CHAPTER 4
PROCESS COST ACCOUNTING

Process-costing is a product cost system used by companies that produce **mass production** of **homogenous** (identical) products in a **continuous** fashion. Once the production begins, it goes through a series of processes or departments until the finished product emerges. Examples of companies that use process-costing systems include companies that produce ice cream, soft drinks, food cannery, brewery, appliances, etc.

Manufacturing costs are ***accumulated in each process*** and then allocated to all units processed during the period in the process, including both units completed and partially completed units. Thus, the ***cost object*** is a process.

As the product passes from one department to another, the cost has to follow. The costs that units transferred from one process to the next process, the costs associated with the units transferred out is called ***transferred-out costs***. Similarly, the costs come from the prior department are called ***transferred-in costs***. Thus, starting from the second process, manufacturing costs include the transferred-in cost as the fourth cost element in addition to direct materials, direct labor, and factory overhead costs.

The Concept of Equivalent Units

Equivalent units are the number of like or similar completed units that could have been produced given the amount of work actually performed on both completed and partially completed units. Equivalent units are not the same as physical units. A firm produced 30 television sets last month with 20 completed sets and 10 partially completed sets (roughly 50% complete). The physical units were 30 sets. But equivalent units were only 25 sets [20 + (10 x 50%)].

FIFO vs. Weighted Average Methods

There are two methods of preparing the departmental production cost report in process costing practices: (1) first-in, first-out method (FIFO), and (2) weighted average method.

First-In-First-Out (FIFO) Method

FIFO assumes that all the beginning work in process inventories were completed first before other work is done during the current period.
FIFO assigns the cost of equivalent units worked on during the current period as follows:

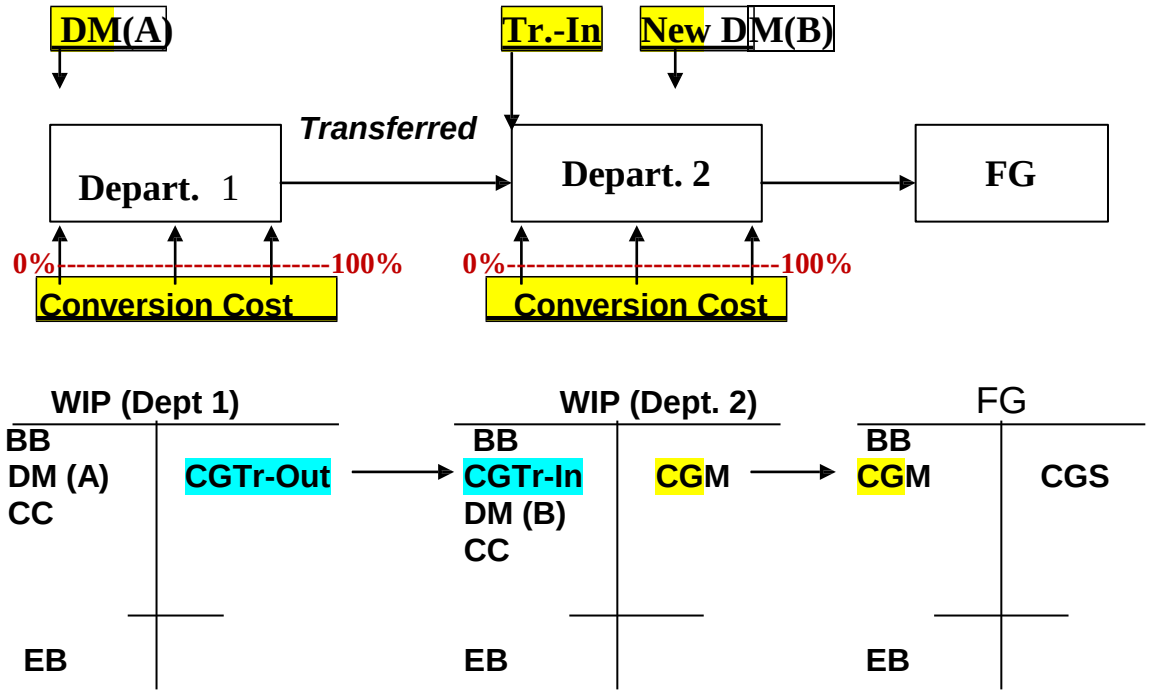
- **first** to complete beginning inventory,
- **next** to start and complete new units, and
- **lastly** to units in ending work in process inventory

Weighted Average (WA) Method

The weighted average method ***assumes*** that all the beginning work in process inventories started this period regardless of their degree of completion in the previous period. Thus, each unit in the BB receives ALL what it needs of production costs during the current period. The costs spent on the units in the BB are ***assumed*** to be incurred during the current period.

