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Process Costing

Chapter 2.5.1

Process costing

- Losses and gains
- Scrap values
- Opening and closing WIP
- Equivalent units
- FIFO and WAC method
- Joint and By products

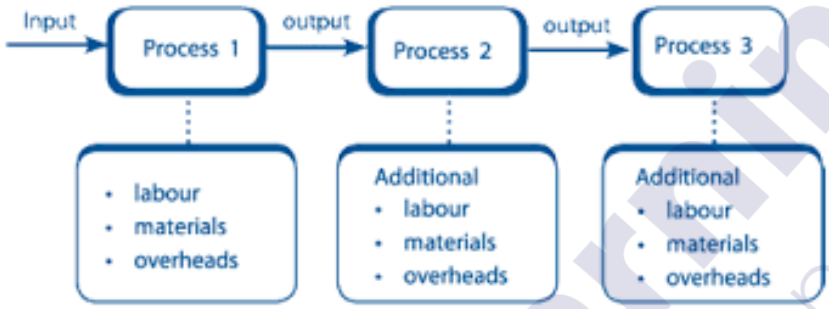
Process costing

- Process costing is a costing method used when mass production of many identical products takes place.
- Process costing is a costing method used where it is not possible to identify separate units of production or jobs, usually because of the continuous nature of the production processes involved.

Features of process costing

Characteristic	Meaning
Continuous production	No separate orders
Homogeneous output	All units same
Sequential processes	Step by step production
Average costing	Cost per unit averaged
Department costing	Cost collected per process

Process costing



How to determine the unit cost?

$$\text{Average cost per unit} = \frac{\text{Net costs of inputs}}{\text{Expected output}}$$

Process accounts

Blending Process Account

Description	Units	Value	Description	Units	Value
Material	125,000	958,200	Output to FG	115,000	1,265,000
Labour	-	200,550	Normal loss	6,250	62,500
Overhead	-	210,000	Abnormal loss	3,750	41,250
	125,000	1,368,750		125,000	1,368,750

Process accounts

- The 'units' columns in the process accounts are for memorandum purposes **only** and help you to ensure that you do not miss out any entries.
- Direct labour and production overhead may be treated together in an examination question as **conversion cost.**
- Same method will be followed in the 02nd or further processors. Then "output" of one process will the "input" for the next process.

Example for process costing

Process 1 cost:

Cost	Rs
Materials	100,000
Labour	50,000
Overhead	50,000
Total	200,000

Units produced = 1,000
Cost per unit = 200,000 / 1,000 = 200

How to dealt with process costing

- **Step 1** Determine output and losses
- **Step 2** Calculate cost per unit of output, losses and WIP
- **Step 3** Calculate total cost of output, losses and WIP
- **Step 4** Complete accounts

Losses and gains in process costing

Normal loss

- Normal loss is the loss expected during a process. It is common for the industry. Therefore any cost on normal loss should be borne by the customer.

Abnormal loss

- Abnormal loss is the extra loss resulting when actual loss is greater than normal or expected loss. This is due to the inefficiencies of the organization and it is not common for the industry. Therefore the cost should be born by the organization.

Example of Normal Loss

Given Data
Input = 1,000 units
Normal loss = 10% = 100 units
Good output = 900 units

Cost Item	Amount (Rs.)
Direct materials	50,000
Direct labour	25,000
Production overhead	15,000
Total cost	**90,000**

Treatment of Normal Loss
Normal loss = 100 units
- These units have **no cost assigned separately**
- Their cost is absorbed by good output

Cost per Unit
Cost per unit
= Total cost ÷ Good output
= 90,000 ÷ 900
= Rs. 100 per unit

Example of Abnormal Loss

Given Data

Input = 1,000 units
Normal loss = 10% = 100 units
Actual output = 850 units

Cost Item	Amount (Rs.)
Direct materials	50,000
Direct labour	25,000
Production overhead	15,000
Total cost	**90,000**

Actual loss = 1,000 − 850 = 150 units
Abnormal loss = 150 − 100 = **50 units**

Step 1 – Cost per Unit

Expected good output = 1,000 − 100 = 900 units
Cost per unit
= Total cost ÷ Expected output
= 90,000 ÷ 900
= Rs. 100 per unit

Step 2 – Value of Abnormal Loss

Abnormal loss = 50 units
Value
= 50 × 100
= Rs. 5,000

Step 3 – Cost Assignment

Output	Units	Rate (Rs.)	Total (Rs.)
Good output	850	100	85,000
Normal loss	100	—	—
Abnormal loss	50	100	5,000
Total	1,000		**90,000**

Losses and gains in process costing

Abnormal gain

- Abnormal gain is the gain resulting when actual loss is less than the normal or expected loss.
- Actual result is higher than the expected result.

