# Process Costing

Chapter 9

AC202 Managerial Accounting

Assistant Professor Dr. Nontawan Yomchinda

## Similarities Between Job-Order and Process Costing

- Both systems assign material, labor and overhead costs to products and they provide a mechanism for computing unit product costs.
- 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.



## Differences Between Job-Order and Process Costing

- Process costing is used when a single product is produced on a continuing basis or for a long period of time. Job-order costing is used when many different jobs having different production requirements are worked on each period.
- Process costing systems accumulate costs by department or process. Job-order costing systems accumulated costs by individual jobs.
- Process costing systems compute unit costs by department or process. Job-order costing systems compute unit costs by job on the job cost sheet.

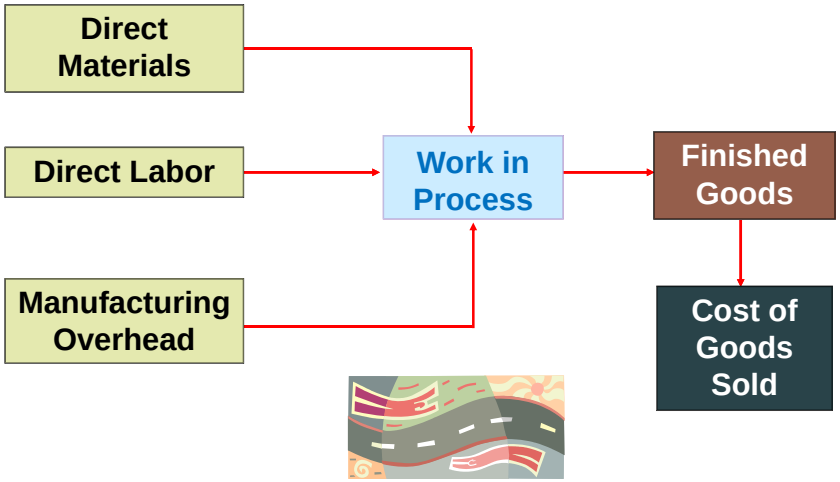


## Processing Departments

Any unit in an organization where materials, labor or overhead are added to the product.

The activities performed in a processing department are *performed uniformly* on all units of production. Furthermore, 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.

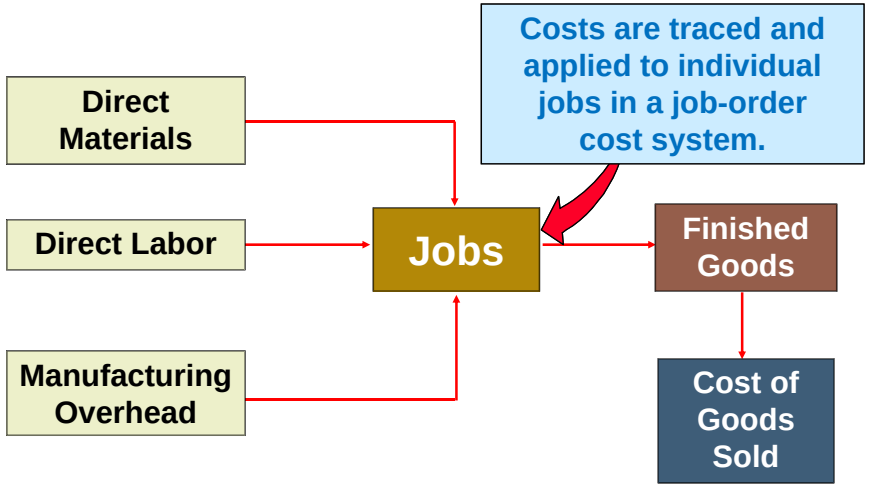
## Comparing Job-Order and Process Costing







