particulars	Units	(₹)
To Process I A/c	7,050	6,82,403	By Normal loss (10% of 7,050 units) × ₹ 37.5	705	26,438
To Direct wages	--	1,29,250	By Finished Stock A/c (₹140.0496 × 6,525 units)	6,525	9,13,824
To Direct expenses	--	84,013			
To Manufacturing overhead	--	19,387			
To Abnormal gain (₹140.0496 × 180 units)	180	25,209			
	7,230	9,40,262		7,230	9,40,262

Cost per unit of completed units and abnormal loss: $\frac{\text{Total Cost} - \text{Realisable value from normal loss}}{\text{Inputs units} - \text{Normal loss units}}$

$$= \frac{₹9,15,053 - ₹26,438}{7,050 \text{ units} - 705 \text{ units}} = \frac{₹8,88,615}{6,345 \text{ units}} = ₹140.0496$$

Finished Goods Stock A/c

Particulars	Units	(₹)	Particulars	Units	(₹)
To Process II A/c	6,525	9,13,824	By Cost of Sales (₹140.0496 × 6,000 units)	6,000	8,40,298
			By Balance c/d	525	73,526
	6,525	9,13,824		6,525	9,13,824

Income Statement

Particulars	(₹)	Particulars	(₹)
To Cost of sales (₹140.0496 × 6,000 units)	8,40,298	By Abnormal gain {180 units × (₹140.0496 – ₹37.50)}	18,459
To Abnormal loss {75 units × (₹96.7947 – ₹12.50)}	6,322	By Sales (₹8,40,298 × 115%)	9,66,343
To Net Profit	1,38,182		
	9,84,802		9,84,802

9.4 Costing of Equivalent Production Units

In the case of process type of industries, it is possible to determine the average cost per unit by dividing the total cost incurred during a given period of time by the total number of units produced during the same period. But this is hardly the case in most of the process type industries where manufacturing is a continuous activity. The reason is that the cost incurred in such industries represents the cost of work carried on opening work-in-progress, closing work-in-progress and completed units. Thus to ascertain the cost of each completed unit it is necessary to ascertain the cost of work-in-progress in the beginning and at the end of the process.

The valuation of work-in-progress presents a good deal of difficulty because it has units under different stages of completion from those in which work has just begun to those which are only a step short of completion. Work-in-progress can be valued on actual basis, *i.e.*, materials used on the unfinished units and the actual amount of labour expenses involved. However, the degree of accuracy in such a case cannot be satisfactory. An alternative method is based on converting partly finished units into equivalent finished units.

Equivalent production means converting the incomplete production units into their equivalent completed units. Under each process, an estimate is made of the percentage completion of work-in-progress with regard to different elements of costs, *viz.*, material, labour and overheads. It is important that the estimate of percentage of completion should be as accurate as possible. The formula for computing equivalent completed units is:

$$\text{Equivalent completed units} = \left(\begin{array}{l} \text{Actual number of units in} \\ \text{the process of manufacture} \end{array} \right) \times \left(\begin{array}{l} \text{Percentage of} \\ \text{Work completed} \end{array} \right)$$

For instance, if 25% of work has been done on the average of units still under process, then 200 such units will be equal to 50 completed units and the cost of work-in-progress will be equal to the cost of 50 finished units.

9.4.1 Valuation of work-in-progress: For the valuation of work-in-progress following three methods are available :

9.10 Cost Accounting

- First-in-First Out (FIFO) method.
- Last-in-First Out (LIFO) method.
- Average Cost method (or weighted average cost method).

(1) First-in-first-out method: Under this method the units completed and transferred include completed units of opening work-in-progress and subsequently introduced units. Proportionate cost to complete the opening work-in-progress and that to process the completely processed units during the period are derived separately. The cost of opening work-in-progress is added to the proportionate cost incurred on completing the same to get the complete cost of such units. Complete cost of such units plus cost of units completely processed constitute the total cost of units transferred. In this method the closing stock of Work in progress is valued at current cost.

Illustration 4: (Computation of equivalent production and cost per equivalent unit under FIFO method)

Opening work-in-progress 1,000 units (60% complete); Cost ₹ 1,100. Units introduced during the period 10,000 units; Cost ₹ 19,300. Transferred to next process - 9,000 units.

