

A close-up of a financial statement table showing various monetary values.

|           |
|-----------|
| 100,000   |
| 10,000    |
| 10,000    |
| 75,000    |
| \$205,000 |
| 25,000    |



# Process Costing

## Chapter 4

# Learning Objective 1

Record the flow of materials, labor, and overhead through a process costing system.



# Key feature of process costing:

## Cost Transfers from Dept. A to Dept. B

### Work in Process Department **A**

- **Direct Materials**
- **Direct Labor**
- **MOH**

Transferred  
to Dept. B

Department  
A

Note: Dept A (the first process) product costs consist of Three components.

### Work in Process Department **B**

- **Direct Materials**
- **Direct Labor**
- **MOH**

• Transferred  
from Dept. A

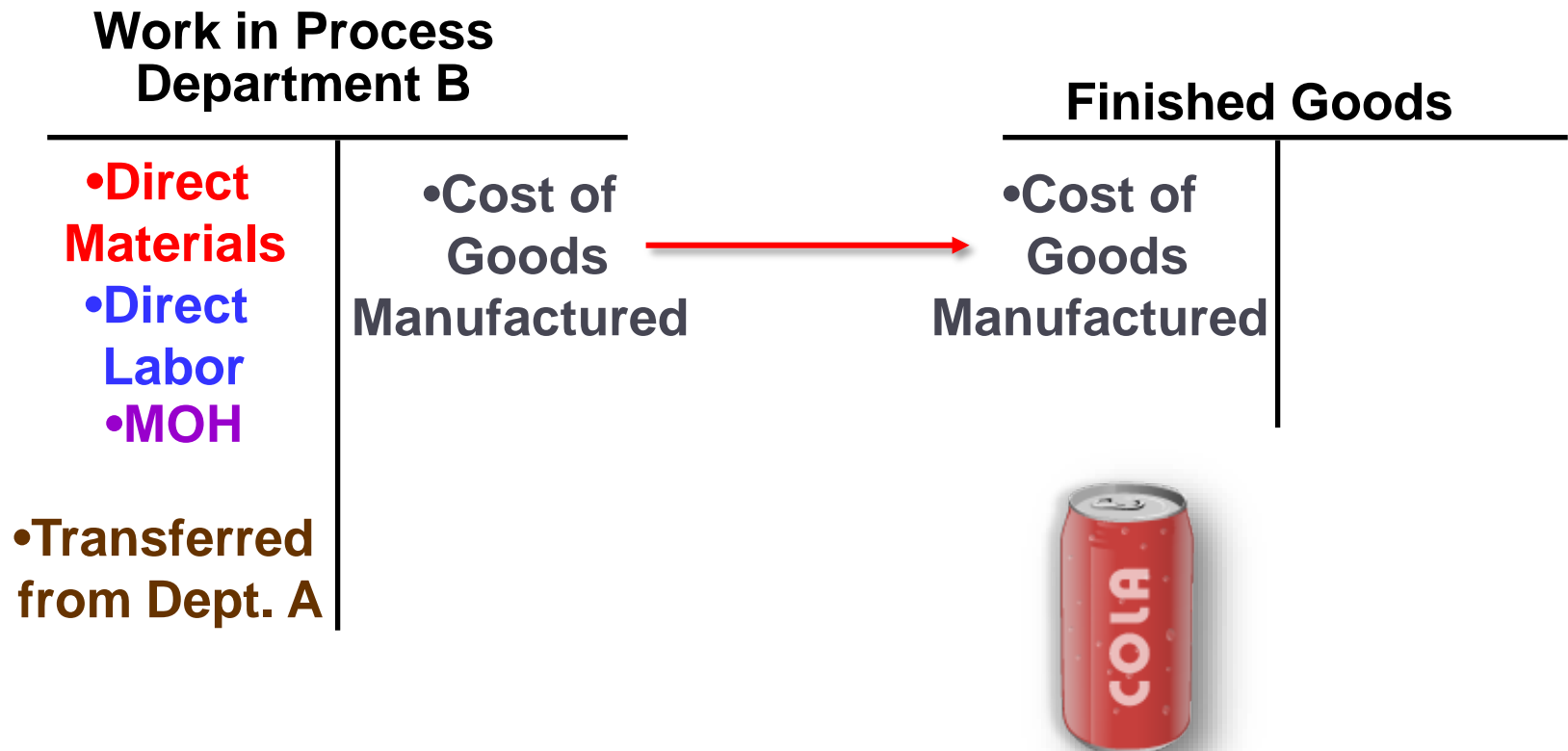
Department  
B

Note: Dept B product costs consist of FOUR components.



