

AC 202 Management Accounting

Process Costing

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Process Costing

- Garrison et. al (2015): Chapter 9
- After studying this chapter, you should be able to:
 - Understand similarities and differences between job-order costing and process costing.
 - Record the flow of materials, labor, and overhead through a process costing system.
 - Compute the *equivalent units* of production using the *weighted-average method*.
 - Assign costs to units using the weighted-average method.

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Similarities Between Job-Order & Process Costing

- Both systems assign *DM, DL and MOH* costs to products.
- Both systems use the same manufacturing accounts, including Manufacturing Overhead, Raw Materials, Work in Process and Finished Goods.
- The flow of costs through the manufacturing accounts is basically the same in both systems.

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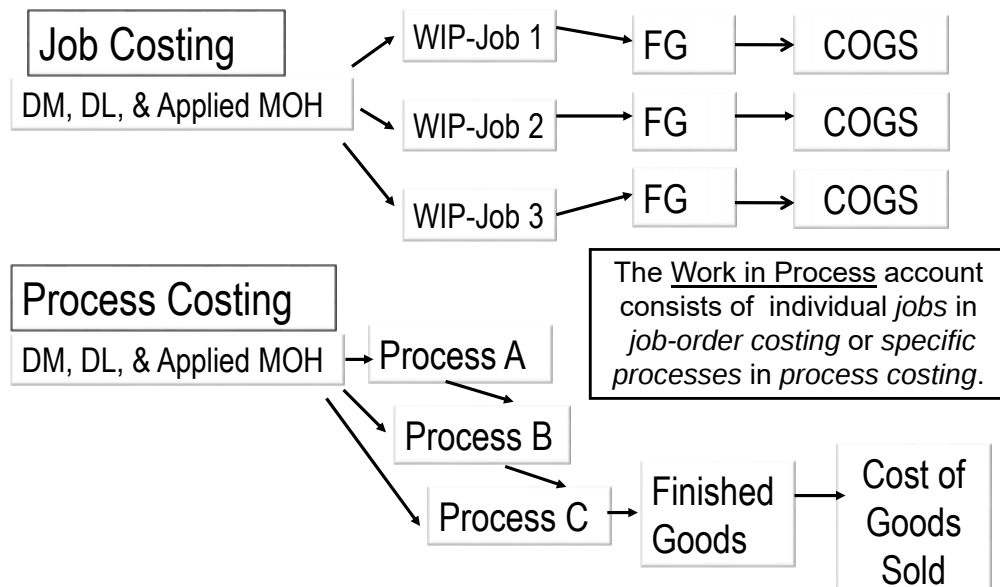
Differences Between Job-Order & Process Costing

- | | |
|---|---|
| <ul style="list-style-type: none">■ Job-order costing:<ul style="list-style-type: none">■ Each job may be different from the next, and consumes different resources.■ The firm accumulates costs by jobs.■ Job-order costing systems compute unit costs by job on the job cost sheet. | <ul style="list-style-type: none">■ Process costing:<ul style="list-style-type: none">■ Process costing is used for mass produced products.■ Each unit receives the same or similar amounts of DM costs, DL costs and MOH costs.■ The firm accumulates manufacturing costs by processes (departments)■ Process costing systems compute unit costs by department. |
|---|---|



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Job Order Costing vs. Process Costing



Processing Departments

- Any unit in an organization where materials, labor or overhead are added to the product.
- The activities in a processing department are performed *uniformly* on *all units* of production.
- The output of a processing department must be *homogeneous*.
- Products in a process costing environment typically flow in a sequence from one department to another.



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T-Account Views of Process Cost Flows