Process Cost Flow

In companies that use process-costing system, production flows through a series of sequence of connected manufacturing processes, where each process takes place in a separate production department. The partially completed output of the first department is transferred to the second department to continue working on it. Similarly, the output of the second department is transferred to the third department, and so on until the final product comes out of the last department.



Definitions:

CGTr-Out = Cost of Goods Transferred **Out** to the next process
CGTr-In = Cost of Goods Transferred **In** from the previous process
CC = Conversion Costs (DL + MOH)

- Materials could be added to production either in a continuous fashion or be applied at ***discrete*** points in the production process (i.e., 0 or 1 condition; either added or not). Unless otherwise it is specified in the problem, the ***default*** is that material is added at the ***beginning*** of the process.

- Conversion costs (DL + FOH) are added to production ***continuously & uniformly***.

- The amount transferred-in will be the amount transferred-out from the previous department and treated as 'materials' contributed at the beginning of the next department operation

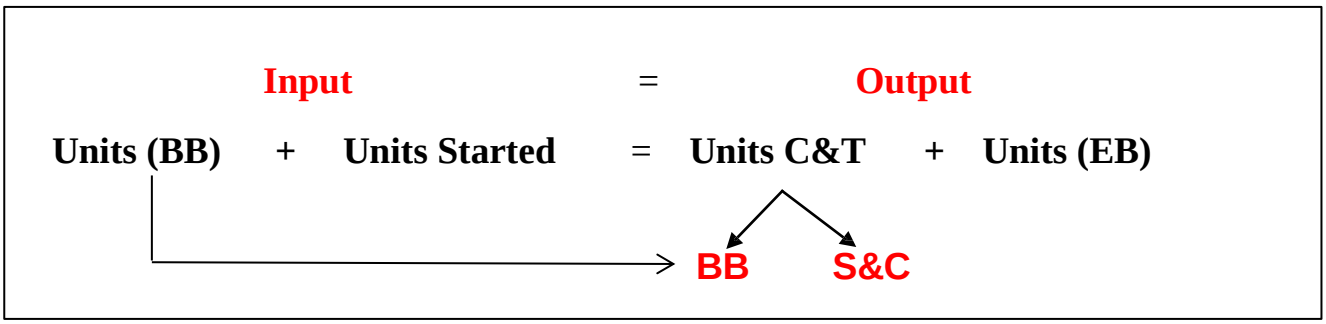
Steps of Preparing Process Costing Production Report

1. Summarize the physical flows of Production.
2. Compute the number of equivalent whole units of production.
3. Compute the cost per equivalent unit.
4. Measure total costs to account for.
5. Assign costs to units completed and transferred out of the department and units in ending inventory.

First-In-First-Out (FIFO) Method

Step 1: *Summarize the physical flows of production.*

The formula to compute physical flow of units of production is as follows:



Step 2: *Compute Equivalent Units:*

Equivalent units of production measure the work done during the period, expressed in fully completed units. This concept is used to determine the cost per unit of completed product.

Under the FIFO method, it is assumed that the beginning work in process is completed before new work is started under the FIFO method.

Equivalent units are the *sum* of the following components:

a. The equivalent units of the work done during this period to *complete* the units in ***BB*** of WIP.

b. The equivalent units to complete the new units ***started*** & ***completed (S&C)*** during the period.

C. The equivalent units of the work performed on the units which are partially completed at the end of the period ***EB*** of WIP.

Example 1:

GM Company manufactures sporting cars. The production takes place in two separate departments: Department 1 and Department 2. GM uses **FIFO** method.

In Department 1, three types of materials are added at three different points of the production process: Frame, Rust-Proofing, and Engine.

- At the ***beginning*** of the production process the *frame* is added.
- Once a unit reaches **20%** production point, the *Rust-Proofing materia*l is applied (sprayed) in a continuous fashion until the unit reaches 40% level of completion.
- At **80%** production point the *engine* is added.

Following is a **summary of the physical production** in the first process during January 2017.

