

Process Costing

Chapter 9

AC202 Managerial Accounting

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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.

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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.

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Processing Departments

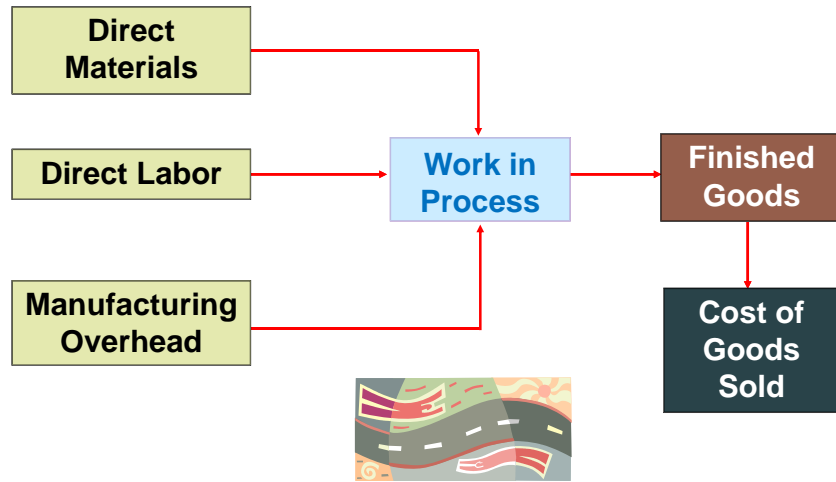
Any unit in an organization where materials, labor or overhead are added to the product.

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.

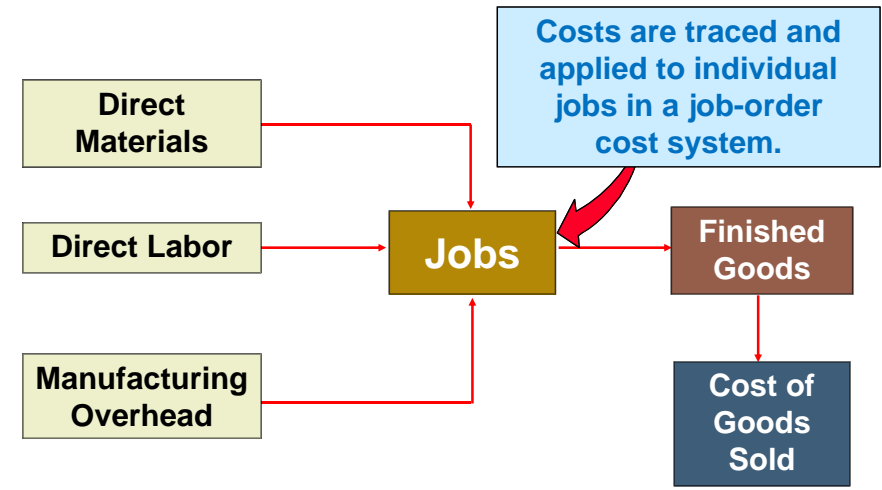


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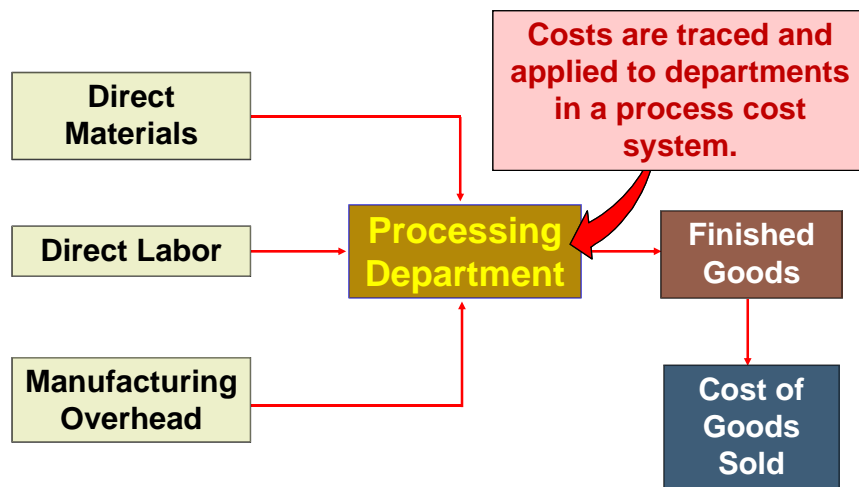
Comparing Job-Order and Process Costing