Closing work-in-progress - 800 units (75% complete). Normal loss is estimated at 10% of total input including units in process at the beginning. Scrap realise ₹1 per unit. Scraps are 100% complete.

Compute equivalent production and cost per equivalent unit. Also evaluate the output.

Solution:

Statement of Equivalent Production Units (Under FIFO Method)

Particulars	Input units	Particulars	Output units	Equivalent Production	
				(%)	Equivalent units
Opening W-I-P	1,000	From opening W-I-P	1,000	40	400
Units introduced	10,000	From fresh inputs	8,000	100	8,000
		Units completed (Transferred to next process)	9,000		
		Normal Loss {10% (1,000 + 10,000 units)}	1,100	--	--
		Closing W-I-P	800	75	600
		Abnormal loss (Balancing figure)	100	100	100
	11,000		11,000		9,100

Computation of cost per equivalent production unit :

Cost of the Process (for the period)	₹19,300
Less: Scrap value of normal loss (₹ 1 × 1,100 units)	(₹1,100)
Total process cost	₹ 18,200

$$\text{Cost per equivalent unit} = \frac{\text{₹18,200}}{9,100\text{units}} = \text{₹ 2}$$

Statement of Evaluation

Particulars	Equivalent Units (EU)	Cost per EU (₹)	Amount (₹)
(i) Opening W-I-P completed	400	2.00	800
<i>Add: Cost of W-I-P</i>	--	--	1,100
Complete cost of 1,000 units of opening W-I-P	1,000	1.90	1,900
(ii) Completely processes units	8,000	2.00	16,000
(iii) Abnormal Loss	100	2.00	200
(iv) Closing W-I-P	600	2.00	1,200

(2) Last-in first-out Method: According to this method units lastly entering in the process are the first to be completed. This assumption has a different impact on the costs of the completed units and the closing inventory of work-in-progress. The completed units will be shown at their current cost and the closing inventory of work-in-progress will continue to appear at the cost of the opening inventory of work-in-progress.

It may be noted that Last in First out (LIFO) is not permitted under Accounting Standard (AS)-2: Valuation of Inventories. However for the purpose of academic knowledge LIFO method is included in this Study Material

Illustration 5: (Computation of equivalent production and cost per equivalent unit under LIFO method)

From the following information relating to the month of April 2015, calculate the equivalent production units and the value of finished production and work-in-progress, using the LIFO method.

Opening work-in-progress on 1st April: 5,000 units; 50% complete.

Cost	(₹)
Materials	6,000
Labour	8,000
Overheads	<u>8,000</u>
	<u>22,000</u>

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Units introduced into the process : 10,000.

<i>Cost</i>	(₹)
<i>Materials</i>	30,000
<i>Labour</i>	52,500
<i>Overheads</i>	<u>70,000</u>
	<u>1,52,500</u>

During the period 7,500 units were completed and transferred to the next process. Closing work-in-progress on 30th April: 7,500 units, 50% complete.

Solution:

(i) **Statement of Equivalent Production Units (Under LIFO Method)**

Particulars	Input units	Particulars	Output units	Equivalent Production	
				(%)	Equivalent units
Opening W-I-P	5,000	From fresh units (Units completed and transferred to next process)	7,500	100	7,500
Units introduced	10,000	Closing W-I-P:			
		-From fresh units	2,500	50	1,250
		-From Opening W-I-P*	5,000	--	--
	15,000		15,000		8,750

* Since the units in the opening work in process were already 50% complete; no work has been done on these units during the period.

(ii) **Cost per unit of equivalent production** = $\frac{₹ 1,52,500}{8,750 \text{ units}} = ₹ 17.43$

Valuation of finished production and WIP:

1.	Finished Production (7,500 units × ₹ 17.43)	₹ 1,30,725.00
2.	Closing W-I-P {₹ 22,000 + (1,250 units × ₹17.43)}	₹ 43,787.50

(3) **Average Cost Method** : Under this method, the cost of opening work-in-progress and cost of the current period are aggregated and the aggregate cost is divided by output in terms of completed units. The equivalent production in this case consists of work-load already contained in opening work-in-process and work-load of current period.