Example of Abnormal Gain

Given Data
Input = 1,000 units
Normal loss = 10% = 100 units
Actual output = 930 units

Cost Item	Amount (Rs.)
Direct materials	50,000
Direct labour	25,000
Production overhead	15,000
Total cost	**90,000**

- Actual loss = 1,000 – 930 = 70 units
- Abnormal gain = 100 – 70 = **30 units**

Step 1 – Cost per Unit
Expected good output = 1,000 – 100 = 900 units
Cost per unit
= Total cost ÷ Expected output
= 90,000 ÷ 900
= Rs. 100 per unit

Step 2 – Value of Abnormal Gain
Abnormal gain = 30 units
Value
= 30 × 100
= Rs. 3,000

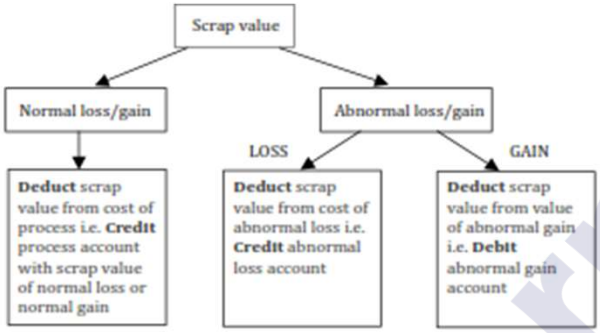
Step 3 – Cost Assignment

Output	Units	Rate (Rs.)	Total (Rs.)
Good output	930	100	93,000
Normal loss	70	—	—
Less: Abnormal gain	30	100	(3,000)
Total	1,000		**90,000**

Losses with scrap value

- Scrap is 'Discarded material having some value.'
- The scrap value of normal loss is usually deducted from the cost of materials, since the cost of the loss is borne by the customer.
- The scrap value of abnormal loss is usually set off against its cost of abnormal loss, since the cost of abnormal loss is borne by the entity.

Losses with scrap value



Normal losses with scrap value

$$\text{Ave. Cost/Unit} = \frac{\text{Net Cost of Input}}{\text{Expected Output}} \quad \frac{\text{Cost of Input - Scrap Value of normal loss}}{\text{Expected Output}}$$

Normal Loss	Normal Loss with Scrap Value
Accounted under process A/C	Loss and Scrap both accounted under process A/C

Abnormal losses with scrap value

		Abnormal Loss	Abnormal Loss with Scrap Value
Ave. Cost/Unit	=	Net Cost of Input / Expected Output	Cost of Input - Scrap Value of normal loss / Expected Output
		Accounted under abnormal loss account.	Loss -Accounted under abnormal loss A/C Gain - Accounted under abnormal gain A/C

Dealing with losses and scraps in process costing

- Determine the out and losses
- Separate the scrap value of normal and abnormal losses.
- Calculate the cost per unit and losses
- Calculate the total cost of output and losses
- Complete accounts.

Example Normal loss with scrap value

Given Data
Input = 1,000 units
Normal loss = 10% = 100 units
Scrap value of normal loss = Rs. 5 per unit

Cost Details

Cost Item	Amount (Rs.)
Direct materials	50,000
Direct labour	25,000
Production overhead	15,000
Total cost	**90,000**

Step 1 – Calculate Scrap Value
Scrap value of normal loss
= 100 units × Rs. 5
= Rs. 500

Step 2 – Calculate Net Process Cost
Net process cost
= Total cost – Scrap value of normal loss
= 90,000 – 500
= Rs. 89,500

Step 3 – Calculate Good Output
Good output
= Input – Normal loss
= 1,000 – 100
= 900 units

Step 4 – Cost per Unit
Cost per unit
= Net process cost ÷ Good output
= 89,500 ÷ 900
= Rs. 99.44