Comparing Job-Order and Process Costing



Comparing Job-Order and Process Costing

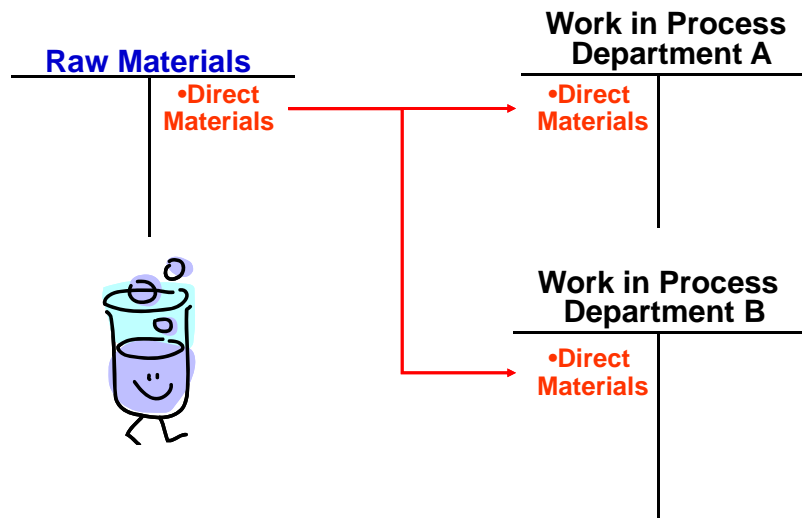


T-Account and Journal Entry Views of Process Cost Flows

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.

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

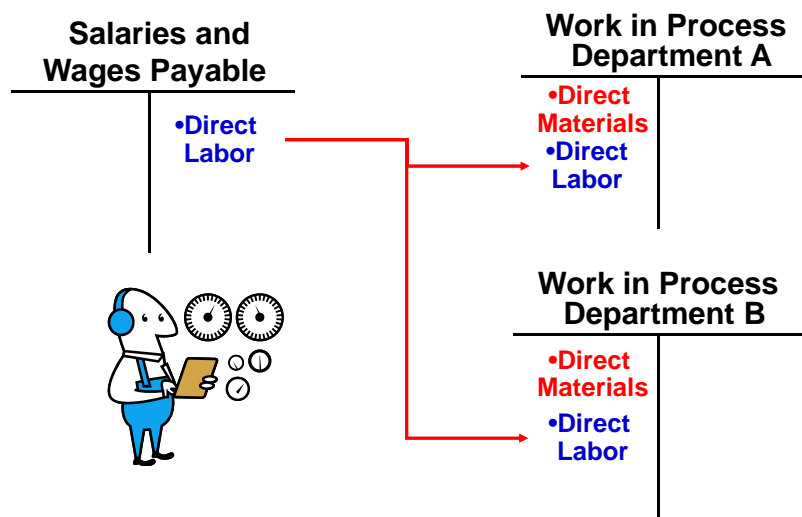
GENERAL JOURNAL				Page 4
Date	Description	Post. Ref.	Debit	Credit
	Work in Process - Department A		XXXXX	
	Work in Process - Department B		XXXXX	
	Raw Materials			XXXXX
	<i>To record the use of direct material.</i>			



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

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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.