The main difference between FIFO method and average method is that units of opening work in progress and their cost are taken in full under average method while under FIFO method only the remaining work done now is considered.

Illustration 6: (Computation of equivalent production and cost per equivalent unit under Average cost method)

Refer to information provided in *Illustration 4* above and solve this by Average Cost Method.

Solution:

Statement of Equivalent Production Units (Under Average Cost Method)

Particulars	Input units	Particulars	Output units	Equivalent Production	
				(%)	Equivalent units
Opening W-I-P	1,000	Units completed (Transferred to next process)	9,000	100	9,000
Units introduced	10,000	Normal Loss {10% (1,000 + 10,000 units)}	1,100	--	--
		Closing W-I-P	800	75	600
		Abnormal loss (Balancing figure)	100	100	100
	11,000		11,000		9,700

Computation of cost per equivalent production unit :

Cost of Opening W-I-P	₹ 1,100
Cost of the Process (for the period)	₹19,300
Less: Scrap value of normal loss (₹ 1 × 1,100 units)	(₹1,100)
Total process cost	₹ 19,300

$$\text{Cost per equivalent unit} = \frac{\text{₹19,300}}{9,700\text{units}} = \text{₹ 1.99}$$

Statement of Evaluation

Particulars	Equivalent Units (EU)	Cost per EU (₹)	Amount (₹)
(i) Units Completed and transferred to next process	9,000	1.99	17,910

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(ii) Abnormal Loss	100	1.99	199
(iii) Closing W-I-P	600	1.99	1,194

Illustration 7: (Computation of equivalent production and cost per equivalent unit under Average cost method)

Following information is available regarding process A for the month of February, 2015 :

Production Record:

Units in process as on 1.2.2015	4,000
<i>(All materials used, 25% complete for labour and overhead)</i>	
New units introduced	16,000
Units completed	14,000
Units in process as on 28.2.2015	6,000
<i>(All materials used, 33-1/3% complete for labour and overhead)</i>	

Cost Records:

Work-in-process as on 1.2.2015	(₹)
Materials	6,000
Labour	1,000
Overhead	1,000
	8,000
Cost during the month	
Materials	25,600
Labour	15,000
Overhead	15,000
	55,600

Presuming that average method of inventory is used, prepare:

- (i) Statement of equivalent production.
- (ii) Statement showing cost for each element.
- (iii) Statement of apportionment of cost.
- (iv) Process cost account for Process A.

Solution

(i) Statement of equivalent production (Average cost method)

Particulars	Input Units	Particulars	Output Units	Equivalent Production			
				Material		Labour & O.H.	
				%	Units	%	Units
Opening WIP	4,000	Completed and transferred	14,000	100	14,000	100	14,000

Units introduced	16,000	Closing WIP	6,000	100	6,000	33-1/3	2,000
	20,000		20,000		20,000		16,000

(ii) Statement showing cost for each element

Particulars	Materials (₹)	Labour (₹)	Overhead (₹)	Total (₹)
Cost of opening work-in-progress	6,000	1,000	1,000	8,000
Cost incurred during the month	25,600	15,000	15,000	55,600
Total cost : (A)	31,600	16,000	16,000	63,600
Equivalent units : (B)	20,000	16,000	16,000	
Cost per equivalent unit : (C) = (A ÷ B)	1.58	1	1	3.58

(iii) Statement of apportionment of cost

	Amount (₹)	Amount (₹)
1. Value of units completed and transferred (14,000 units × ₹ 3.58)		50,120
2. Value of Closing W-I-P:		
- Materials (6,000 units × ₹ 1.58)	9,480	
- Labour (2,000 units × ₹ 1)	2,000	
- Overheads (2,000 units × ₹ 1)	2,000	13,480

(iv) Process A Cost Account

Particulars	Units	(₹)	Particulars	Units	(₹)
To Opening W-I-P	4,000	8,000	By Completed units	14,000	50,120
To Materials	16,000	25,600	By Closing W-I-P	6,000	13,480
To Labour	--	15,000			
To Overhead	--	15,000			
	20,000	63,600		20,000	63,600

Illustration 8: (Treatment of scrap and its realisable value under Average cost method)

Following details are related to the work done in Process 'A' XYZ Company during the month of March, 2015:

	(₹)
Opening work-in progress (2,000 units)	
Materials	80,000
Labour	15,000
Overheads	45,000

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Materials introduced in Process 'A' (38,000 units)	14,80,000
Direct Labour	3,59,000
Overheads	10,77,000

Units scrapped : 3,000 units

Degree of completion :

Materials 100%

Labour and overheads 80%

Closing work-in progress : 2,000 units

Degree of completion :

Materials 100%

Labour and overheads 80%

Units finished and transferred to Process 'B' : 35,000 units

Normal Loss :

5% of total input including opening work-in-progress.