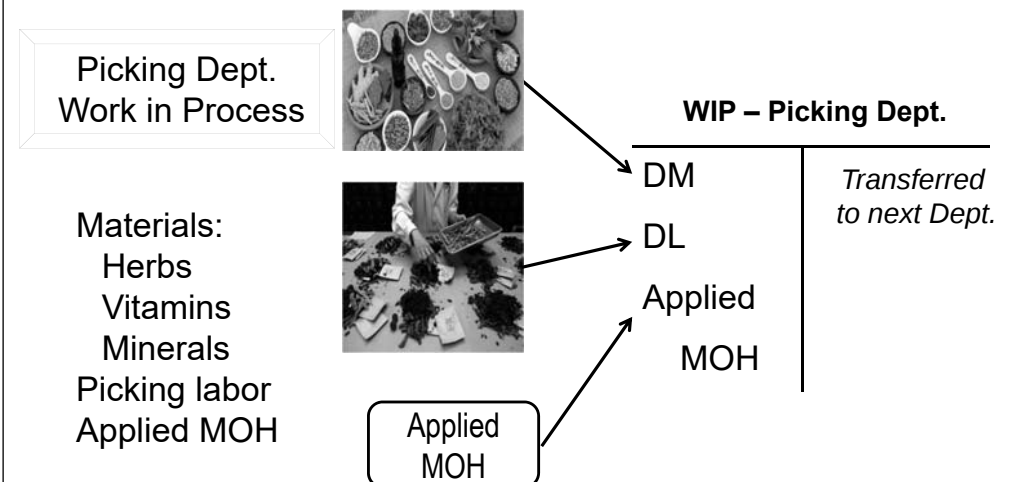
- The company produces 2,000 bottles of multivitamins.
- We will use T-accounts to illustrate process cost flows.



Picking Dept. Work in Process → Encapsulating Dept. Work in Process → Bottling Dept. Work in Process

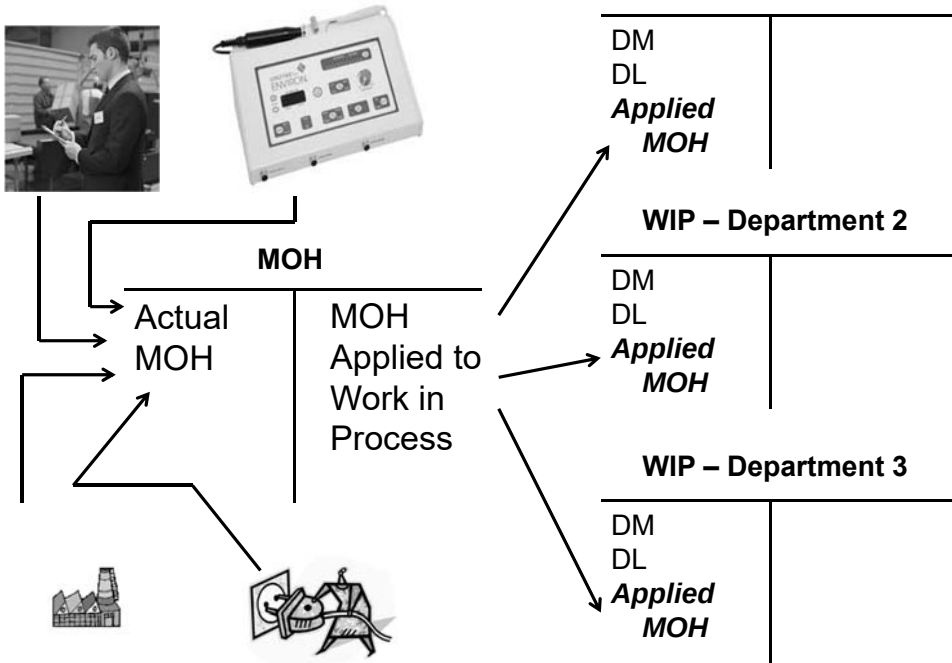
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Cost Flows



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Accounting for MOH



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The Picking Department costs are:

Direct materials	\$1,700
Direct labor	50
MOH Applied	450

WIP - Picking			WIP - Encapsulating	
DM	1,700	2,200	2,200	
DL	50			
MOH	450			
	- 0 -			

The mixture is transferred from picking to Encapsulating.

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Cost Flows

Encapsulating Dept.
Work in Process

- Transferred-in from Picking
- DM: Capsules
- Encapsulating labor
- MOH Applied



Applied
MOH

WIP - Encapsulating

TR
DM
DL
Applied
MOH

Transferred
to next Dept.

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The Encapsulating Department costs are:

Direct materials	\$1,000
Direct labor	60
Applied overhead	500

WIP - Encapsulating			WIP - Bottling	
TR	2,200	3,760	3,760	
DM	1,000			
DL	60			
MOH	500			
	- 0 -			

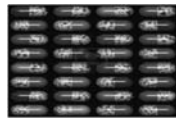
The cost is transferred from Encapsulating to Bottling.