BB is 1000 units (**70% complete**)	***Frame***	***Rust-Proof***	***Engine***	***CC***
Costs spent last period on **BB =$304,000**	$140,000	$105,000	0	$59,000

- New Units Started from scratch during the month = 6000 units
- Units Completed and Transferred out (C&T) = 5000 units
- Units in the EB = 2000 units **(60% level of completion)**

Costs spent during January

Direct Materials costs ***Frame***	$630,000
Direct Materials costs ***Rust Proofing***	$420,000
Direct Materials costs ***Engine***	$400,000
Conversion costs (***CC***)	$220,000

Required: (Assume FIFO)

1. Prepare the equivalent units of production table under the following assumptions for the level of completion of BB and EB of WIP:

   Case 1: **BB** is **70%** complete and **EB** is **60%** complete.
   Case 2: **BB** is **25%** complete and **EB** is **90%** complete.
   Case 3: **BB** is **90%** complete and **EB** is **25%** complete.
   Case 4: **BB** is **35%** complete and **EB** is **35%** complete.
   Case 5: **BB** is **40%** complete and **EB** is **20%** complete.

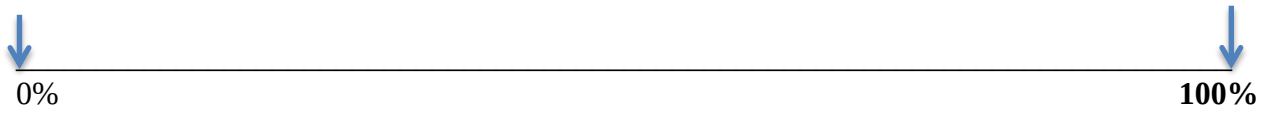
2. Complete the production report cost for ***case 1***.

3. Repeat the above two requirements assuming **Weighted Average (WA)** method.

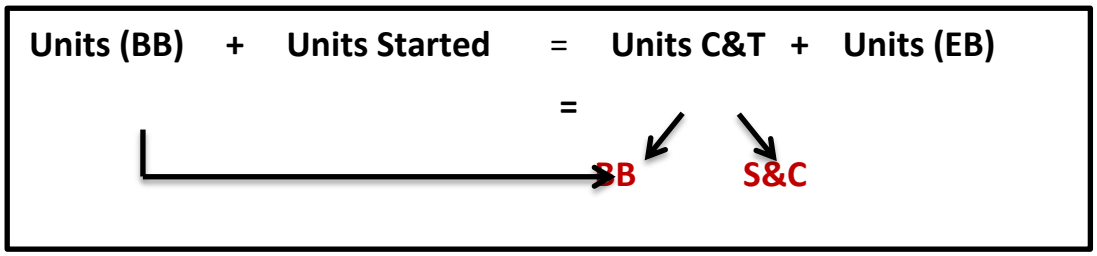
Example 1: Case 1 under FIFO

- At the ***beginning*** of the production process the ***frame*** is added.
- Once a unit reaches **20%** production point, the ***Rust-Proofing*** *materia*l is applied (sprayed) in a continuous fashion until the unit reaches 40% level of completion.
- At **80%** production point the ***engine*** is added.

Case 1: BB is **70%** complete and **EB** is **60%** complete



Summary of Production



Equivalent Units

		Physical Units	Frame	Rust-Proof	Engine	CC
1	**BB**	1,000				
2	**S & C**	4,000				
3	**EB**	2,000				
4	**Total Units**	**7,000**				

Cost per Equivalent Unit of Production

		Frame	Rust-Proof	Engine	CC
5	**Current Period Costs (Given)**	**$**	**$**	**$**	**$**
6	**Cost per Unit = Row 5 / Row 4**				

Cost Assignment

		Total Cost	Frame	Rust-Proof	Engine	CC
7	**BB (Cost Incurred *last period*)**					
8	**+ BB (Cost added *this period* = 1x6**					
9	**+ S & C = 2x6**					
10	**Total Cost of C&T = (7+8+9)**					
11	**EB = 3x6**					

Case 2: **BB** is **25%** complete and **EB** is **90%** complete.

	Physical Units	*Frame*	*Rust-Proof*	*Engine*	*CC*
BB	**1,000**				
S&C	**4,000**				
EB	**2,000**				
Total	**7,000**				

Case 3: **BB** is **90%** complete and **EB** is **25%** complete.

	Physical Units	*Frame*	*Rust-Proof*	*Engine*	*CC*
BB	**1,000**				
S&C	**4,000**				
EB	**2,000**				
Total	**7,000**				

Case4: **BB** is **35%** complete and **EB** is **35%** complete.