Scrapped units fetch ₹ 20 per piece.

You are required to prepare :

- (i) Statement of equivalent production
- (ii) Statement of cost
- (iii) Statement of distribution cost, and
- (iv) Process 'A' Account, Normal Loss Account and Abnormal Loss Account.

Solution

(i) Statement of Equivalent Production

Particulars	Input Units	Particulars	Output Units	Equivalent Production			
				Material		Labour & O.H.	
				%	Units	%	Units
Opening WIP	2,000	Completed and transferred to Process B	35,000	100	35,000	100	35,000
Units introduced	38,000	Normal Loss (5% of 40,000)	2,000	--	--	--	--
		Abnormal loss (Balancing figure)	1,000	100	1,000	80	800
		Closing WIP	2,000	100	2,000	80	1,600
	40,000		40,000		38,000		37,400

(ii) Statement showing cost for each element

Particulars	Materials (₹)	Labour (₹)	Overhead (₹)	Total (₹)
Cost of opening work-in-progress	80,000	15,000	45,000	1,40,000
Cost incurred during the month	14,80,000	3,59,000	10,77,000	29,16,000
Less: Realisable Value of normal scrap (₹ 20 × 2,000 units)	(40,000)	--	--	(40,000)
Total cost : (A)	15,20,000	3,74,000	11,22,000	30,16,000
Equivalent units : (B)	38,000	37,400	37,400	
Cost per equivalent unit : (C) = (A ÷ B)	40.00	10.00	30.0	80.00

(iii) Statement of Distribution of cost

	Amount (₹)	Amount (₹)
1. Value of units completed and transferred (35,000 units × ₹ 80)		28,00,000
2. Value of Abnormal Loss:		
- Materials (1,000 units × ₹ 40)	40,000	
- Labour (800 units × ₹ 10)	8,000	
- Overheads (800 units × ₹ 30)	24,000	72,000
3. Value of Closing W-I-P:		
- Materials (2,000 units × ₹ 40)	80,000	
- Labour (1,600 units × ₹ 10)	16,000	
- Overheads (1,600 units × ₹ 30)	48,000	1,44,000

(iv) Process A A/c

Particulars	Units	(₹)	Particulars	Units	(₹)
To Opening W.I.P:			By Normal Loss (₹20 × 2,000 units)	2,000	40,000
- Materials	2,000	80,000	By Abnormal loss	1,000	72,000
- Labour	--	15,000	By Process B A/c	35,000	28,00,000
- Overheads	--	45,000	By Closing WIP	2,000	1,44,000
To Materials introduced	38,000	14,80,000			

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To Direct Labour		3,59,000			
To Overheads		10,77,000			
	40,000	30,56,000		40,000	30,56,000

Normal Loss A/c

Particulars	Units	(₹)	Particulars	Units	(₹)
To Process A A/c	2,000	40,000	By Cost Ledger Control A/c	2,000	40,000
	2,000	40,000		2,000	40,000

Abnormal Loss A/c

Particulars	Units	(₹)	Particulars	Units	(₹)
To Process A A/c	1,000	72,000	By Cost Ledger Control A/c	1,000	20,000
			By Costing Profit & Loss A/c		52,000
	1,000	72,000		1,000	72,000

Illustration 9: (Preparation of statement of equivalent production)

A company produces a component, which passes through two processes. During the month of April, 2015, materials for 40,000 components were put into Process I of which 30,000 were completed and transferred to Process II. Those not transferred to Process II were 100% complete as to materials cost and 50% complete as to labour and overheads cost. The Process I costs incurred were as follows :

Direct material	₹15,000
Direct wages	₹18,000
Factory overheads	₹12,000

Of those transferred to Process II, 28,000 units were completed and transferred to finished goods stores. There was a normal loss with no salvage value of 200 units in Process II. There were 1,800 units, remained unfinished in the process with 100% complete as to materials and 25% complete as regard to wages and overheads.