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Cost Flows

Bottling Dept.
Work in Process

Transferred-in
from
Encapsulating
Materials:
Bottles
Bottling
labor
Applied MOH



Applied
MOH

WIP – Bottling

TR

DM

DL

Applied

MOH

Transferred
to FG

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The Bottling Department costs are:

Direct materials	\$800
Direct labor	300
Applied overhead	600

WIP - Bottling		Finished Good	
TR	3,760	5,460	5,460
DM	800		
DL	300		
MOH	600		
	- 0 -		

The cost is transferred to the
finished goods warehouse.



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Cost Flows

WIP – Last Department

•Transferred
from
previous
Dept.

•Direct
Materials

•Direct
Labor

•Applied
Overhead

•Cost of
Goods
Manufactured

Finished Goods

•Cost of
Goods
Manufactured

•Cost of
Goods
Sold

COGS

•Cost of
Goods
Sold

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Intuitive Example of Process Costing

- Suppose Smith Corp. incurs \$10 in manufacturing costs for milk produced. Smith had no beginning in raw material (RM), work in process (WIP), and finished goods (FG) and began work on 10 gallons of milk. By year-end, Smith had 6 full gallons of milk and 4 gallons half full of milk
- To make it simple, we will consider only one type of material → *raw milk*



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Can We Assign Costs This Way?

- Total costs = \$10
- No. of gallons = 10
- Unit cost = \$10 / 10 = \$1 per gallon

■ Therefore;

- FG = 6 gallons x \$1 = \$6
- EWIP = 4 gallons x \$1 = \$4

Nooooooooooooo....!!!



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Equivalent Units of Production

- Some units remain in ending work-in-process inventory and have not been completed. These ending work-in-process inventory units do not contain the same amount of inputs as a completed and transferred-out unit.
- **Equivalent Units** → units expressed in terms of finished unit. They are the measure of a period's output.
- **EUs** are the complete units that could have been produced given the total amount of manufacturing effort expended for the period under consideration.

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Equivalent Units of Production

- For example, if we bring 1,000 units to a 40 % state of completion, this is equivalent to 400 units (1,000 x 40%) that are 100% complete.
- Accountants base this concept on the assumption that a company must incur approximately the same amount of costs to bring 1,000 units to a 40% level of completion as it would to complete 400 units.

1,000 units (40% completion) = 400 EUs

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Intuitive Example of Process Costing

Equivalent unit (EU)

→ units expressed in terms of finished units

	EU
6 Full gallons (6 gallons x 100%)	6
Restatement of 4 half full gallons into full gallons (4 gallons x 50%)	<u>2</u>
Total equivalent units (EU)	<u>8</u>

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Intuitive Example of Process Costing

- Total costs to be allocated = \$10
- Cost per EU = $\$10 \div 8 \text{ EU}$
= **\$1.25 per EU**
- Costs allocated to FG (6 EU):
 - $6 \text{ EU} \times \$1.25 = \7.50
- Costs allocated to WIP (2 EU):
 - $2 \text{ EU} \times \$1.25 = \2.50

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Quick Check



For the current period, PencilCo started 15,000 units and completed 10,000 units, leaving 5,000 units in process 30 percent complete. How many equivalent units of production did PencilCo have for the period?

- a. 10,000
- b. 11,500
- c. 13,500
- d. 15,000

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Quick Check



Now assume that PencilCo incurred \$27,600 in production costs. What was PencilCo's cost per EU for the period?