Step 5 – Cost Assignment

Output	Units	Rate (Rs.)	Total (Rs.)
Good output	900	99.44	89,500
Normal loss (scrap)	100	5.00	500
Total	1,000		**90,000**

Example Abnormal loss with scrap value

Given Data
Input = 1,000 units
Normal loss = 10% = 100 units
Actual output = 850 units
Scrap value = Rs. 5 per unit

Cost Details

Cost Item	Amount (Rs.)
Direct materials	50,000
Direct labour	25,000
Production overhead	15,000
Total cost	**90,000**

Actual loss = 1,000 – 850 = 150 units
Abnormal loss = 150 – 100 = **50 units**

Step 1 – Scrap Value of Normal Loss
Normal loss scrap
= 100 × 5
= Rs. 500

Step 2 – Net Process Cost
Net process cost
= Total cost – Scrap value of normal loss
= 90,000 – 500
= Rs. 89,500

Step 3 – Cost per Unit
Expected output = 1,000 – 100 = 900 units
Cost per unit
= 89,500 ÷ 900
= Rs. 99.44

Step 4 – Value of Abnormal Loss
Abnormal loss = 50 units
Cost = 50 × 99.44 = Rs. 4,972
Less scrap value = 50 × 5 = Rs. 250
Net abnormal loss = 4,972 – 250 = Rs. 4,722

Step 5 – Cost Assignment

Output	Units	Rate (Rs.)	Total (Rs.)
Good output	850	99.44	84,524
Normal loss (scrap)	100	5.00	500
Abnormal loss (net)	50	—	4,722
Total	1,000		**90,000**

Valuation of closing WIPs

- At the end of an accounting period there may be some units that have entered a production process but the process has not been completed. These units are called closing work in progress (or WIP) units.
- If we assume that there is no opening WIP, then the output at the end of a period will consist of the following:
  - fully-processed units
  - part-processed units (closing WIP).

Valuation of closing WIPs Conti..

- Closing WIP units become the opening WIP units in the next accounting period.
- It would not be fair to allocate a full unit cost to part-processed units and so we need to use the concept of equivalent units (EUs) which spreads out the process costs of a period fairly between the fully-processed and part-processed units.

Concept of equivalent units

Process costs are allocated to units of production on the basis of EUs.

The idea behind this concept is that a part-processed unit can be expressed as a proportion of a fully-completed unit.

For example, if 100 units are exactly half-way through the production process, they are effectively equal to 50 fully-completed units. Therefore the 100 part-processed units can be regarded as being equivalent to 50 fully-completed units or 50 EUs.

Different degrees of completion

- For most processes the material is input at the start of the process, so it is only the addition of labour and overheads that will be incomplete at the end of the period.
- This means that the material cost should be spread over all units, but conversion costs should be spread over the EUs.
- This can be achieved using an expanded Statement of EUs which separates out the materials and labour costs.

Example - Equivalent Units (Degree of Completion)

Given Data

Units introduced = 1,000 units

Output:

•Completed units = 800 units

•Work-in-progress (WIP) = 200 units

Degree of completion of WIP:

•Materials = 100%

•Labour = 50%

•Overheads = 50%

Step 1 – Concept

Equivalent units convert **partially completed units into fully completed units**.

Formula:

Equivalent units = Units × % completion

Step 2 – Calculate Equivalent Units

Cost Element	Completed Units	WIP Units	% Completion	Equivalent Units
Materials	800	200	100%	800 + (200×100%) = 1,000
Labour	800	200	50%	800 + (200×50%) = 900
Overhead	800	200	50%	800 + (200×50%) = 900

Step 3 – Result

Cost Element	Equivalent Units
Materials	1,000
Labour	900
Overhead	900

Valuation of opening WIPs

- Until now, we have assumed that there has been no opening WIP. In reality, this is unlikely to be the case.
- Work remaining in process (WIP) and transfers out of a process (fully-completed units) can be valued on different bases:
  - Weighted average method
  - FIFO method

Valuing opening work in progress: weighted average cost method (AVCO)

- An alternative to FIFO is the weighted average cost method of inventory valuation which calculates a weighted average cost of units produced from both opening inventory and units introduced in the current period.
- By this method no distinction is made between units of opening inventory and new units introduced to the process during the accounting period.
- The cost of opening inventory is added to costs incurred during the period, and completed units of opening inventory are each given a value of one full equivalent unit of production.