No further process material costs occur after introduction at the first process until the end of the second process, when protective packing is applied to the completed components. The process and packing costs incurred at the end of the Process II were :

Packing materials	₹4,000
Direct wages	₹3,500
Factory overheads	₹4,500

Required :

- (i) Prepare Statement of Equivalent Production, Cost per unit and Process I A/c.
- (ii) Prepare Statement of Equivalent Production, Cost per unit and Process II A/c.

Solution:

(i) **Process I – Statement of Equivalent Production**

Particulars	Completed Units	Closing stock of WIP			Equivalent Production units
		Units	% of Completion	Equivalent Units	
	(1)			(2)	(1) + (2)
Material	30,000	10,000	100%	10,000	40,000
Wages	30,000	10,000	50%	5,000	35,000
Overhead	30,000	10,000	50%	5,000	35,000

Process I

Particulars	Process Cost (₹)	Equivalent Production (units)	Process Cost p.u. (2)/(3)	WIP stock Equivalent units	Cost of WIP Stock (₹) (4) × (5)	Transfer to Process II (2)-(6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Material	15,000	40,000	0.375	10,000	3,750	11,250
Wages	18,000	35,000	0.514	5,000	2,570	15,430
Overhead	12,000	35,000	0.343	5,000	1,715	10,285
	45,000				8,035	36,965

Process I A/c

Particulars	Unit	(₹)	Particulars	Units	(₹)
To Direct material	40,000	15,000	By Process II A/c	30,000	36,965
To Direct wages	--	18,000	By Closing W-I-P	10,000	8,035
To Factory overhead	--	12,000		--	--
	40,000	45,000		40,000	45,000

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(ii) Process II – Statement of Equivalent Production

Particulars	Completed Units	Closing stock of WIP			Equivalent Production units
		Units	% of Completion	Equivalent Units	
	(1)			(2)	(1) + (2)
Material	28,000	1,800	100%	1,800	29,800
Wages	28,000	1,800	25%	450	28,450
Overhead	28,000	1,800	25%	450	28,450

Process II

Particulars	Process Cost (₹)	Equivalent Production (units)	Process Cost p.u. (2)/(3)	WIP stock Equivalent units	Cost of WIP Stock (₹) (4) × (5)	Transfer to Finished Stock (2)-(6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Material	36,965	29,800	1.240	1,800	2,232	34,733
Wages	3,500	28,450	0.123	450	55	3,445
Overhead	4,500	28,450	0.158	450	71	4,429
	44,965				2,358	42,607
Add: Packing Material Cost						4,000
Cost of Finished Stock						46,607

Process II A/c

Particulars	Units	(₹)	Particulars	Units	(₹)
To Process I	30,000	36,965	By Finished Stock	28,000	46,607
To Direct wages	--	3,500	By Normal loss	200	--
To Factory overhead	--	4,500	By WIP stock	1,800	2,358
To Packing charges	--	4,000			
	30,000	48,965		30,000	48,965

9.5 Inter-Process Profits

In some process industries the output of one process is transferred to the next process not at cost but at market value or cost plus a percentage of profit. *The difference between cost and the transfer price is known as inter-process profits.*

The advantages and disadvantages of using inter-process profit, in the case of process type industries are as follows:

Advantages:

1. Comparison between the cost of output and its market price at the stage of completion is facilitated.
2. Each process is made to stand by itself as to the profitability.

Disadvantages:

1. The use of inter-process profits involves complication.
2. The system shows profits which are not realised because of stock not sold out.

Illustration 10: (Preparation of process cost accounts with inter process profit)

A Ltd. produces product 'AXE' which passes through two processes before it is completed and transferred to finished stock. The following data relate to October 2014 :

	Process I (₹)	Process II (₹)	Finished Stock (₹)
Opening stock	7,500	9,000	22,500
Direct materials	15,000	15,750	--
Direct wages	11,200	11,250	--
Factory overheads	10,500	4,500	--
Closing stock	3,700	4,500	11,250
Inter-process profit included in opening stock	--	1,500	8,250

Output of Process I is transferred to Process II at 25% profit on the transfer price.