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

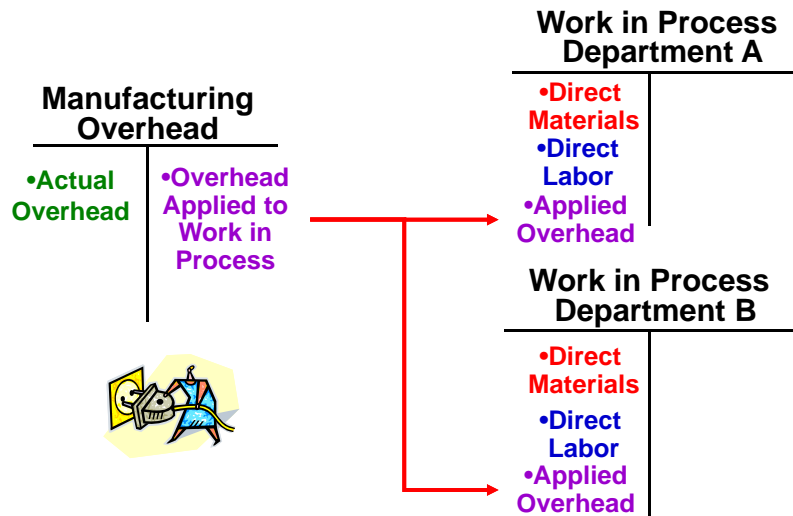
GENERAL JOURNAL				Page 4
Date	Description	Post. Ref.	Debit	Credit
	Work in Process - Department A		XXXXX	
	Work in Process - Department B		XXXXX	
	Salaries and Wages Payable			XXXXX
	<i>To record direct labor costs.</i>			



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

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



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

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

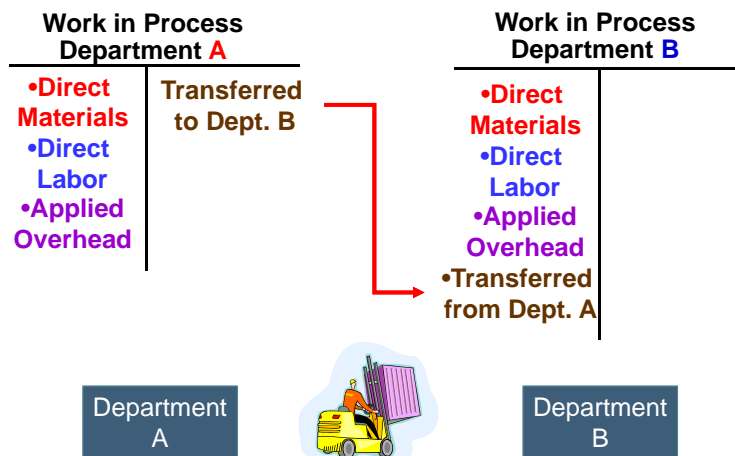
GENERAL JOURNAL				Page 4
Date	Description	Post. Ref.	Debit	Credit
	Work in Process - Department A		XXXXX	
	Work in Process - Department B		XXXXX	
	Manufacturing Overhead			XXXXX
	<i>To apply overhead to departments.</i>			



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

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



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

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

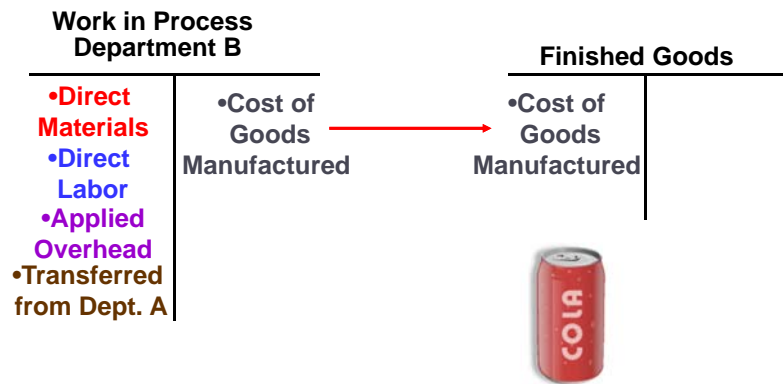
GENERAL JOURNAL				Page 4
Date	Description	Post. Ref.	Debit	Credit
	Work in Process - Department B		XXXXX	
	Work in Process - Department A			XXXXX
	<i>To record the transfer of goods from Department A to Department B.</i>			