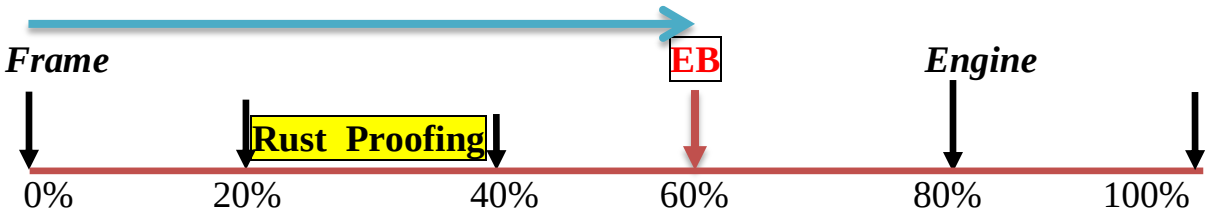
	Physical Units	*Frame*	*Rust-Proof*	*Engine*	*CC*
BB	**1,000**				
S&C	**4,000**				
EB	**2,000**				
Total	**7,000**				

Case 5: **BB** is **40%** complete and **EB** is **20%** complete.

	Physical Units	*Frame*	*Rust-Proof*	*Engine*	*CC*
BB	**1,000**				
S&C	**4,000**				
EB	**2,000**				
Total	**7,000**				

Repeat Example 1 under Weighted Average (WA) Method

Case 1: BB is **70%** complete and **EB** is **60%** complete.



Units (BB)	+	Units Started	=	Units C&T	+	Units (EB)
1,000	+	6,000	=	5,000	+	2,000

Equivalent Units:

		Physical Units	*Frame*	*Rust-Proof*	*Engine*	*CC*
1	C&T	5,000				
2	EB	2,000				
3	Total	7,000				

Cost Per Equivalent Units:

		Frame	*Rust-Proof*	*Engine*	*CC*
4	BB (Given)				
5	Current Period Cost (Given)				
6	***Total Costs*** = Rows 4 + 5				
7	Per Unit Cost = Row 6 /Row 3				

Cost Per Equivalent Units:

		Total	*Frame*	*Rust-Proof*	*Engine*	*CC*
8	**C & T =** Row 1 x Row 7					
9	**EB =** = Row 2 x Row 7					

Case 2: **BB** is **25%** complete and **EB** is **90%** complete.

	Physical Units	*Frame*	*Rust-Proof*	*Engine*	*CC*
C&T	5,000				
EB	2,000				
Total	7,000				

Case 3: **BB** is **90%** complete and **EB** is **25%** complete.

	Physical Units	*Frame*	*Rust-Proof*	*Engine*	*CC*
C&T	5,000				
EB	2,000				
Total	7,000				

Case4: **BB** is **35%** complete and **EB** is **35%** complete.

	Physical Units	*Frame*	*Rust-Proof*	*Engine*	*CC*
C&T	5,000				
EB	2,000				
Total	7,000				

Case 5: **BB** is **40%** complete and **EB** is **20%** complete.

	Physical Units	*Frame*	*Rust-Proof*	*Engine*	*CC*
C&T	5,000				
EB	2,000				
Total	7,000				

Example 2: (Department 2)

Pangani Company produces remote controls for toy cars. The production takes place in two separate departments. Department 2 receives units from Department 1 and applies conversion costs at a uniform rate. The company uses a **FIFO** process costing system to account for its two manufacturing departments.

In Department 2, two types of materials are added at two different points of the production process: the engine is added at the 40% conversion point and the remote control sensor is added at 80% conversion point.

Following is a summary of ***costs*** and ***production*** in Department 2 for the month of April 2014:

	Physical Production (Units)	**Costs in $**
Beginning Balance (WIP)	8,000 units (60% conversion level)	$ 226,000 (Engine) 0 (Sensor) 199,250 Conversion Cost 338,000 Transferred-In **$763,250**
Production Activities during April		
Transferred-In from Department 1	98,000 units	$ 2,842,000
Completed during April	---??----units	$ -----??-----
Ending Balance (WIP)	11,000 units (75% conversion level)	$ -----??-----
Costs incurred during April		
Material (Engine)		$ 1,470,000
Material (Sensor)		$ 380,000
Conversion Costs		$ 1,969,000

Required

1. Prepare a cost of production report for Department 2 for April 2014 and calculate the cost of goods C&T and EWIP
2. Repeat the same requirement using the Weighted Average method