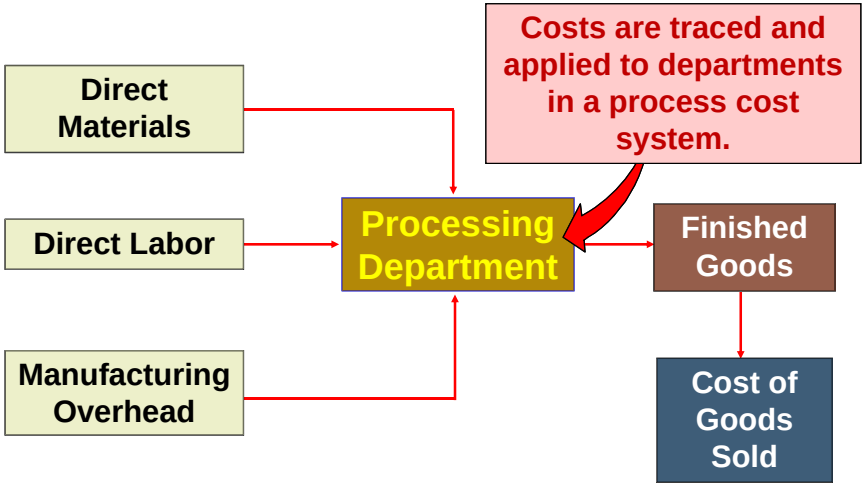

## Comparing Job-Order and Process Costing








## Comparing Job-Order and Process Costing

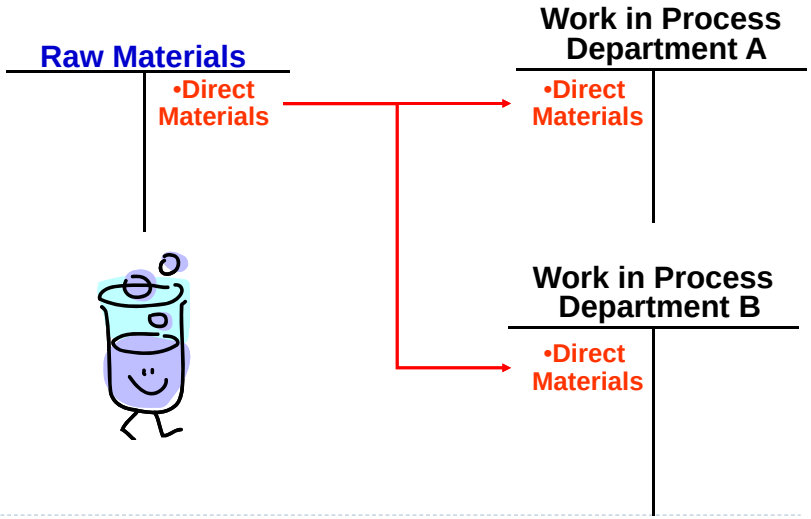





## T-Account and Journal Entry Views of Process Cost Flows

For purposes of this example, assume there are two processing departments – Departments A and B.
We will use T-accounts and journal entries.

## Process Cost Flows: The Flow of Raw Materials (in T-account form)




Objective 1: Record the flow of materials, Labor, and OH through a process costing system.



## Process Cost Flows: The Flow of Raw Materials (in journal entry form)

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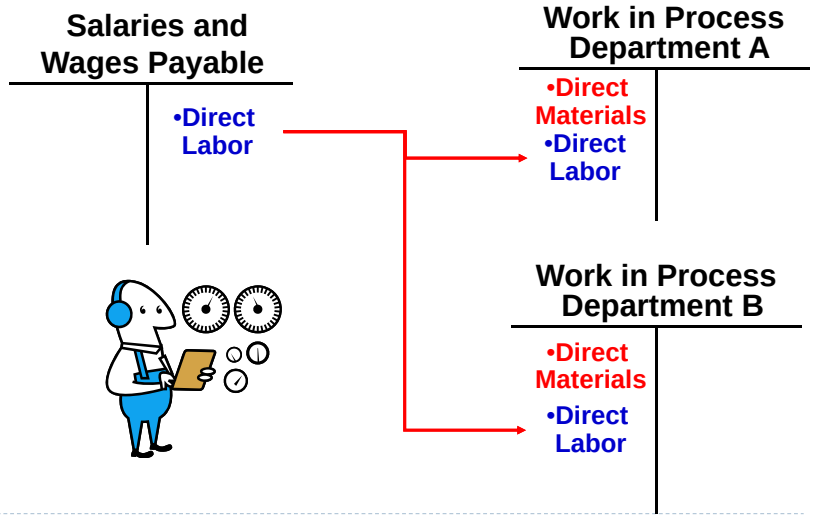
| Date | | Description | Post. Ref. | Debit | Credit |
|---|---|---|---|---|---|
| | | Work in Process - Department A | | XXXXX | |
| | | Work in Process - Department B | | XXXXX | |
| | | Raw Materials | | | XXXXX |
| | | *To record the use of direct material.* | | | |
| | | | | | |

