CHAPTER 3

Process Costing – 3

(Calculation of Equivalent Production)

INTRODUCTION

- In industries where Process Costing is used, there is bound to remain some goods unfinished at the end of each month or at the end of the year, which would be carried forward to next period for the purpose of converting them into finished products.
- Due to the existence of such work in progress, difficulties arise in determining the unit cost of finished units. Hence in order to find out the real cost of one unit of finished product, the unfinished unit or work in progress is converted into finished units for each element of cost.
- Such units are called 'Equivalent Units'. If 1000 units are in stock of work in progress in which full material has been used then from the view point of material, equivalent production is 1000 units. However, if they are finished to the extent of 50% in respect of labour and overheads, then the equivalent units are 500 from the view point of labour and overhead cost, which is called "Conversion Cost". In this chapter we will study, how such unfinished units are converted in to finished units.

INTRODUCTION

- We have seen that the industries in which production can be divided into clear-cut stages, each stage is called process and cost is found out for each process. This is Process Costing. In industries where process costing is used, the production is generally continuous. At the end of the year there will be some work which is incomplete which we call work-in-progress.
- The work-in-progress is such work on which some work is done, but some work is still to be done. E.g., in cotton textile industry in weaving department, some cloth is not completely woven. This is work-in-progress. The question of valuation of such work-in-progress is important, because it is shown in Trading Account and any wrong valuation will affect the profit.

Calculation of Equivalent Production

- As the question of valuation of work-in-progress is important, it has to be converted into completed units. An estimate is made about the stage of completion of such work-in-progress. E.g., cloth lying incomplete on power looms has to be estimated for completion stage of each element of cost such as material, labour and overhead. How much material has been used.
- If all the material is already put into it, such work-in-progress is considered to be 100% complete as regards material. It means no more material cost has to be incurred on it. If half the wages are already paid on it, it can be said that it is 50% complete as regards labour and so on.
- On the basis of stage of completion, the incomplete units have to be converted into completed units. E.g., if 10,000 meters of cloth have been lying incomplete and 80% material is used on it, the equivalent production of 10,000 meters would be 10,000 × 80% = 8,000 meters (units).
- If it is complete up to 60% as regards wages, then 10,000 × 60% = 6,000 meters (units) would be the completed units from the viewpoint of labour. If it is complete up to 40% as regards overheads, then 10,000 × 40% = 4,000 meters (units) would be the completed units from viewpoint of overheads.
- Thus, ***Equivalent Production = Units in work-in-progress × Degree of completion for each element.***

STATEMENT OF EVALUATION

- Once the equivalent units are found out, the question of evaluation of various items will arise. For this purpose, firstly, the statement showing cost per unit for each element will have to be prepared. On the basis of expenses incurred in the process during the period, and the number of equivalent production, the cost per unit is found out, e.g., equivalent production as regards material is 10,000 units and material expenses given in the example are ₹ 25,000, then the cost of material per unit will be 25,000 ÷ 10,000 units = ₹ 2.50. Similar calculation will be made for labour and overhead.
  - In the statement of equivalent production:
    - Equivalent production for **Normal Wastage** is taken as **NIL**.
    - In case of **Abnormal wastage**, production should be calculated on the basis of **percentage of completion** of each element of cost, if given. If **it is not given**, it must be considered as **100%** complete.
    - For each element of **finished stock,** completion is **100%**.
    - It is always **100%** complete in case of **Abnormal gain**.

Thus, total cost of production per unit is also found out. This is done by preparing ***"Statement of Cost."***

STATEMENT OF EVALUATION

- On the basis of this cost of production per unit it is necessary to prepare ***"Valuation Statement"*** showing value of each item like Opening Work-in-progress, Finished units completed during the year, Closing Work-in-progress and Abnormal wastage or gain has to be prepared. This gives the value of various items to be shown in Process Account.
- Now we are able to prepare Process Account. On the debit side of this account, the value of Opening Work-in-progress as found out from the valuation statement is shown. All expenses incurred during the month or the year for material, labour and overhead are shown. On the credit side, the sale proceeds of Normal wastage, the value of Abnormal wastage, the value of finished units transferred to next process and the value of closing work-in-progress are shown. If there is Abnormal gain, it is shown on the debit side of Process Account.