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

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



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

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

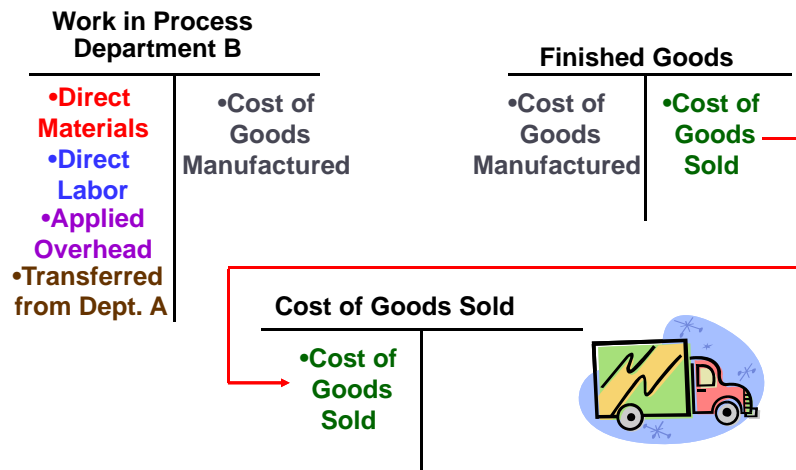
GENERAL JOURNAL				Page 4
Date	Description	Post. Ref.	Debit	Credit
	Finished Goods		XXXXX	
	Work in Process - Department B			XXXXX
	<i>To record the completion of goods and their transfer from Department B to finished goods inventory.</i>			



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

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



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

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

GENERAL JOURNAL				Page 4
Date	Description	Post. Ref.	Debit	Credit
	Cost of Goods Sold		XXXXX	
	Finished Goods			XXXXX
	<i>To record the transfer of finished goods inventory to cost of goods sold.</i>			



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

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Equivalent Units of Production

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

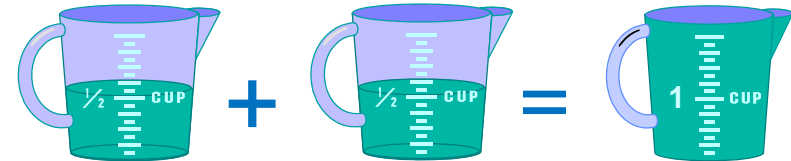


We need to calculate equivalent units because a department usually has some partially completed units in its beginning and ending inventory. These partially completed units complicate the determination of a department's output for a given period and the unit cost that should be assigned to that output.

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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.**

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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.



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Equivalent Units of Production Weighted-Average Method

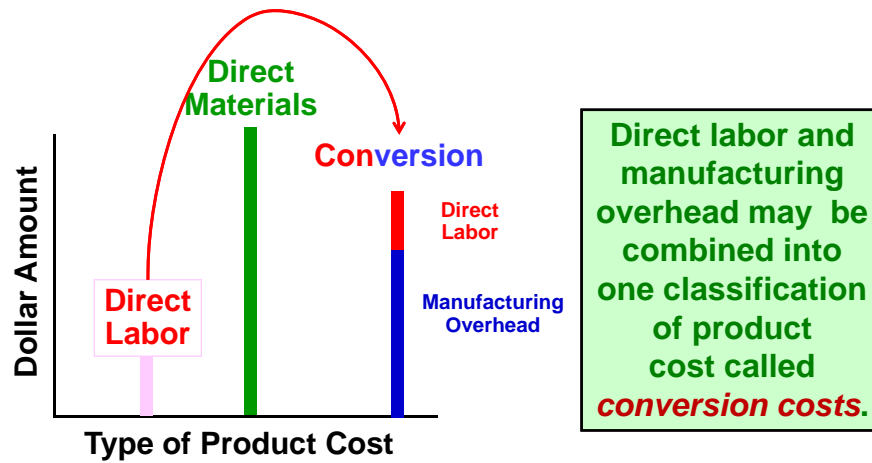
The weighted-average method . . .

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.