Objective 1: Record the flow of materials, Labor, and OH through a process costing system.



## Process Cost Flows: The Flow of Labor Costs (in T-account form)




Objective 1: Record the flow of materials, Labor, and OH through a process costing system.



## Process Costing: The Flow of Labor Costs (in journal entry form)

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| Date | | Description | Post. Ref. | Debit | Credit |
|---|---|---|---|---|---|
| | | Work in Process - Department A | | XXXXX | |
| | | Work in Process - Department B | | XXXXX | |
| | | Salaries and Wages Payable | | | XXXXX |
| | | *To record direct labor costs.* | | | |
| | | | | | |

Objective 1: Record the flow of materials, Labor, and OH through a process costing system.

## Process Cost Flows: The Flow of Manufacturing Overhead Costs (in T-account form)

**Manufacturing Overhead**

| •Actual Overhead | •Overhead Applied to Work in Process |
|---|---|

**Work in Process Department A**

| •Direct Materials<br>•Direct Labor<br>•Applied Overhead |
|---|

**Work in Process Department B**

| •Direct Materials<br>•Direct Labor<br>•Applied Overhead |
|---|

Objective 1: Record the flow of materials, Labor, and OH through a process costing system.



## Process Cost Flows: The Flow of Manufacturing Overhead Costs (in journal entry form)

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| Date | | Description | Post. Ref. | Debit | Credit |
|---|---|---|---|---|---|
| | | Work in Process - Department A | | XXXXX | |
| | | Work in Process - Department B | | XXXXX | |
| | | Manufacturing Overhead | | | XXXXX |
| | | *To apply overhead to departments.* | | | |
| | | | | | |

Objective 1: Record the flow of materials, Labor, and OH through a process costing system.



## Process Cost Flows: Transfers from WIP-Dept. A to WIP-Dept. B (in T-account form)

**Work in Process Department A**

| •Direct Materials<br>•Direct Labor<br>•Applied Overhead | Transferred to Dept. B |
|---|---|

**Work in Process Department B**

| •Direct Materials<br>•Direct Labor<br>•Applied Overhead<br>•Transferred from Dept. A |
|---|

Department A

Department B

Objective 1: Record the flow of materials, Labor, and OH through a process costing system.



## Process Cost Flows: Transfers from WIP-Dept. A to WIP-Dept. B (in journal entry form)

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| Date | | Description | Post. Ref. | Debit | Credit |
|---|---|---|---|---|---|
| | | Work in Process - Department B | | XXXXX | |
| | | Work in Process - Department A | | | XXXXX |
| | | *To record the transfer of goods from* | | | |
| | | *Department A to Department B.* | | | |
| | | | | | |

Objective 1: Record the flow of materials, Labor, and OH through a process costing system.

## Process Cost Flows: Transfers from WIP-Dept. B to Finished Goods (in T-account form)

**Work in Process Department B**

| | |
|---|---|
| •Direct Materials<br>•Direct Labor<br>•Applied Overhead<br>•Transferred from Dept. A | •Cost of Goods Manufactured |

**Finished Goods**

| |
|---|
| •Cost of Goods Manufactured |




## Process Cost Flows: Transfers from WIP-Dept. B to Finished Goods (in journal entry form)

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| Date | Description | Post. Ref. | Debit | Credit |
|---|---|---|---|---|
| | Finished Goods | | XXXXX | |
| | Work in Process - Department B | | | XXXXX |
| | *To record the completion of goods* | | | |
| | *and their transfer from Department B* | | | |
| | *to finished goods inventory.* | | | |
| | | | | |