Valuing opening work in progress: weighted average cost method (AVCO)

Example – WIP Valuation - Average Cost Method

Given Data

Opening WIP

Units	Materials	Conversion Cost	Total
200 units	100%	60%	Rs. 20,000

Assume opening cost breakdown:
- Materials = Rs. 8,000
- Conversion cost = Rs. 12,000

Cost Element	Amount (Rs.)
Materials	40,000
Conversion cost	60,000

Output
- Completed units = 900 units
- Closing WIP = 100 units

Degree of completion of closing WIP:
- Materials = 100%
- Conversion cost = 50%

Example – WIP Valuation - Average Cost Method

Step 1 – Total Units to Account For

Total units
= Opening WIP + Units introduced
= 200 + 800
= **1,000 units**

Step 2 – Equivalent Units

Cost Element	Completed Units	Closing WIP	Equivalent Units
Materials	900	100 × 100%	1,000
Conversion cost	900	100 × 50%	950

Step 3 – Total Cost to Account For

Cost Element	Opening Cost (Rs.)	Current Cost (Rs.)	Total Cost (Rs.)
Materials	8,000	40,000	48,000
Conversion cost	12,000	60,000	72,000
Total	**20,000**	**100,000**	**120,000**

Step 4 – Cost per Equivalent Unit

Cost Element	Total Cost (Rs.)	Equivalent Units	Cost per EU (Rs.)
Materials	48,000	1,000	48.00
Conversion cost	72,000	950	75.79

Example – WIP Valuation - Average Cost Method

◆ **Step 5 – Valuation of Output**

Completed Units (900 units)

Cost Element	Calculation	Amount (Rs.)
Materials	900 × 48.00	43,200
Conversion cost	900 × 75.79	68,211
Total completed units		**111,411**

Closing WIP (100 units)

Cost Element	Calculation	Amount (Rs.)
Materials	100 × 48.00	4,800
Conversion cost	50 × 75.79	3,789.50
Total closing WIP		**8,589.50**

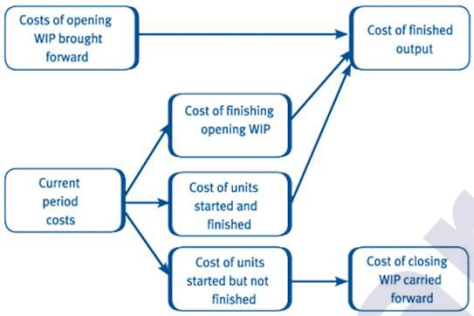
◆ Step 6 – Check Total Cost

Total cost assigned
= Completed units + Closing WIP
= 111,411 + 8,589.50
= **120,000.50**

Valuing opening work in progress: FIFO method

- Opening work in progress is partly complete at the beginning of a period and is valued at the cost incurred to date.
- With FIFO it is assumed that the opening WIP units are completed first. This means that the process costs in the period must be allocated between:
  - Opening WIP units
  - Units started and completed in the period (fully-worked units)
  - Closing WIP units.

Valuing opening work in progress: FIFO method



Example - Opening Stock Valuation under FIFO Basis

- Given Data

Opening WIP

Units	Materials	Conversion Cost	Total
200 units	100%	60%	Rs. 20,000

Opening cost breakdown:
•Materials = Rs. 8,000
•Conversion cost = Rs. 12,000

Current Period
Units introduced = 800 units

Costs added during the period:

Cost Element	Amount (Rs.)
Materials	40,000
Conversion cost	60,000

Output
•Completed units = 900 units
•Closing WIP = 100 units

Degree of completion of closing WIP:
•Materials = 100%
•Conversion cost = 50%

Example - Opening Stock Valuation under FIFO Basis

◆ **Step 1 – Units Reconciliation**

Output	Units
Opening WIP completed	200
Units started and completed	700
Closing WIP	100
Total output	**1,000**

Particulars	Units
Opening WIP	200
Units introduced	800
Total units	**1,000**

◆ **Step 2 – Equivalent Units under FIFO**

Under FIFO, we consider **only current period work**.