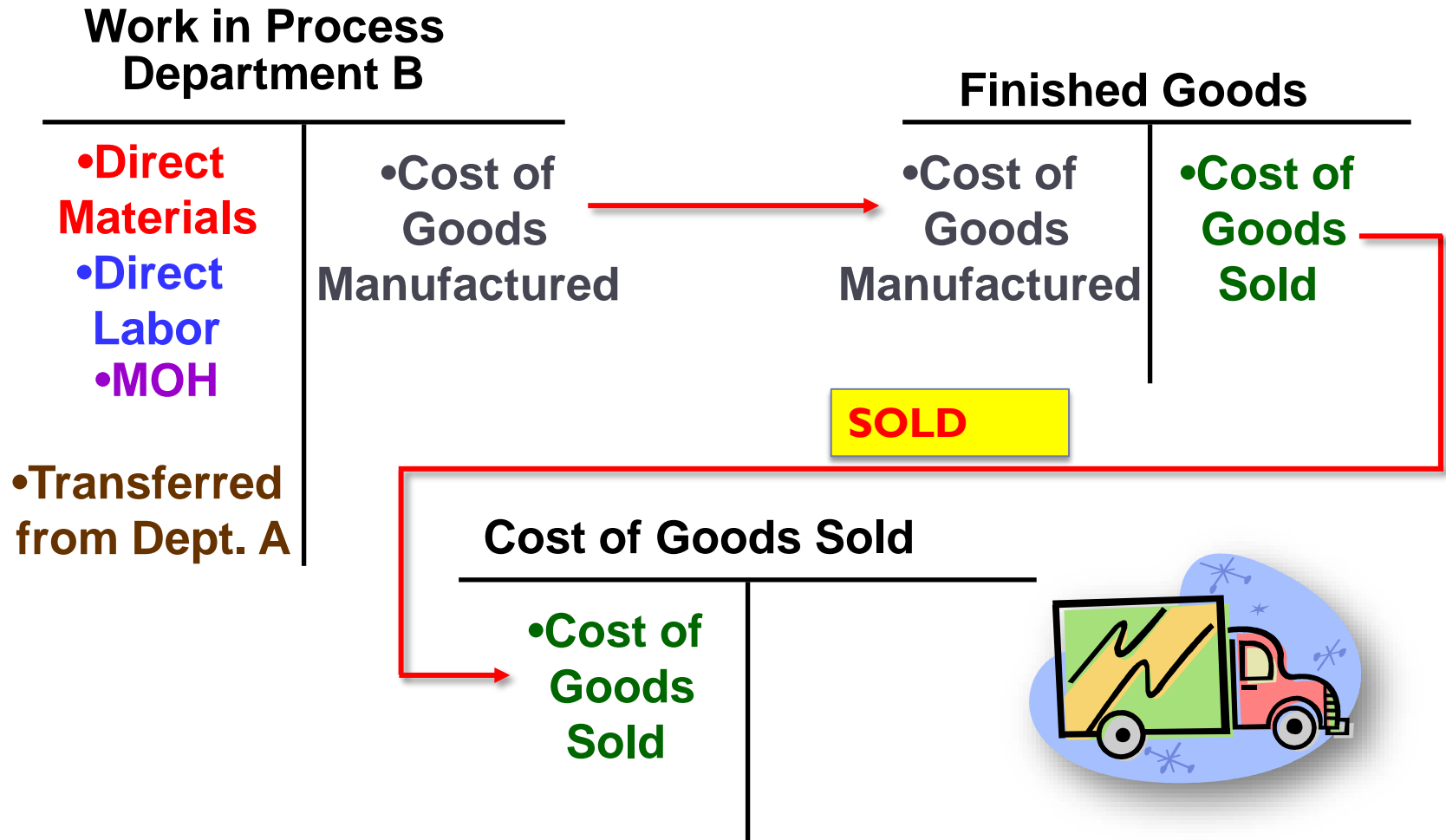
# Process Cost Flows: Dept. B to Finished Goods

Dept. B finishes the whole production



# Cost flow from finished goods to COGS

It goes to COGS expense item when the product was sold.