## Process Cost Flows: Transfers from Finished Goods to COGS (in T-account form)

**Work in Process Department B**

| | |
|---|---|
| •Direct Materials<br>•Direct Labor<br>•Applied Overhead<br>•Transferred from Dept. A | •Cost of Goods Manufactured |

**Finished Goods**

| | |
|---|---|
| •Cost of Goods Manufactured | •Cost of Goods Sold |

**Cost of Goods Sold**

| |
|---|
| •Cost of Goods Sold |



## Process Cost Flows: Transfers from Finished Goods to COGS (in journal entry form)

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| Date | Description | Post. Ref. | Debit | Credit |
|---|---|---|---|---|
| | Cost of Goods Sold | | XXXXX | |
| | Finished Goods | | | XXXXX |
| | *To record the transfer of finished* | | | |
| | *goods inventory to cost of goods* | | | |
| | *sold.* | | | |
| | | | | |

## Equivalent Units of Production

Equivalent units are the product of the number of partially completed units and the percentage completion of those units.


We need to calculate equivalent units because a department usually has some partially completed units in its beginning and ending inventory. These partially completed units complicate the determination of a department's output for a given period and the unit cost that should be assigned to that output.





## Equivalent Units – The Basic Idea

**Two half completed products are *equivalent to* one complete product.**


**So, 10,000 units 70% complete are *equivalent to* 7,000 complete units.**





## Calculating Equivalent Units

Equivalent units can be calculated two ways:

1. The First-In, First-Out Method – FIFO is covered in the appendix to this chapter.
2. The Weighted-Average Method – This method will be covered in the main portion of the chapter.

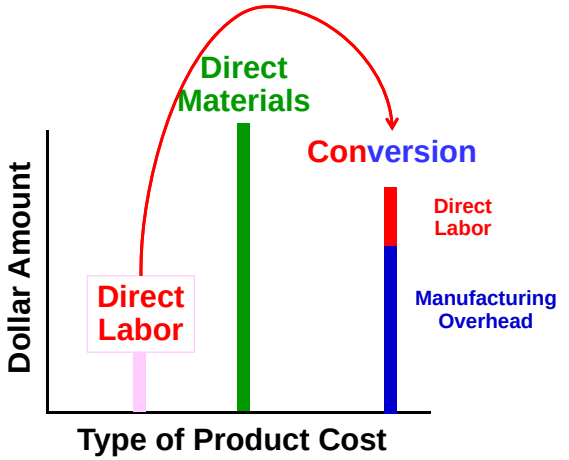


## Equivalent Units of Production
### Weighted-Average Method

The weighted-average method . . .

1. Makes no distinction between work done in prior or current periods.
2. Blends together units and costs from prior and current periods.
3. Determines equivalent units of production for a department by adding together the number of units transferred out plus the equivalent units in **ending** Work in Process Inventory.

## Treatment of Direct Labor




**Direct labor and manufacturing overhead may be combined into one classification of product cost called *conversion costs*.**





## Weighted-Average – An Example

Smith Company reported the following activity in the Assembly Department for the month of June:

| | | Percent Completed | |
|---|---|---|---|
| | Units | Materials | Conversion |
| Work in process, June 1 | 300 | 40% | 20% |
| Units started into production in June | 6,000 | | |
| Units completed and transferred out of Department A during June | 5,400 | | |
| Work in process, June 30 | 900 | 60% | 30% |





## Weighted-Average – An Example

- Equivalent units of production *always* equals:
  - Units completed and transferred
  - \+ Equivalent units remaining in work in process

| | Materials | Conversion |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |





## Weighted-Average – An Example

Materials

**6,000 Units Started**

| Beginning Work in Process 300 Units 40% Complete | 5,100 Units Started and Completed | Ending Work in Process 900 Units 60% Complete |
|---|---|---|

**5,400 Units Completed**
**540 Equivalent Units** ← 900 × 60%
**5,940 Equivalent units of production**

Objective 2: Compute the equivalent units of production using the weighted-average method.