- a. **\$1.84**
- b. **\$2.40**
- c. **\$2.76**
- d. **\$2.90**



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Five Steps in Process Costing

Step 1: Summarize the flow of physical units of output

Step 2: Compute output in terms of equivalent units

Step 3: Summarize total costs to account for

Step 4: Compute equivalent unit costs

Step 5: Assign total costs (1) to finished goods and (2) to work in process

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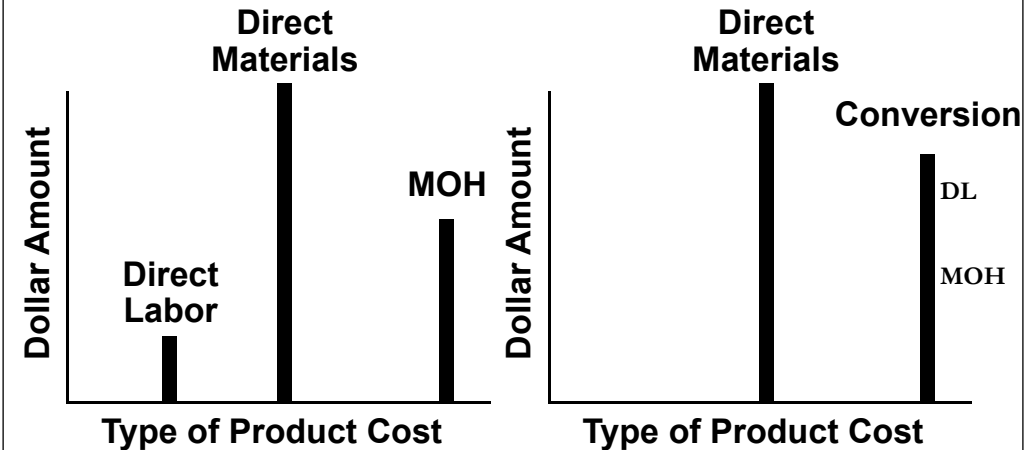
Process Costing: Case # 1

Case # 1: Process costing with zero beginning work in process

- On January 1, 20x1, there was no beginning inventory. During the period, *Assembly Department* started to produce 35,000 units. However, at the end of the period, only 30,000 units are completed and transferred to *Finishing Department*.
- The 5,000 units in ending WIP are fully processed with respect to direct materials.
- However, a supervisor estimates that the 5,000 units in ending WIP are, on average, 20% complete from the perspective of conversion costs (direct labor & manufacturing overhead).
- Total costs for the period:
 - DM costs added during the period \$ 84,050
 - Conversion costs added \$ 62,000
 - Total costs added during the period \$146,050

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Process Costing



Direct labor costs may be small in comparison to other product costs in process cost systems. So, direct labor and manufacturing overhead are often combined into one product cost called *conversion*.

Production Report

	Physical units	E.U.	
		DM	CC
Units to account for			
Beginning WIP	-		
Started this period	35,000		
Total units to account for	35,000		
Units accounted for			
Units completed and transferred out	30,000	30,000	30,000
Ending WIP	5,000	5,000	1,000
Total units accounted for	35,000	35,000	31,000
	Total	DM	CC
Costs to account for:			
Costs in Beginning WIP	-	-	-
Current period costs	146,050	84,050	62,000
Total costs to account for	146,050	84,050	62,000
Costs per equivalent units	4.40	2.40	2.00
Costs accounted for			
Units completed and transferred out	132,043	72,043	60,000
Ending WIP	14,007	12,007	2,000
Total costs accounted for	146,050	84,050	62,000

Step 1: Physical Units

Work in process, beginning

Started during current period

Units to account for

Completed and transferred out
during the period

Work in process, ending

Units accounted for



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Step 2: Compute Equivalent Units (EU)

Flow of production	<u>DM</u>	<u>CC</u>
Completed and transferred out (30,000 units)		
Work in process, ending (5,000 units)		
EU		



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Step 3: Summarize Total Costs

Costs in beginning WIP		\$ 0
Add Current period costs:		
Direct material costs	\$84,050	
Conversion costs	<u>62,000</u>	<u>146,050</u>
Total costs to account for		<u>\$146,050</u>



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Step 4: Compute Equivalent Unit Costs

	<u>DM</u>	<u>CC</u>
Costs added	\$84,050	\$62,000
EU	<u>35,000</u>	<u>31,000</u>
Cost per EU	<u>\$2.4014</u>	<u>\$2.00</u>