# Keynotes

- Both job-order costing and process-costing methods are under absorption costing system;
- all manufacturing costs, both fixed and variable, are assigned to product units. therefore, both costing methods are acceptable under GAAP

- Under Job-costing, we can calculate unit cost for only finished goods;
- Under process-costing, we need to sum up the unit cost for each individual processing department;
- However, each individual department often has incomplete units;
- Then, we need to consider both incomplete and complete units for each processing department;
- That is why we have “equivalent unit” concept under process-costing.

Also, under the process-costing method, the use of “pre-determined MOH rate” (hence the “over- or under-applied MOH” issues) is NOT as prevalent as that for job-order costing. **So, we do not talk about over- or under-apply MOH here.**

- Key: the concern of timeliness is largely alleviated when using the process-costing method.

# Equivalent Units of Production

- Process costing is done by department. Each department has its beginning and ending inventory with different completion percentage.

We need to calculate equivalent units because 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.

- We need to know dollar amount (\$) for products transferred from Dept. A to B and the \$ for ending inventory in Dept. A.

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

- “**Equivalent Units**” is only meaningful for the homogenous products under process costing method

# Equivalent Units – The Basic Idea

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

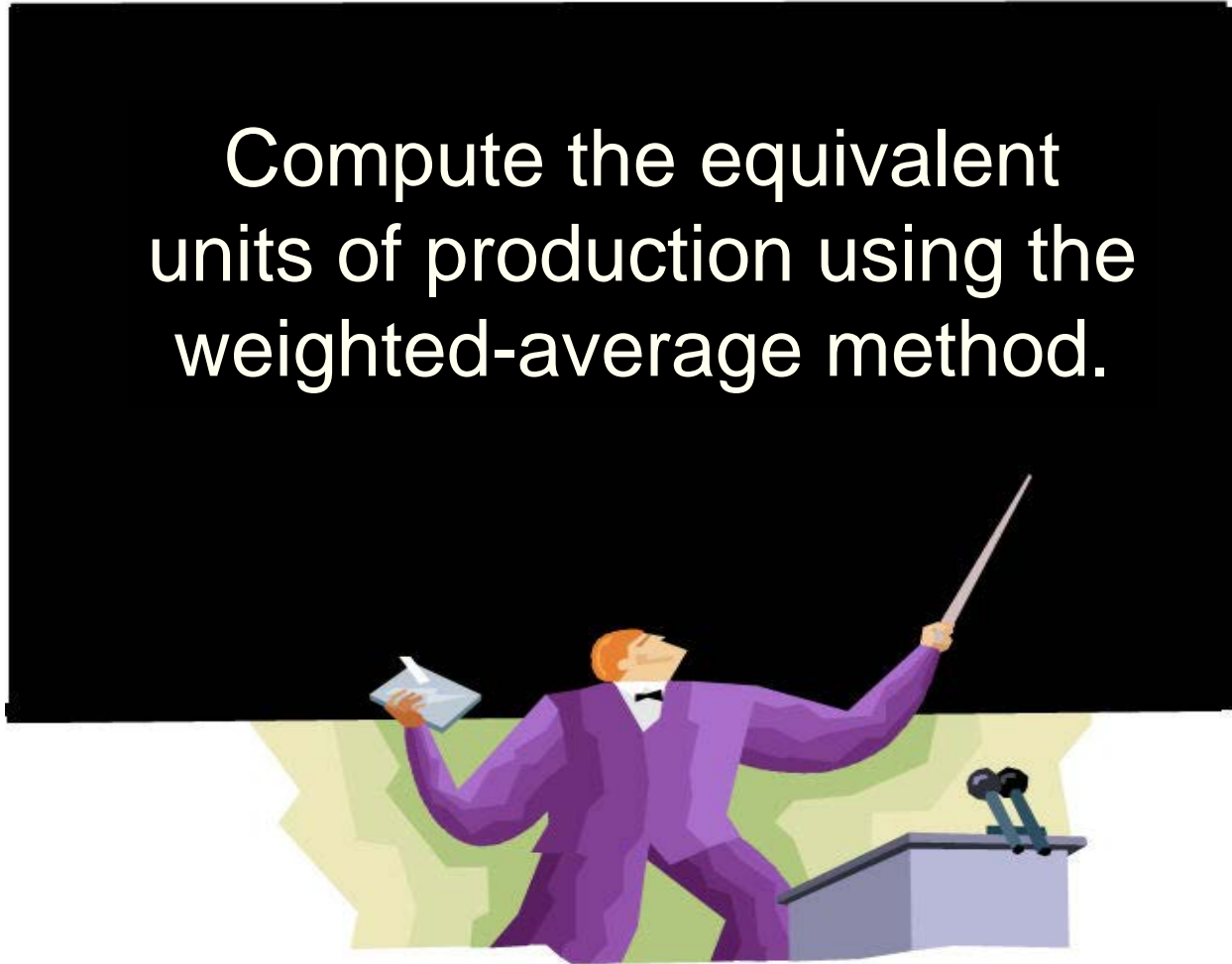


So, 10,000 units with 70% completion are ***equivalent to*** 7,000 complete units.