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Treatment of Direct Labor



Weighted-Average – An Example

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

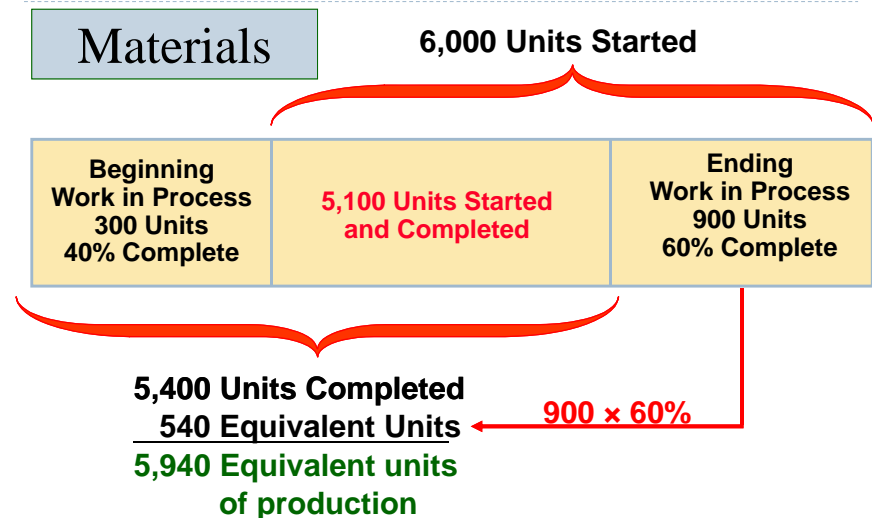
	Units	Percent Completed	
		Materials	Conversion
Work in process, June 1	300	40%	20%
Units started into production in June	6,000		
Units completed and transferred out of Department A during June	5,400		
Work in process, June 30	900	60%	30%

Weighted-Average – An Example

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

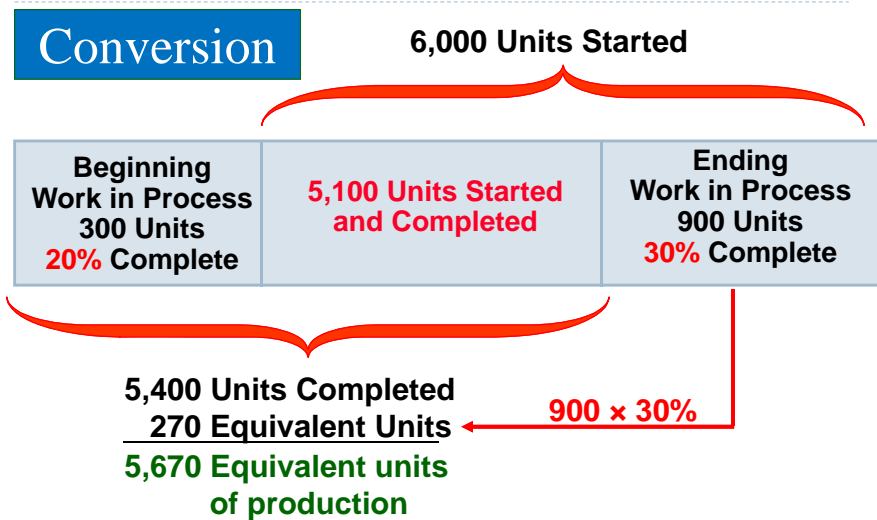
	Materials	Conversion

Weighted-Average – An Example



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

Weighted-Average – An Example



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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	

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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:

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



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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			

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

Computing the Cost of Units Transferred Out

Assembly Department Cost of Ending WIP Inventory and Units Transferred Out			
	Materials	Conversion	Total

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Objective 5: Prepare a cost reconciliation report.

Reconciling Costs

Assembly Department 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

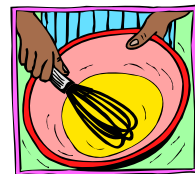
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Objective 5: Prepare a cost reconciliation report.

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.



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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.

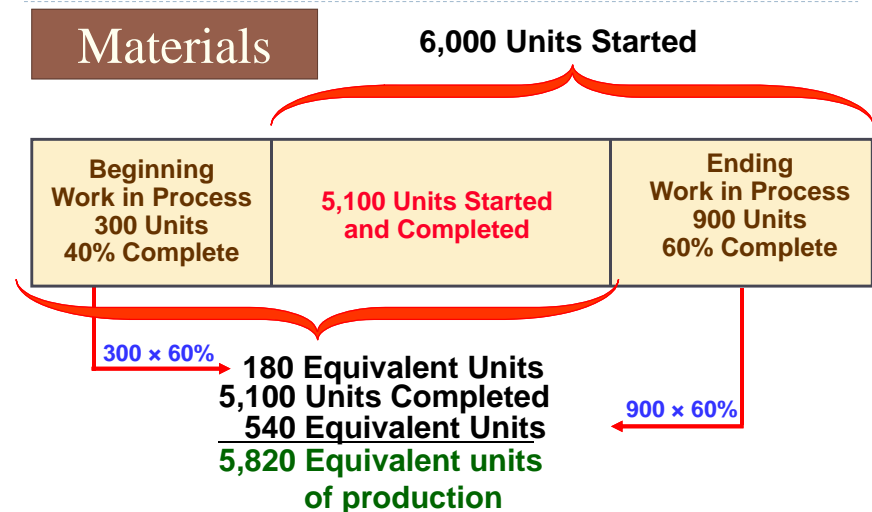
	Units	Percent Completed	
		Materials	Conversion
Work in process, June 1	300	40%	20%
Units started into production in June	6,000		
Units completed and transferred out of Department A during June	5,400		
Work in process, June 30	900	60%	30%