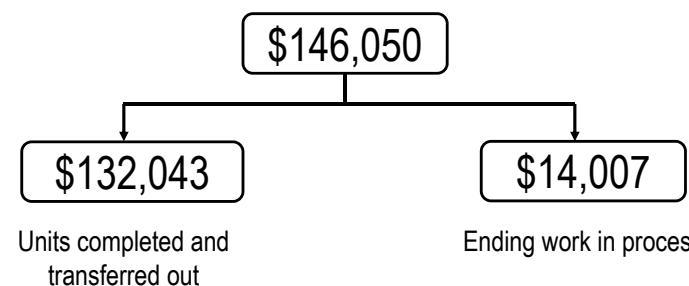
$$\begin{aligned}\text{Total production cost per EU} &= \$2.4014 + \$2.00 \\ &= \$4.4014\end{aligned}$$



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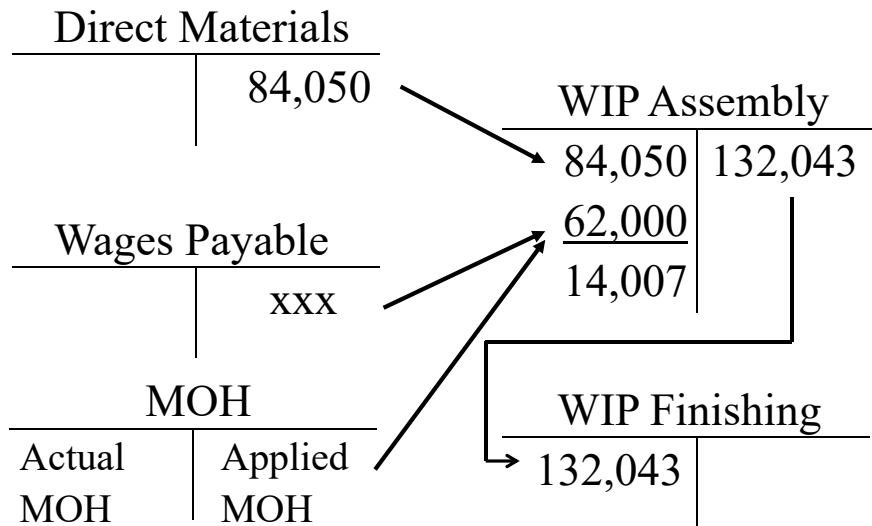
Steps 5: Summarize & Assign Total Costs

- Units completed and transferred out
= $30,000 \times \$4.4014$ = \$132,043
- Ending work in process
= $(5,000 \times \$2.4014) + (1,000 \times \$2.00)$ = 14,007



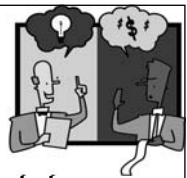
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Flow of Costs Example



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Process Costing: Case # 2



Case # 2: Process costing with some beginning work in process

- The previous period's ending inventory becomes the current period's beginning inventory
- If unit cost of BWIP $\neq$ current unit cost, the accounting for process costing can be one of two approaches:
 - ① Weighted-average process costing method (WA)
 - ② First-in, first-out (FIFO) process costing method
- The major difference relates to the way in which the *beginning work-in-process inventories* are treated

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Process Costing: Case # 2

- **Weighted-average process costing method (WA):**
 - Makes *no distinction* between work done in prior and current period.
 - *Blends together* units and costs from prior period and current period
 - Weighted-average costs is the total of all costs in the Work-in-Process Account divided by the total equivalent units of work done to date

This method will be covered in the class.

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Process Costing: Case # 2

- **First-in, first-out process costing method (FIFO):**
 - *Distinguishes* between costs from beginning WIP (i.e., costs incurred during the prior period) and costs added to WIP (i.e., costs incurred during the current period).
 - *Assumes that the earliest equivalent units in WIP are completed first*
 - Assigns the cost of the previous accounting period's equivalent units in beginning work-in-process inventory to the first units completed and transferred out of the process

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Process Costing: Case # 2

- On January 1, 20x1, there was 1,000 units of beginning work in process inventory
- These 1,000 units in beginning WIP are fully processed (100%) with respect to direct materials (\$2,350 cost incurred).
- However, they are, on average, 60% complete from the perspective of conversion costs (direct labor & manufacturing overhead) (\$5,200 cost incurred).