Output of Process II is transferred to finished stock at 20% profit on the transfer price. Stock in process is valued at prime cost. Finished stock is valued at the price at which it is received from process II. Sales during the period are ₹ 1,40,000.

Prepare Process cost accounts and finished goods account showing the profit element at each stage.

9.22 Cost Accounting

Solution

Process I Account

Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
Opening stock	7,500	7,500	--	Process II A/c	54,000	40,500	13,500
Direct materials	15,000	15,000	--				
Direct wages	11,200	11,200	--				
	33,700	33,700	--				
Less: Closing stock	(3,700)	(3,700)					
Prime cost	30,000	30,000	--				
Overheads	10,500	10,500	--				
Process cost	40,500	40,500	--				
Profit (33 ¹ / ₃ of total cost)	13,500	--	13,500				
	54,000	40,500	13,500		54,000	40,500	13,500

Process II Account

Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
Opening stock	9,000	7,500	1,500	Finished Stock A/c	1,12,500	75,750	36,750
Transferred from Process I	54,000	40,500	13,500				
Direct materials	15,750	15,750	--				
Direct wages	11,250	11,250	--				
	90,000	75,000	15,000				
Less Closing stock*	(4,500)	(3,750)	(750)				
Prime cost	85,500	71,250	14,250				
Overheads	4,500	4,500	--				
Process cost	90,000	75,750	14,250				
Profit (25% on total cost)	22,500	--	22,500				
	1,12,500	75,750	36,750		1,12,500	75,750	36,750

$$* \text{ Cost of Closing Stock} = \frac{\text{₹}75,000}{\text{₹}90,000} \times \text{₹}4,500 = \text{₹}3,750$$

Finished Stock Account

Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
Opening stock	22,500	14,250	8,250	Process II A/c	1,40,000	82,500	57,500
Process II	1,12,500	75,750	36,750				
	1,35,000	90,000	45,000				
Less: Closing stock*	(11,250)	(7,500)	(3,750)				
Finished stock	1,23,750	82,500	41,250				
Profit	16,250	--	16,250				
	1,40,000	82,500	57,500		1,40,000	82,500	57,500

$$* \text{ Cost of Closing Stock} = \frac{₹90,000}{₹1,35,000} \times ₹11,250 = ₹7,500$$

Working Notes:

Let the transfer price be 100 then profit is 25; i.e. cost price is ₹75.

1. If cost is ₹ 75 then profit is ₹ 25

$$\text{If cost is ₹ 40,500 then profit is } \frac{25}{75} \times 40,500 = ₹ 13,500$$

2. If cost is ₹ 80 then profit is ₹ 20

$$\text{If cost is ₹ 90,000 then profit is } \frac{20}{80} \times 90,000 = ₹ 22,500$$

9.6 Summary

Process Costing:- Used in industries where the material has to pass through two or more processes for being converted into a final product.

Operation Costing:- It is the refinement of process costing. It is concerned with the determination of the cost of each operation rather than the process.

Treatment of Losses in process costing:-

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(i) **Normal process loss** - The cost of normal process loss is absorbed by good units produced under the process. The amount realised by the sale of normal process loss units should be credited to the process account.

(ii) **Abnormal process loss** - The total cost of abnormal process loss is credited to the process account from which it arises. The total cost of abnormal process loss is debited to costing profit and loss account.

Abnormal gain- The process account under which abnormal gain arises is debited with the abnormal gain and credited to Abnormal gain account which will be closed by transferring to the Costing Profit and loss account.

Equivalent production units: This concept is used in the industries where manufacturing is a continuous activity. Converting partly finished units into equivalent finished units.

Equivalent production means converting the incomplete production units into their equivalent completed units.

Equivalent completed units = {Actual number of units in the process of manufacture} × {Percentage of work completed}

Valuation of work-in-progress : three methods :

- (1) First-in-First Out (FIFO) method.
- (2) Last-in-First Out (LIFO) method.
- (3) Average Cost method (or weighted average cost method).

Inter-Process Profits

The output of one process is transferred to the next process not at cost but at market value or cost plus a percentage of profit. The difference between cost and the transfer price is known as inter-process profits.