## Weighted-Average – An Example

**Conversion**

**6,000 Units Started**

| Beginning Work in Process 300 Units 20% Complete | 5,100 Units Started and Completed | Ending Work in Process 900 Units 30% Complete |
|---|---|---|

**5,400 Units Completed**
**270 Equivalent Units** (900 × 30%)
**5,670 Equivalent units of production**



Objective 3: Compute the cost per equivalent unit using the Weighted-Average method.

## Compute and Apply Costs

**Beginning Work in Process Inventory: 400 units**
- Materials: 40% complete $ 6,119
- Conversion: 20% complete $ 3,920

**Production started during June 6,000 units**
**Production completed during June 5,400 units**

**Costs added to production in June**
- Materials cost $ 118,621
- Conversion cost $ 81,130

**Ending Work in Process Inventory: 900 units**
- Materials: 60% complete
- Conversion: 30% complete



Objective 3: Compute the cost per equivalent unit using the Weighted-Average method.

## Compute and Apply Costs

The formula for computing the cost per equivalent unit is:

$$\text{Cost per equivalent unit} = \frac{\text{Cost of beginning Work in Process Inventory} + \text{Cost added during the period}}{\text{Equivalent units of production}}$$



Objective 3: Compute the cost per equivalent unit using the Weighted-Average method.

## Compute and Apply Costs

Here is a schedule with the cost and equivalent unit information.

| | Total Cost | Materials | Conversion |
|---|---|---|---|
| Cost to be accounted for: | | | |
| Work in process, June 1 | $ 10,039 | $ 6,119 | $ 3,920 |
| Cost added in Assembly | 199,751 | 118,621 | 81,130 |
| Total cost | $ 209,790 | $ 124,740 | $ 85,050 |
| Equivalent units | | 5,940 | 5,670 |
| Cost per equivalent unit | | | |

Objective 4: Assign costs to units using the Weighted-Average method.

## Computing the Cost of Units Transferred Out

| Assembly Department<br>Cost of Ending WIP Inventory and Units Transferred Out | | | |
|---|---|---|---|
| | Materials | Conversion | Total |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |



Objective 5: Prepare a cost reconciliation report.

## Reconciling Costs

| Assembly Department<br>Cost Reconciliation | | |
|---|---|---|
| Costs to be accounted for: | | |
| Cost of beginning Work in Process Inventory | $ | 10,039 |
| Costs added to production during the period | | 199,751 |
| Total cost to be accounted for | $ | 209,790 |
| | | |
| Cost accounted for as follows: | | |
| Cost of ending Work in Process Inventory | $ | 15,390 |
| Cost of units transferred out | | 194,400 |
| Total cost accounted for | $ | 209,790 |

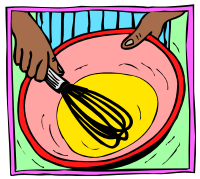


Objective 5: Prepare a cost reconciliation report.

## Operation Costing

Operation cost is a hybrid of job-order and process costing because it possesses attributes of both approaches

Operation costing is commonly used when batches of many different products pass through the same processing department.






## FIFO Method

Appendix 9A

## FIFO vs. Weighted-Average Method

The FIFO method (generally considered more accurate than the weighted-average method) differs from the weighted-average method in two ways:

1. The computation of equivalent units.
2. The way in which the costs of beginning inventory are treated.





## Equivalent Units – FIFO Method

Let's revisit the Smith Company example. Here is information concerning the Assembly Department for the month of June.

| | | Percent Completed | |
|---|---|---|---|
| | Units | Materials | Conversion |
| Work in process, June 1 | 300 | 40% | 20% |
| Units started into production in June | 6,000 | | |
| Units completed and transferred out of Department A during June | 5,400 | | |
| Work in process, June 30 | 900 | 60% | 30% |