Example 2: Under FIFO Method

Production Line:_____

1. Summary of Production

Units (BB) + Units Transferred In = Units C&TO + Units (EB)

Equivalent Units	Physical	Transferred-In	Engine	Sensor	CC
BB					
S & C					
EB					
Total Units					

Costs per unit

Current Period Cost s				
Cost per Unit				

Costs Accounted for

	Total Cost	Transferred In	Engine	Sensor	CC
BB (last period)					
BB this period)					
S & C					
GC&Tr Out					
EB					

Comparing WA and FIFO Methods

Unit costs can differ materially between the two methods when:

- Input production costs (DM & CC) per unit vary from period to period
- Physical inventory levels of **WIP** are large in relation to total number of units transferred out.

Results in Example 1 (the case of *Falling* Prices)

	FIFO	WA	Difference (FIFO – WA)
CGC & TO	**$ 1,576,000**	**$ 1,550,000**	**$ 26,000**
EB (WIP)	**$ 398,000**	**$ 424,000**	**($ 26,000)**
Total	**$ 1,974,000**	**$ 1,974,000**	**$0**

In periods of ***Falling*** prices, FIFO method (as compared with WA method), provides:

1. **HIGHER** CGM and hence higher CGS. This , in turn, yields **LOWER** reported NI and Lower Taxes. As a result, the company saves money and there will be an increase in the company's valuation. Therefore, ***in a period of falling prices*** FIFO is the preferred managerial choice.
2. **LOWER** cost of ending inventory for the WIP account because the partially completed units in the EB of WIP are priced using the most recent prices (which are lower).

In periods of rising prices, the **opposite** of the above two results will hold true.

Practice Questions

1. Which of the following is not a step in preparing a production cost report?
   a. Prepare a cost reconciliation schedule.
   b. Compute equivalent units of production.
   c. Compute the physical unit flow.
   d. Assign costs to particular jobs.

2. A department has no beginning work in process, has started 60,000 units and completed 40,000 units. Its ending work in process is 20,000 units, 60% complete as to conversion costs and fully complete as to materials. Its equivalent units for conversion costs are
   a. 40,000.
   b. 60,000.
   c. 52,000.
   d. 36,000.

3. In process costing, the computation of unit production costs requires
   a. the accumulation of material and conversion costs in work in process for each depart- ment or process.
   b. the computation of equivalent units for material and conversion costs.
   c. both a and b.
   d. neither a nor b.

4. Which of the following is not included in a production cost report?
   a. Costs accounted for.
   b. Entries to assign cost.
   c. Units accounted for.
   d. Units to be accounted for.

5. Unit costs for materials and conversion costs amount to $4 and $5 respectively. The ending work in process costs for 6,000 units (100% complete as to material and 70% complete as to conversion) amount to
   a. $45,000.
   b. $54,000.
   c. $33,000.
   d. $30,000.

THE FOLLOWING INFORMATION APPLIES To the next four QUESTIONS

The Rest-a-Lot chair company manufacturers a standard recliner. During February, the firm's Assembly Department started production of 75,000 chairs. During the month, the firm completed 80,000 chairs, and transferred them to the Finishing Department. The firm ended the month with 10,000 chairs in ending inventory. There were 15,000 chairs in beginning inventory. All direct materials costs are added at the beginning of the production cycle and conversion costs are added uniformly throughout the production process. The FIFO method of process costing is used by Rest-a-Lot. Beginning work in process was 30% complete as to conversion costs, while ending work in process was 80% complete as to conversion costs.

Beginning inventory:

Direct materials	$24,000
Conversion costs	$35,000

Manufacturing costs added during the accounting period:

Direct materials	$168,000
Conversion costs	$278,000

6. How many of the units that were started during February were completed during February?
   a. 85,000
   b. 80,000
   c. 75,000
   d. 65,000

7. What were the equivalent units for conversion costs during February?
   a. 83,500
   b. 85,000
   c. 75,000
   d. 79,500

8. What is the amount of direct materials cost assigned to ending work-in-process inventory at the end of February?
   a. $19,200
   b. $22,400
   c. $25,600
   d. $22,500

9. What is the cost of the goods transferred out during February?
   a. $417,750
   b. $456,015
   c. $476,750
   d. $505,000

ANSWER Key

1.	d.	4	b	7	a
2.	c.	5	a	8	b
3.	c.	6	d	9	b