Equivalent Units – FIFO Method

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

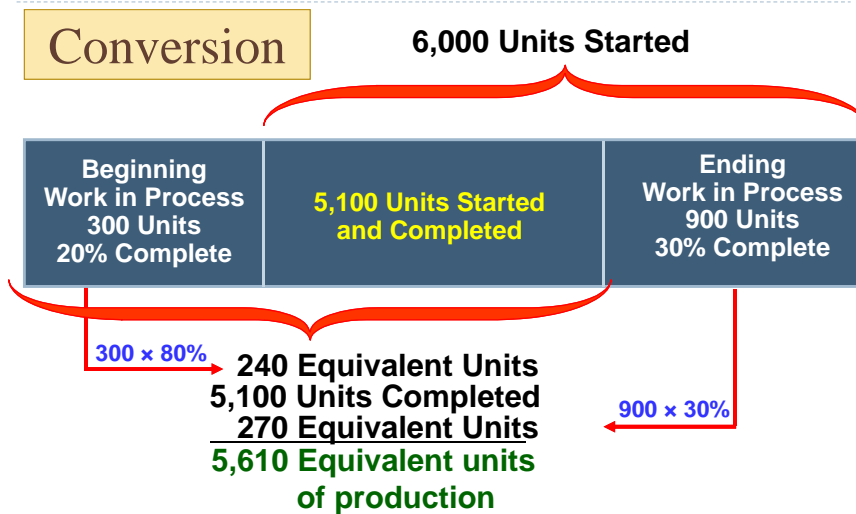
	Materials	Conversion
To complete beginning Work in Process:		
Materials: 300 units × (100% - 40%)	180	
Conversion: 300 units × (100% - 20%)		240
Units started and completed during June	5,100	5,100
Ending Work in Process		
Materials: 900 units × 60% complete	540	
Conversion: 900 units × 30% complete	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

FIFO Example



Objective 6: Compute the equivalent units of production using the FIFO method.

FIFO Example



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Objective 6: Compute the equivalent units of production using the FIFO method.

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.

	<u>Materials</u>	<u>Conversion</u>
Equivalent units - weighted-average method	5,940	5,670
Less equivalent units in beginning inventory:		
300 units \times 40%	120	
300 units \times 20%		60
Equivalent units - FIFO method	<u>5,820</u>	<u>5,610</u>

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

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	

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

Cost per Equivalent Unit - FIFO

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

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



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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

$$\$118,600 \div 5,820$$

$$\$81,130 \div 5,610$$

$$\text{Total cost per equivalent unit} = \$20.3816 + \$14.4617 = \$34.8433$$

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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 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

$$540 \times \$20.3816$$

$$270 \times 14.4617$$

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

Cost of Units Transferred Out

Assembly Department 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

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

Reconciling Costs

Assembly Department 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

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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.



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Summary of Weighted Average vs FIFO