## Learning Objective 2

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



# 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 is taught for this course.

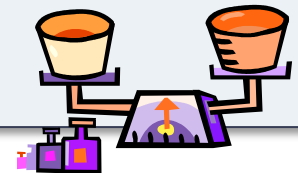


**Note:**  
For this course, we will only need to know the  
“weighted-average method”!

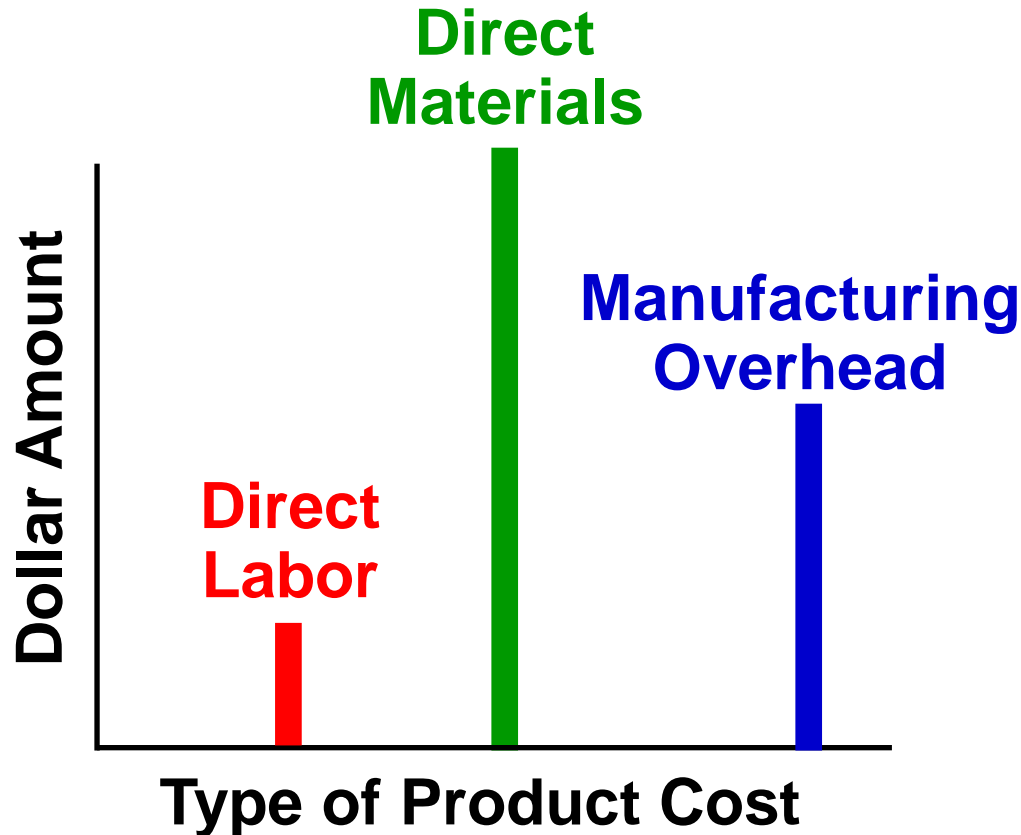
# Equivalent Units of Production

## The weighted-average method . . .

1. Makes no distinction between work done in prior or current periods (i.e., cost for beginning inventory vs. cost incurred for current year's work).
2. Blends together units and costs from prior and current periods. (i.e., we don't try to figure out those units in the ending inventory are from prior period or from the work in this period.
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.