- Thus, generally four statements are prepared:

1) *Statement of Equivalent Production*
2) *Statement of Cost*
3) *Statement of Evaluation*
4) *Process Account*

1. There was opening stock of work in progress 5,000 units, which was 60% complete. During the year, 30,000 units were transferred to finished stock and 4,000 units were incomplete at the end of the year. They were 50% complete.

Find out the equivalent production in units during the year.

Solution:

Equivalent Production	
Opening Stock (5,000 units × 40% incomplete)	2,000 units
Add: Finished Stock (30,000 – 5,000 opening stock)	25,000 units
Add: Closing Stock (4,000 units × 50% complete)	2,000 units
Total Equivalent Production	**29,000 units**

closing stock 2,000 units (4,000 × 50%).]

2. From the following data, find out the equivalent production in units of a manufacturing company :

Opening stock : work-in-progress	4,000	70% complete
Input units in Process	31,000	
Transfer to next Process during the year	33,000	
Closing stock : work-in-progress units	2,000	50% complete

- **Solution:**

Equivalent Production

Opening Stock (4,000 units × 30% incomplete)	1,200 units
Add: Finished Stock (33,000 – 4,000 opening stock)	29,000 units
Add: Closing Stock (2,000 units × 50% complete)	1,000 units
Total Equivalent Production	**31,200 units**

3. In a Process, 4,000 units were introduced during a month. The normal wastage was estimated at 5% of input. At the end of the month 1,000 units were incomplete. The stage of completion is as follows :

Material 80%; Labour 60%; Overhead 50%.

Calculate the Equivalent Production.

Solution:

Statement Showing Equivalent Production

Particulars	Units	Material		Labour		Overheads	
		%	Units	%	Units	%	Units
Normal Wastage (5%)	200	0	--	0	--	0	--
Finished Stock (4,000 – 1,000 – 200)	2,800	100	2,800	100	2,800	100	2,800
Closing W-I-P.	1,000	80	800	60	600	50	500
TOTAL	4,000	-	3,600	-	3,400	-	3,300

4. The following information relating to cost is obtained from the books of Akshay Mfg. Co. Ltd. Calculate equivalent production, cost per unit and value of closing work in progress.

Completed units	5,000
Incomplete units at the end of year	1,000

Stage of completion of work-in-progress : Material 70%, Labour 50% and Overhead 50%.

The process costs during the month :

Material	Rs. 28,500
Labour	Rs. 22,000
Overhead	Rs. 16,500

5. You are given the following information regarding production of a factory :

Units introduced	3,500
Units completed	3,000
Incomplete units at the year end	500

Process cost were : Material Rs. 24,500, Wages Rs. 13,200 and Overhead Rs. 9,750.

Degree of completion of work-in-progress : Material 100%, Wages 60%, Overhead 50%.

Prepare necessary Statements and Process Account.

6. The data relating to production and cost of factory for the month of August, 2012 is as under :

Units introduced 20,000 at a cost of Rs. 74,800	
Units transferred to next progress	12,800 units
Units incomplete at the end of the month	5,000 units
Units scrapped	2,200 units

Stage of completion of closing work-in-progress :
Material 80%, Labour 50%, Overhead 40%.

The expenses of production during the month were :

Materials Rs. 32,000, Wages Rs. 62,000, Overhead Rs. 30,000.

Normal wastage is considered 10% of input. Scrap realises Rs. 2.40 per unit.

From the above information prepare Statement of Equivalent Production, Statement of Cost, Statement of Evaluation and Process Account.

[units, Rs. 4,78,250.]

9. From the following information of a factory, prepare Statement of Equivalent Production, Statement of Cost and Process II Account.

Opening stock 3,000 units cost Rs. 4,650

Stage of completion :

Material	80%
Labour	60%
Overhead	60%

Transfer from Process I, 25,000 units costing Rs. 24,160.

Transfer to Process III 24,000 units.

No further materials were introduced in this process. Labour Rs. 12,060, Overheads Rs. 18,090.

Units scrapped 1,600, which realised Rs. 400

Closing stock 2,400 units.