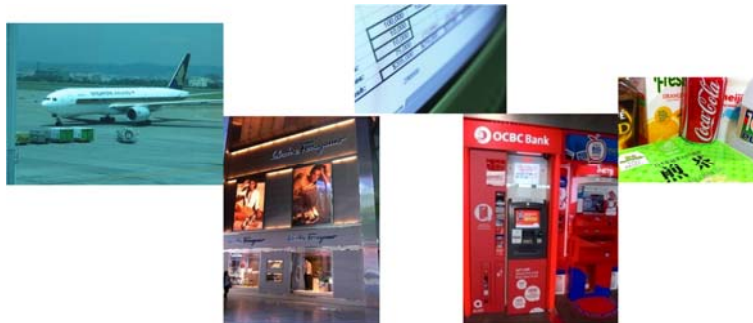
	Weighted Average	FIFO
Physical flow calculation	Calculate physical flow (in units): $BWIP + \text{Units started} = \text{Units completed} + EWIP$	
Equivalent Unit calculation	All units are assumed to be pooled together without differentiating the period of completing the work Calculate the equivalent units based on 1. Completed units 2. EWIP	Emphasize percentage of input and work done in the period strictly on the FIFO basis Calculate the equivalent units based on 1. Work done to complete the remaining part of BWIP 2. Units Started and Completed [*] within the period 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)	$\frac{\text{Costs b/f} + \text{Costs in the period}}{\text{Equivalent unit produced}}$	$\frac{\text{Costs in the period}}{\text{Equivalent unit produced}}$
Cost of completed Units	Completed units x CEU	Units started and completed x CEU + Completion of BWIP ^{**} + Cost brought forward
Cost of EWIP	Equivalent EWIP Units completed in the period x CEU	
Final Checking	Cost reconciliation: $\text{Costs brought forward} + \text{incurred in the period} = \text{completed units} + \text{Ending WIP}$	

^{*} 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}

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Losses in Process Costing

Appendix 9B

Production Losses

► Losses in production can be classified into:

- **Expected – Normal Losses**
 - In packaged/canned manufacturing – parts of vegetables purchased are not suitable for consumption
- **Expected – Normal Losses with scrap value**
 - In clothes/shirts manufacturing – part of the fabrics are in irregular formats after trimming out the shape required, leaving some losses which may be able to sell as scrap
- **Unexpected – Abnormal Losses**
 - In packaged/canned manufacturing – the refrigerator broke down without notice and food stored inside cannot be used – abnormal losses
- **Unexpected – Abnormal Losses with scrap value**
 - In clothes/shirts manufacturing – a batch of shirts being rejected due to wrong fabric being used could be sold to rejected clothing merchandisers after removing the logos.

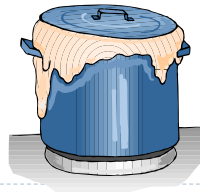
Accounting for Normal Losses and Scrap Value

▶ Normal Losses

- It is part of the production outputs
- It is treated as part of the normal production cost for the finished items (i.e. is absorbed into all products and is included in inventory valuation)

▶ Normal Losses with scrap value

- Scrap value is part of the expected income to offset the expense therefore is net-off from the expenses.



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Accounting for Abnormal Losses and Scrap Value

▶ Abnormal Losses

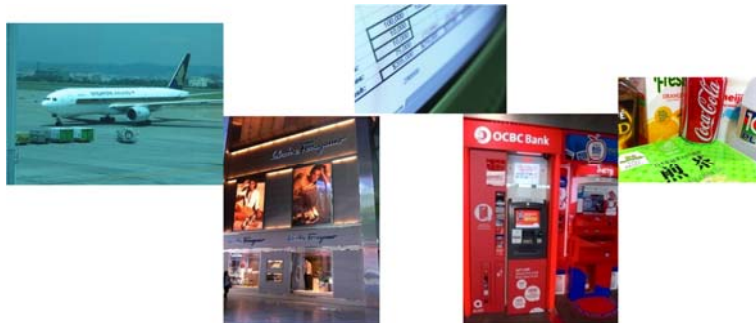
- They are a part of the production outputs
- They are not part of the normal production cost, and therefore are expensed off separately from the production costs (i.e. cannot be used for inventory valuation)

▶ Abnormal Losses with scrap value

- Scrap value receivable is also not part of the normal production income, and therefore is treated as other income.



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Activity-based Process Costing

Appendix 9C

Activity-based Process Costing

- ▶ Large quantity homogeneous products with similarities
- ▶ Sharing production facilities
- ▶ Premium and low-end products with different consumption of the shared production facilities
- ▶ Resource and activity consumption being traceable by using the activity-based costing technique within the process costing environment
- ▶ Examples: Candies manufacturing, instant noodle manufacturing and wine bottling



End of Chapter 9