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Process Costing: Case # 2

- During the period, *Assembly Department* started to produce 35,000 units. However, at the end of the period, only 31,000 units are completed and transferred to *Finishing Department*.
- The 5,000 units in ending WIP are fully processed with respect to direct materials and are, on average, 20% complete from the perspective of conversion costs (DL & MOH).
- Total costs for the period:

■ DM costs added	\$ 84,050
■ Conversion costs added	<u>\$ 62,000</u>
■ Total costs added during the period	<u>\$146,050</u>

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Production Report – Weighted Average

	Physical units	E.U.	
		DM	CC
Units to account for			
Beginning WIP	1,000		
Started this period	35,000		
Total units to account for	36,000		
Units accounted for			
Units completed and transferred out	31,000	31,000	31,000
Ending WIP	5,000	5,000	1,000
Total units accounted for	36,000	36,000	32,000
	Total	DM	CC
Costs to account for: ③			
Costs in Beginning WIP	7,550	2,350	5,200
Current period costs	146,050	84,050	62,000
Total costs to account for	153,600	86,400	67,200
Costs per equivalent units ④	4.50	2.40	2.10
Costs accounted for ⑤			
Units completed and transferred out	139,500	74,400	65,100
Ending WIP	14,100	12,000	2,100
Total costs accounted for	153,600	86,400	67,200

Step 1: WA - Physical Units

Work in process, beginning

Started during current period

Units to account for

Completed and transferred out
during the period

Work in process, ending

Units accounted for



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Step 2: WA - Compute Equivalent Units (EU)

Flow of production	<u>DM</u>	<u>CC</u>
Completed and transferred out (31,000 units)		
Work in process, ending (5,000 units)		
EU		



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Step 3: WA - Summarize Total Costs

Costs in work in process beginning inventory:

Materials	\$ 2,350	
Conversion	<u>5,200</u>	
Total beginning inventory		\$ 7,550

Current costs in Assembly Dept.:

Materials	\$ 84,050	
Conversion	<u>62,000</u>	
Total current costs added		<u>146,050</u>

Total costs to account for		<u>\$153,600</u>
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Step 4: WA - Compute Equivalent Unit Costs

	<u>DM</u>	<u>CC</u>
BWIP costs	\$ 2,350	\$ 5,200
Current costs	<u>84,050</u>	<u>62,000</u>
Total costs	\$ 86,400	\$ 67,200
EU	<u>36,000</u>	<u>32,000</u>
Cost per EU	<u>\$2.40</u>	<u>\$2.10</u>

Total production cost per EU = \$2.40 + \$2.10
= \$4.50



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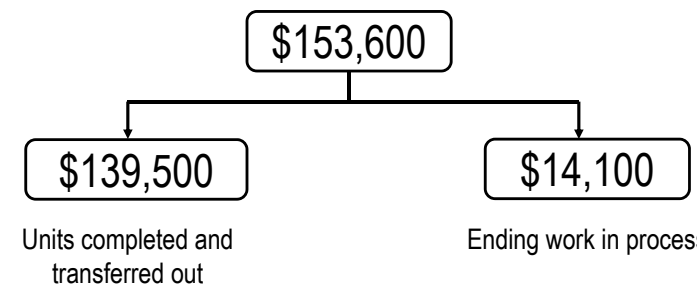
Step 5: WA - Assign Total Costs

- Units completed & transferred out:

$$= 31,000 \times \$4.50 = \$139,500$$

- EWIP:

$$= (5,000 \times \$2.40) + (1,000 \times \$2.10) = \$14,100$$



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Key T-Account: Weighted-Average

Work in Process Inventory, Assembly

BWIP	7,550	Transferred
Materials	84,050	to Finishing
Conversion	62,000	139,500
Balance	<u>14,100</u>	



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Process Costing in Sequential Production Departments

- In manufacturing operations with sequential production departments, the costs assigned to the units transferred out of one department remain assigned to those units as they enter the next department.
- To calculate costs per EU, we add a “transferred-in” column.

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Process Costing in Sequential Production Departments

WIP – Assembly Dept.

BWIP	7,550	→	Costs transferred to Finishing Dept
DM	84,050		
DL			
Applied	62,000		
MOH			
	139,500		

**Assembly
Dept.**



WIP – Finishing Dept.

Transferred-in costs	139,500
DM	
DL	
Applied	
MOH	

**Finishing
Dept.**

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