Materials

•Opening WIP: already 100% complete for materials → **0**
•Units started and completed: 700 × 100% = **700**
•Closing WIP: 100 × 100% = **100**
Equivalent units for materials = **800**

Conversion Cost

•Opening WIP: 200 × (100% − 60%) = 200 × 40% = **80**
•Units started and completed: 700 × 100% = **700**
•Closing WIP: 100 × 50% = **50**
Equivalent units for conversion cost = **830**

◆ **Step 3 – Cost per Equivalent Unit**

FIFO uses **current period costs only**.

Cost Element	Current Cost (Rs.)	Equivalent Units	Cost per EU (Rs.)
Materials	40,000	800	50.00
Conversion cost	60,000	830	72.29

Example - Opening Stock Valuation under FIFO Basis

◆ Step 4 – Valuation of Completed Units

A. Cost of Opening WIP Completed

Cost already in opening WIP
= Rs. 20,000

Cost to complete opening WIP

Cost Element	Calculation	Amount (Rs.)
Materials	0 × 50.00	0
Conversion cost	80 × 72.29	5,783.20

Cost of opening WIP completed
= 20,000 + 5,783.20
= **Rs. 25,783.20**

B. Cost of Units Started and Completed

700 units × current period cost

Cost Element	Calculation	Amount (Rs.)
Materials	700 × 50.00	35,000.00
Conversion cost	700 × 72.29	50,603.00

Cost of units started and completed
= 35,000 + 50,603
= **Rs. 85,603.00**

C. Total Cost of Completed Units

Particulars	Amount (Rs.)
Opening WIP completed	25,783.20
Units started & completed	85,603.00
Total completed units cost	**111,386.20**

Example - Opening Stock Valuation under FIFO Basis

◆ Step 5 – Valuation of Closing WIP

Cost Element	Calculation	Amount (Rs.)
Materials	100 × 50.00	5,000.00
Conversion cost	50 × 72.29	3,614.50
Total closing WIP		**8,614.50**

◆ **Step 6 – Check Total Cost**

Total cost to account for
= Opening WIP cost + Current cost
= 20,000 + 100,000
= **120,000**
Total cost assigned
= Completed units + Closing WIP
= 111,386.20 + 8,614.50
= **120,000.70**

◆ Key Difference from Weighted Average

Weighted Average	FIFO
Opening WIP and current cost are merged	Opening WIP kept separate
Uses total cost	Uses current period cost only for EU rate
Simpler method	More accurate period cost

Which method should be used?

AVCO

- If you are not given the degree of completion of each cost element in opening inventory, but you are given the value of each cost element, then you must use the **weighted average method.**

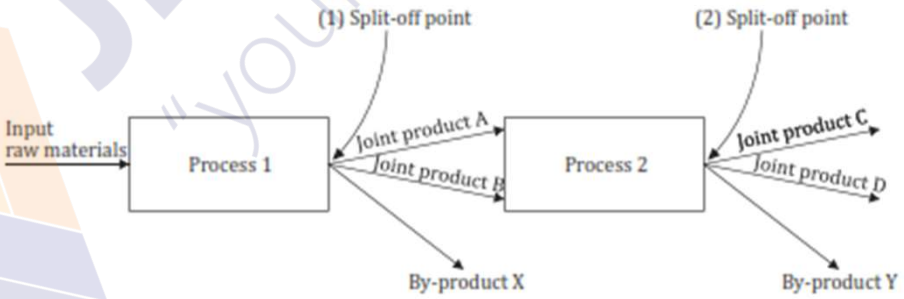
FIFO

- If you are told the degree of completion of each element in opening WIP, but not the value of each cost element, then you must use the **FIFO method.**

Joint Products

- Joint products are two or more products separated in a process, each of which has a significant value compared to the other.
- A by-product is an incidental product from a process, and has an insignificant value compared to the main product.
- The point at which joint products and by-products become separately identifiable is known as the split-off point or separation point.
- Costs incurred up to this point are called common costs or joint costs.