Degree of completion :

Material	90%
Labour	80%
Overhead	80%

10. The following information is obtained in respect of Process II for the month of March, 2012.

			Rs.
(1) Opening stock : 800 units			5,520
Degree of completion :			
Material	70%		
Labour	60%		
Overhead	60%		
(2) Transfer from Process I	5,100 units		10,200
(3) Transfer to Process III 4,600 units.			
(4) Expenses :			
Direct Material added in Process II		4,480	
Direct labour in Process II		13,140	
Works Overheads in Process II		17,520	
(5) Units Scrapped : 400 units			
Degree of completion :			
Material		100%	
Labour		70%	
Overhead		70%	
(6) Closing stock : 900 units			
Degree of completion :			
Material		60%	
Labour		40%	
Overhead		40%	
(7) Normal loss in process 10% of production.			
(8) Units scrapped realised Rs. 2 per unit.			

Prepare :

(1) Statement of Equivalent Production
(2) Statement of Cost
(3) Process II Account
(4) Abnormal Loss / Gain Account. *[Guj. Uni., M.Com., June, 1989]*

OPENING STOCK OF W-I-P

- When there is an opening stock of incomplete units and they are completed during the current year, then the question of valuing such opening stock will arise. There are two methods on the basis of which such opening stock is valued: (1) FIFO method and (2) Weighted Average Method.

(A) FIFO Method: Under this method, the cost of opening stock incurred during last year and the cost incurred on these incomplete units during the current year are separately shown and they are added to find out the total cost of completing these units.

The FIFO method suggests that out of the expenses incurred during current year, they are incurred first for completing the opening work-in-progress and then for completing the units introduced during the current year. Suppose, there is an opening stock of work-in-progress of 2,000 units on which, cost of ₹ 10,000 was incurred during the last year and they were 50% complete. During the current year cost per unit of materials was ₹ 10, for labour ₹ 5 and overhead ₹ 4, then the total cost of completing work-in-progress will be calculated as follows:

OPENING STOCK OF W-I-P

Cost of last year			₹ 10,000
+ Cost during the current year			
Material	2,000 units × 50% × ₹ 10	=	₹ 10,000
Labour	2,000 units × 50% × ₹ 5	=	₹ 5,000
Overhead	2,000 units × 50% × ₹ 4	=	₹ 4,000
	Value of Opening stock		**₹ 29,000**

- Thus, the cost of completing opening stock of work-in-progress will be calculated separately for last year and for current year.

OPENING STOCK OF W-I-P

(B) Weighted Average Cost Method: This method of valuing opening stock of work-in-progress differs from FIFO method in one respect. Here the cost incurred during last year on incomplete units of opening stock, is included in the cost incurred during current year and then the cost of units completed is calculated on average of these two types of expenses.

Here, the cost incurred during last year on the opening stock is not separately calculated but is added to the cost incurred during the current year and the average cost is then calculated.

12. Axe Co. Ltd. provides you the following information in respect of Process III for the month of March, 2013 :

Opening stock in Process III : 600 units at	Rs. 8,400
Transfer from Process II : 11,000 units at	Rs. 44,000
Direct material added in Process III	Rs. 19,280
Direct wages	Rs. 57,240
Production Overhead	Rs. 76,320

Units scrapped during the period	1,200	units
Units transferred to Process IV	8,800	units
Closing stock of Process III	1,600	units

Degree of completion :

	Opening stock	Closing stock	Scrap
Material	80%	70%	100%
Labour	60%	60%	70%
Overhead	60%	60%	70%

These was a normal loss of 10% of production and units scrapped were sold at Rs. 4 per unit.

Company follows **FIFO Method.**

Prepare :

(1) Statement of Equivalent Production.
(2) Statement of Cost.
(3) Statement of Evaluation.
(4) Process III Account and
(5) Abnormal Loss / Gain Account.

16. The following information is obtained of a company :

Opening stock of work-in-progress 15,000 units

	Rs.
Materials	1,20,000
Labour	75,000
Overheads	45,000

During the year additional 60,000 units were introduced and additional expenses were as follows :

Materials	Rs. 4,05,000
Labour	Rs. 2,40,000
Overheads	Rs. 1,35,000

45,000 units were finished at the end of the year and 30,000 units were in work-in-progress and the stage of completion is follows :

Materials	100%
Labour	60%
Overheads	50%

From the above information prepare the following using **Average Cost Method.**

(1) Statement of Equivalent production.
(2) Statement of Average cost.
(3) Statement of Evaluation and
(4) Process Account.