## Equivalent Units – FIFO Method

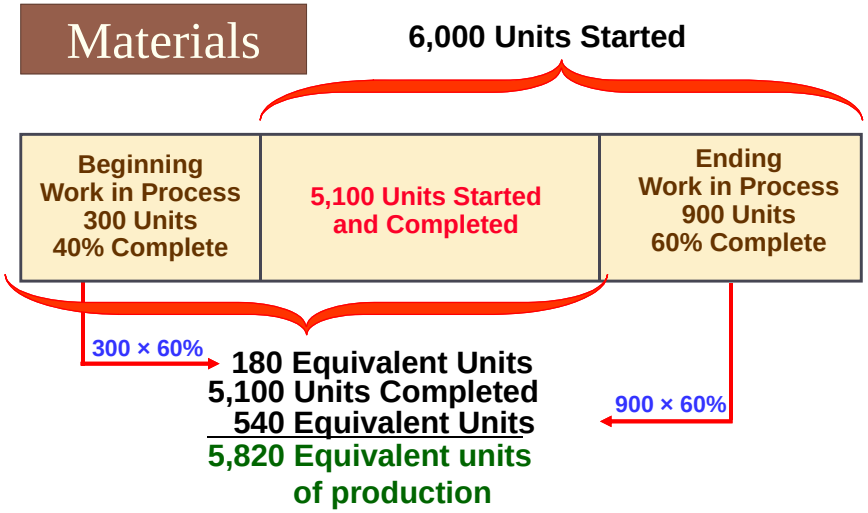
Step 3: Add the equivalent units in ending Work in Process Inventory.

| | Materials | Conversion |
|---|---|---|
| To complete beginning Work in Process: | | |
| Materials: 300 units × (100% - 40%) | 180 | |
| Conversion: 300 units × (100% - 20%) | | 240 |
| Units started and completed during June | 5,100 | 5,100 |
| Ending Work in Process | | |
| Materials: 900 units × 60% complete | 540 | |
| Conversion: 900 units × 30% complete | | 270 |
| Equivalent units of production | 5,820 | 5,610 |





## FIFO Example



## FIFO Example

Conversion

6,000 Units Started

| Beginning Work in Process 300 Units 20% Complete | 5,100 Units Started and Completed | Ending Work in Process 900 Units 30% Complete |
|---|---|---|

300 × 80%

240 Equivalent Units
5,100 Units Completed
270 Equivalent Units
5,610 Equivalent units of production

900 × 30%





## Equivalent Units: Weighted-Average vs. FIFO

As shown below, the equivalent units in beginning inventory are subtracted from the equivalent units of production per the weighted-average method to obtain the equivalent units of production under the FIFO method.

| | Materials | Conversion |
|---|---|---|
| Equivalent units - weighted-average method | 5,940 | 5,670 |
| Less equivalent units in beginning inventory: | | |
| 300 units × 40% | 120 | |
| 300 units × 20% | | 60 |
| Equivalent units - FIFO method | 5,820 | 5,610 |





## Cost per Equivalent Unit - FIFO

Let's revisit the Smith Company Assembly Department for the month of June to prepare our production report.

| | | |
|---|---|---|
| **Beginning work in process:** | | **400 units** |
| Materials: 40% complete | $ 6,119 | |
| Conversion: 20% complete | $ 3,920 | |
| **Production started during June** | | **6,000 units** |
| **Production completed during June** | | **5,400 units** |
| **Costs added to production in June** | | |
| Materials cost | $ 118,621 | |
| Conversion cost | $ 81,130 | |
| **Ending work in process** | | **900 units** |
| Materials: 60% complete | | |
| Conversion: 30% complete | | |





## Cost per Equivalent Unit - FIFO

**The formula for computing the cost per equivalent unit under FIFO method is:**

$$\text{Cost per equivalent unit} = \frac{\text{Cost added during the period}}{\text{Equivalent units of production}}$$

Objective 7: Compute the cost per equivalent unit using the FIFO method.

## Cost per Equivalent Unit - FIFO

| | Total Cost | Materials | Conversion |
|---|---|---|---|
| Cost added in June | $ 199,751 | $ 118,621 | $ 81,130 |
| Equivalent units | | 5,820 | 5,610 |
| Cost per equivalent unit | | $ 20.3816 | $ 14.4617 |

$118,600 ÷ 5,820

$81,130 ÷ 5,610

Total cost per equivalent unit = $20.3816 + $14.4617 = $34.8433



Objective 8: Assigning cost to units using the FIFO method.