Joint Products



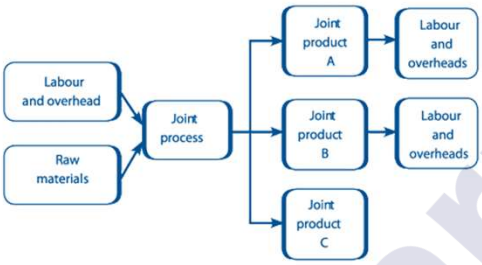
Joint Products - Joint Cost Allocation Methods

Method	Calculation Basis	Advantages	Disadvantages
Physical Output Method	Based on physical measures (weight, volume, units)	✓ Simple and objective ✓ Easy to apply	✕ Ignores economic value of products ✕ Not suitable when products have different prices
Sales Value at Split-off Method	Based on market value at split-off point	✓ Reflects revenue-generating ability ✓ More realistic allocation	✕ Requires reliable market prices ✕ Not usable if no market at split-off
Net Realisable Value (NRV) Method	Final sales value – further processing costs	✓ Suitable when further processing required ✓ Reflects true profitability	✕ More complex calculations ✕ Requires estimation of future costs

Process costing with Joint Products

- **Step 1** Determine output and losses
- **Step 2** Calculate cost per unit of output, losses and WIP
- **Step 3** Calculate total cost of output, losses and WIP
- **Step 4** Complete accounts

Process costing with Joint Products



Example - Joint Cost Allocation

◆ **Given Data**

A process produces **2 joint products A and B**

Particulars	Product A	Product B
Output (units)	1,000	500
Selling price at split-off (Rs.)	50	80
Further processing cost (Rs.)	10,000	5,000
Final selling price (Rs.)	60	90

◆ Method 1 – Physical Output Method

Based on units

Total units = 1,000 + 500 = 1,500

Product	Units	Ratio	Joint Cost (Rs.)
A	1,000	2/3	40,000
B	500	1/3	20,000

Example - Joint Cost Allocation

- Method 2 – Sales Value at Split-off

Sales value at split-off:

Product	Calculation	Value (Rs.)
A	1,000 × 50	50,000
B	500 × 80	40,000
Total		90,000

Allocation:

Product	Ratio	Joint Cost (Rs.)
A	50/90	33,333
B	40/90	26,667

- Method 3 – Net Realisable Value (NRV)

NRV = Final value – Further processing cost

Product	Calculation	NRV (Rs.)
A	(1,000 × 60) – 10,000	50,000
B	(500 × 90) – 5,000	40,000
Total		90,000

Allocation:

Product	Ratio	Joint Cost (Rs.)
A	50/90	33,333
B	40/90	26,667

Joint products and by-products

- Joint products are two or more products which are output from the same processing operation, but which are indistinguishable from each other up to their point of separation. **(Important as saleable items)**
- A by-product is a supplementary or secondary product (arising as the result of a process) whose value is small relative to that of the principal product. **(Not important as saleable items)**

By-products

- The most common method of accounting for by-products is to deduct the net realizable value of the by-product from the cost of the main products.
- the by-product may be added to sales of the main product, thereby increasing sales turnover for the period.
- The sales of the by-product may be treated as a separate, incidental source of income and it will be presented in FS as other income.
- The by-product may be deducted from the cost of production or cost of sales of the main product.
- The net realizable value of the by-product may be deducted from the cost of production of the main product.

What is Hybrid Costing ?

Hybrid costing is a combination of:

👉 Job Costing + Process Costing

Used when products are:

•Partly customised

•Partly standardised

🔷 **Key Concept**

✓ Direct materials → traced to specific job / batch

✓ Conversion costs (labour + overhead) → averaged across all units

👉 Mix of:

•Job costing (for materials)

•Process costing (for conversion)

When Hybrid Costing is Used

✓ Products have similar processing steps
✓ But different materials or specifications

Examples:
•Garment manufacturing
•Furniture production
•Electronics assembly
•Food processing with variations

◆ Simple Example

A factory produces 2 batches of shirts:

Particular	Batch A	Batch B
Units	1,000	1,500
Material cost	80,000	90,000

Conversion cost per unit = 125,000 ÷ 2,500 = Rs. 50

👉 Batch A cost per unit = Material + Conversion
👉 Batch B cost per unit = Material + Conversion

Particular	Batch A (Rs.)	Batch B (Rs.)
Material	80	60
Conversion	50	50
Total cost per unit	**130**	**110**