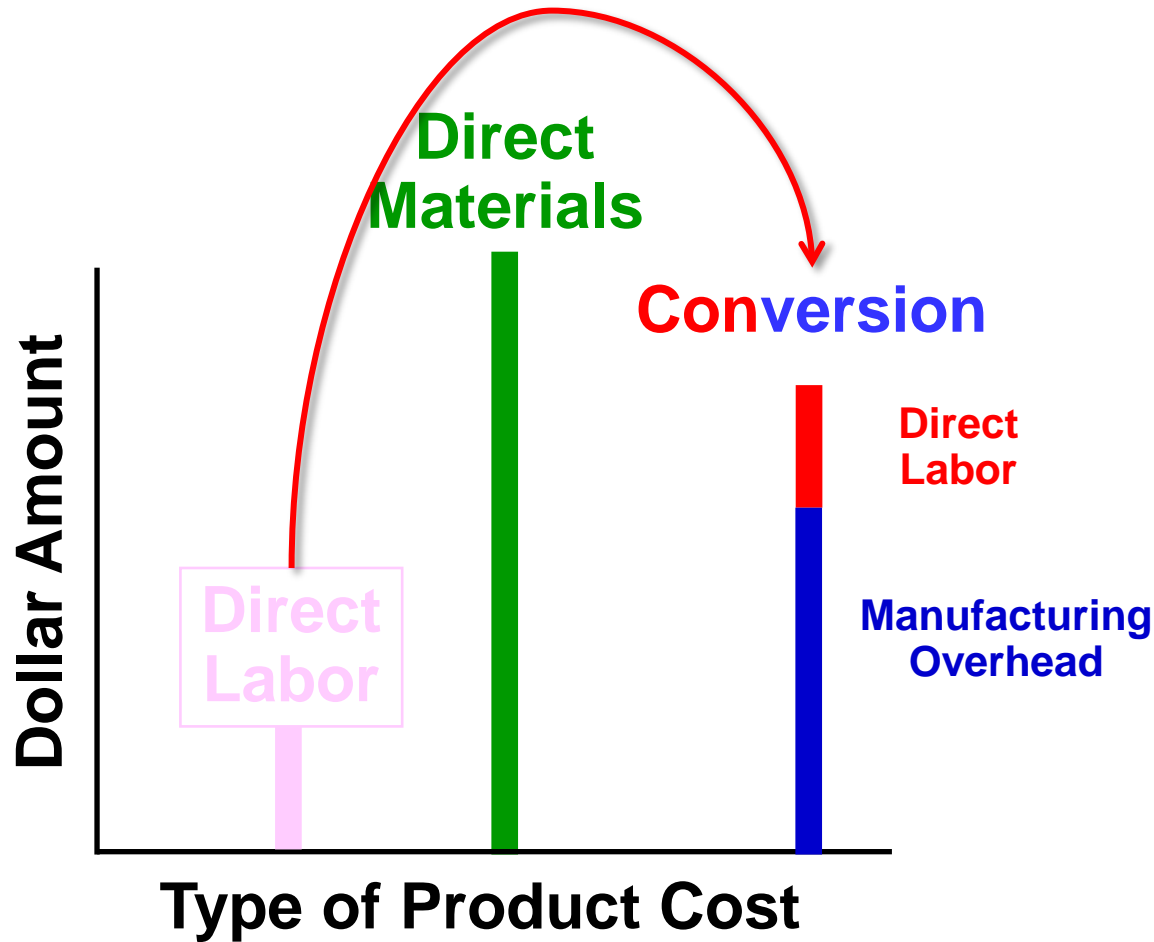


# Treatment of Direct Labor



**Direct labor costs may be small in comparison to other product costs in the process-costing systems.**

# 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:

|   | 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

The first step in calculating the equivalent units is to identify the units completed and transferred out of Assembly Department in June (5,400 units)

|  | <u>Materials</u> | <u>Conversion</u> |
|--|------------------|-------------------|
| <b>Units completed and transferred out of the Department in June</b> | <b>5,400</b>     | <b>5,400</b>      |
|  | <hr/>            | <hr/>             |
|  | <hr/>            | <hr/>             |

# Weighted-Average – An Example

The next step is to identify the *equivalent units* with respect to the two cost categories, *Materials and Conversion*, respectively.