## Applying Costs - FIFO

Step 3: Compute the cost of ending Work in Process Inventory.

| Assembly Department<br>Cost of Ending WIP Inventory | Materials | Conversion | Total |
|---|---|---|---|
| Ending WIP inventory: | | | |
| Equivalent units | 540 | 270 | |
| Cost per equivalent unit | $ 20.3816 | $ 14.4617 | |
| Cost of Ending WIP inventory | $ 11,006 | $ 3,905 | $ 14,911 |

540 × $20.3816

270 × 14.4617



Objective 8: Assigning cost to units using the FIFO method.

## Cost of Units Transferred Out

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| Assembly Department<br>Cost of Units Transferred Out in June | Materials | Conversion | Total |
|---|---|---|---|
| Cost of Units Transferred Out: | | | |
| Cost in beginning WIP inventory | $ 6,119 | $ 3,920 | $ 10,039 |
| Cost to complete beginning WIP | | | |
| Equivalent units to complete | 180 | 240 | |
| Cost per equivalent unit | $ 20.3816 | $ 14.4617 | |
| Cost to complete beginning WIP | $ 3,668 | $ 3,471 | 7,139 |
| Cost of units started and completed: | | | |
| Units started and completed | 5,100 | 5,100 | |
| Cost per equivalent unit | $ 20.3816 | $ 14.4617 | |
| Cost of units started and completed | $ 103,946 | $ 73,755 | 177,701 |
| Cost of Units Transferred Out | | | $ 194,879 |



Objective 9: Prepare a cost reconciliation report using the FIFO method.

## Reconciling Costs

| Assembly Department<br>Cost Reconciliation for June | |
|---|---|
| Costs to be accounted for: | |
| Cost of beginning Work in Process Inventory | $ 10,039 |
| Costs added to production during the period | 199,751 |
| Total cost to be accounted for | $ 209,790 |
| Cost accounted for as follows: | |
| Cost of ending Work in Process Inventory | $ 14,911 |
| Cost of units transferred out | 194,879 |
| Total cost accounted for | $ 209,790 |

**Objective 9: Prepare a cost reconciliation report using the FIFO method.**

## A Comparison of Costing Methods

In a lean production environment, FIFO and weighted-average methods yield similar unit costs.

When considering cost control, FIFO is superior to weighted-average because it does not mix costs of the current period with costs of the prior period.



## Summary of Weighted Average vs FIFO

| | Weighted Average | FIFO |
|---|---|---|
| **Physical flow calculation** | Calculate physical flow (in units):<br>BWIP + Units started = Units completed + EWIP | |
| **Equivalent Unit calculation** | All units are assumed to be **pooled together** without differentiating the period of completing the work | Emphasize **percentage of input and work done in the period** strictly on the FIFO basis |
| | Calculate the equivalent units based on<br>1. Completed units<br>2. EWIP | Calculate the equivalent units based on<br>1. Work done to complete the remaining part of BWIP<br>2. Units ***Started and Completed***[#] within the period<br>3. Work started on EWIP |
| **Brought Forward Costs** | Add to the current period to calculate the average cost per equivalent unit | Add to the cost of completed units as all items are assumed completed before starting new production |
| **Cost incurred in the period** | Differentiate Material and Conversion costs | |
| **Cost per Equiv. Unit (CEU)** | Costs b/f + Costs in the period<br>Equivalent unit produced | Costs in the period<br>Equivalent unit produced |
| **Cost of completed Units** | Completed units<br>x<br>CEU | Units started and completed x CEU<br>+<br>***Completion of BWIP****<br>+<br>Cost brought forward<br>} Total costs related to BWIP |
| **Cost of EWIP** | Equivalent EWIP Units completed in the period x CEU | |
| **Final Checking** | Cost reconciliation:<br>Costs brought forward + incurred in the period = completed units + Ending WIP | |

[#] ***Started and Completed*** = Completed Units – BWIP = Units Started in the period – EWIP

*** Completion of BWIP***:
Equivalent units of Raw Materials to complete BWIP x $CEU_{raw\ materials}$ + Equivalent units of Conversion to complete BWIP x $CEU_{conversion}$



## End of Chapter 9