## Equivalent units of production =

Units completed and transferred + Equivalent units remained in the ending inventory

|  | <u>Materials</u> | <u>Conversion</u> |
|--|------------------|-------------------|
| <b>Units completed and transferred out of the Department in June</b> | <b>5,400</b>     | <b>5,400</b>      |
| <b>Work in process, June 30:</b>                                     |                  |                   |
| <b>900 units × 60%</b>   | <b>540</b>       |                   |
| <b>900 units × 30%</b>   |                  | <b>270</b>        |
| <b>Equivalent units of Production in the Department during June</b>  | <b>5,940</b>     | <b>5,670</b>      |



# product units vs. product dollar amount in the real flow of goods

Units of beginning inventory + Units started in the process =  
Units completed/transferred out + Units of ending inventory

\$Costs of beginning inventory + \$Costs used in the process =  
\$Costs of units completed/transferred out + \$Costs of ending inventory

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

“Cost per equivalent units” can be calculated separately for different types of costs in the same process.

Given additional information about the costs for the above example

**Beginning Work in Process Inventory: 300 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**

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

Calculate the equivalent units separately for Materials and for Conversion costs

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

See the previous slides for the calculation of Equivalent units

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

$$\text{\$124,740} \div 5,940 \text{ units} = \text{\$21.00}$$

$$\text{\$85,050} \div 5,670 \text{ units} = \text{\$15.00}$$

|                                  | <u>Total<br/>Cost</u>    | <u>Materials</u>         | <u>Conversion</u>       |
|----------------------------------|--------------------------|--------------------------|-------------------------|
| <b>Cost to be accounted for:</b> |                          |                          |                         |
| Work in process, June 1          | \$ 10,039                | \$ 6,119                 | \$ 3,920                |
| Cost added in Assembly           | 199,751                  | 118,621                  | 81,130                  |
| <b>Total cost</b>                | <u><u>\$ 209,790</u></u> | <u><u>\$ 124,740</u></u> | <u><u>\$ 85,050</u></u> |
| <b>Equivalent units</b>          |                          | 5,940                    | 5,670                   |
| <b>Cost per equivalent unit</b>  |                          | <u><u>\$ 21.00</u></u>   | <u><u>\$ 15.00</u></u>  |

$$\text{Cost per equivalent unit} = \text{\$21.00} + \text{\$15.00} = \text{\$36.00}$$

# Applying Costs

## Assembly Department Cost of Ending WIP Inventory and Units Transferred Out

|                              | <u>Materials</u> | <u>Conversion</u> | <u>Total</u> |
|------------------------------|------------------|-------------------|--------------|
| <b>Ending WIP inventory:</b> |                  |                   |              |
| Equivalent units             | 540              | 270               |              |
| Cost per equivalent unit     | \$ 21.00         | \$ 15.00          |              |
| Cost of Ending WIP inventory | <u>\$ 11,340</u> | <u>\$ 4,050</u>   | \$ 15,390    |

# Computing the Cost of Units Transferred Out

| Assembly Department<br>Cost of Ending WIP Inventory and Units Transferred Out |            |            |            |
|---|------------|------------|------------|
|   | Materials  | Conversion | Total      |
| <b>Ending WIP inventory:</b>  |            |            |            |
| Equivalent units  | 540        | 270        |            |
| Cost per equivalent unit  | \$ 21.00   | \$ 15.00   |            |
| Cost of Ending WIP inventory  | \$ 11,340  | \$ 4,050   | \$ 15,390  |
| <b>Units completed and transferred out:</b>                                   |            |            |            |
| Units transferred   | 5,400      | 5,400      |            |
| Cost per equivalent unit  | \$ 21.00   | \$ 15.00   |            |
| Cost of units transferred out   | \$ 113,400 | \$ 81,000  | \$ 194,400 |

## Learning Objective 3

**Use process costing in a second or later production department**




# Process Costing in a Second or Later Processing Department

In the previous analysis, we start from raw materials and hence ignore an important cost item: the units transferred from last process.

- Include the cost of units transferred in when calculating equivalent units (EU) and cost per EU
- **Transferred-in costs**
  - All the costs incurred in previous process(es) and are carried forward as part of the product's costs when the physical product is transferred to the next process.



# Step 1: Summarize the Flow of Physical Units

| <br>Flow of Production | Step 1                 |
|---|------------------------|
|   | Flow of Physical Units |
| Units to account for:   |                        |
| Beginning work in process, October 1  | 5,000                  |
| Transferred in during October   | 40,000                 |
| Total physical units to account for   | 45,000                 |
| Units accounted for:  |                        |
| Completed and transferred out   |                        |
| during October  | 38,000                 |
| Ending work in process, October 31  | 7,000                  |
| Total physical units accounted for  | 45,000                 |
| Total equivalent units  |                        |

For second process, “transferred in” units are similar to “newly started units” when analyzing the first process. It is a similar “unit” equation.

## Step 2: Compute Output in Terms of Equivalent Units

Assumption:

(a) CC are added evenly throughout the conversion process and **DM are added at the end of the conversion process.**

(b) Units completed & transferred out = 100% completed

Ending Inventory = 30% completed for CC; 0% completed for DM

|  | Step 1                 | Step 2: Equivalent Units |                  |                    |
|--|------------------------|--------------------------|------------------|--------------------|
|  | Flow of Physical Units | Transferred In           | Direct Materials | Conversion Cost    |
| Units to account for:                        |                        |                          |                  |                    |
| Beginning work in process, October 1         | 5,000                  |                          |                  |                    |
| Transferred in during October                | 40,000                 |                          |                  |                    |
| Total physical units to account for          | 45,000                 |                          |                  |                    |
| Units accounted for:                         |                        |                          |                  |                    |
| Completed and transferred out during October | 38,000                 | 38,000                   | 38,000*          | 38,000*            |
| Ending work in process, October 31           | 7,000                  | 7,000                    | 0 <sup>†</sup>   | 2,100 <sup>†</sup> |
| Total physical units accounted for           | 45,000                 |                          |                  |                    |
| Total equivalent units                       |                        | 45,000                   | 38,000           | 40,100             |

# Given the information of Total Costs

|                                      | Transferred In | Direct Materials | Conversion Costs | Total          |
|--------------------------------------|----------------|------------------|------------------|----------------|
| Beginning work in process, October 1 | \$ 22,000      | \$ 0.00          | \$ 1,100         | \$ 23,100      |
| Costs added during October           | <u>176,000</u> | <u>19,000</u>    | <u>12,935</u>    | <u>207,935</u> |
| Total costs to account for           | \$ 198,000     | \$ 19,000        | \$ 14,035        | \$ 231,035     |
| Divide by total equivalent units     |                |                  |                  |                |
| Cost per equivalent unit *           |                |                  |                  |                |

\$176,000 transferred-in could be based on the calculation of cost-per-equivalent unit for the previous process. Then, why not just simply use “cost-per-equivalent unit” for the previous process for the calculation of transferred-in cost contained in every unit of this process?

-- for example, why not use \$36/per unit as calculated on slide #19 (assumed that is the calculation for the current process) for the transferred-in cost for next process? Instead, we still repeat the calculation for the transferred-in cost?

# Steps 3 and 4: Summarize Total Costs to Account For and Compute the Cost per Equivalent Unit

|                                      | Transferred In | Direct Materials | Conversion Costs | Total             |
|--------------------------------------|----------------|------------------|------------------|-------------------|
| Beginning work in process, October 1 | \$ 22,000      | \$ 0.00          | \$ 1,100         | \$ 23,100         |
| Costs added during October           | <u>176,000</u> | <u>19,000</u>    | <u>12,935</u>    | <u>207,935</u>    |
| Total costs to account for           | \$ 198,000     | \$ 19,000        | \$ 14,035        | \$ <b>231,035</b> |
| Divide by total equivalent units     | 45,000         | 38,000           | 40,100           |                   |
| Cost per equivalent unit *           | \$ 4.40        | \$ 0.50          | \$ 0.35          |                   |

Again, let's discuss: Why do we calculate the cost per equivalent unit (\$4.4) for transferred-in category? Why not simply use the cost of equivalent units calculated for the previous process?

## Step 5: Assign Total Costs to Units Completed and to Units in Ending Work in Process Inventory

|  | Transferred In                      | Direct Materials | Conversion Cost | Total      |
|--|-------------------------------------|------------------|-----------------|------------|
| Units completed and transferred out to Finished Goods Inventory (38,000) | [ 38,000 x ( 4.40 + 0.50 + 0.35 ) = |                  |                 | \$199,500  |
| Ending work in process, October 31 (7,000)                               |                                     |                  |                 |            |
| Transferred-in costs   | [ 7,000 x 4.40]                     |                  |                 | 30,800     |
| Direct materials   | [ 0 x 0.50 ]                        |                  |                 | 0          |
| Conversion costs   | [ 2,100 x 0.35]                     |                  |                 | <u>735</u> |
| Total ending work in process, October 31                                 |                                     |                  |                 | \$ 31,535  |
| Total costs accounted for  |                                     |                  |                 | \$ 231,035 |

# In-class exercise

- Exercise 4-11

End of Chapter 4

