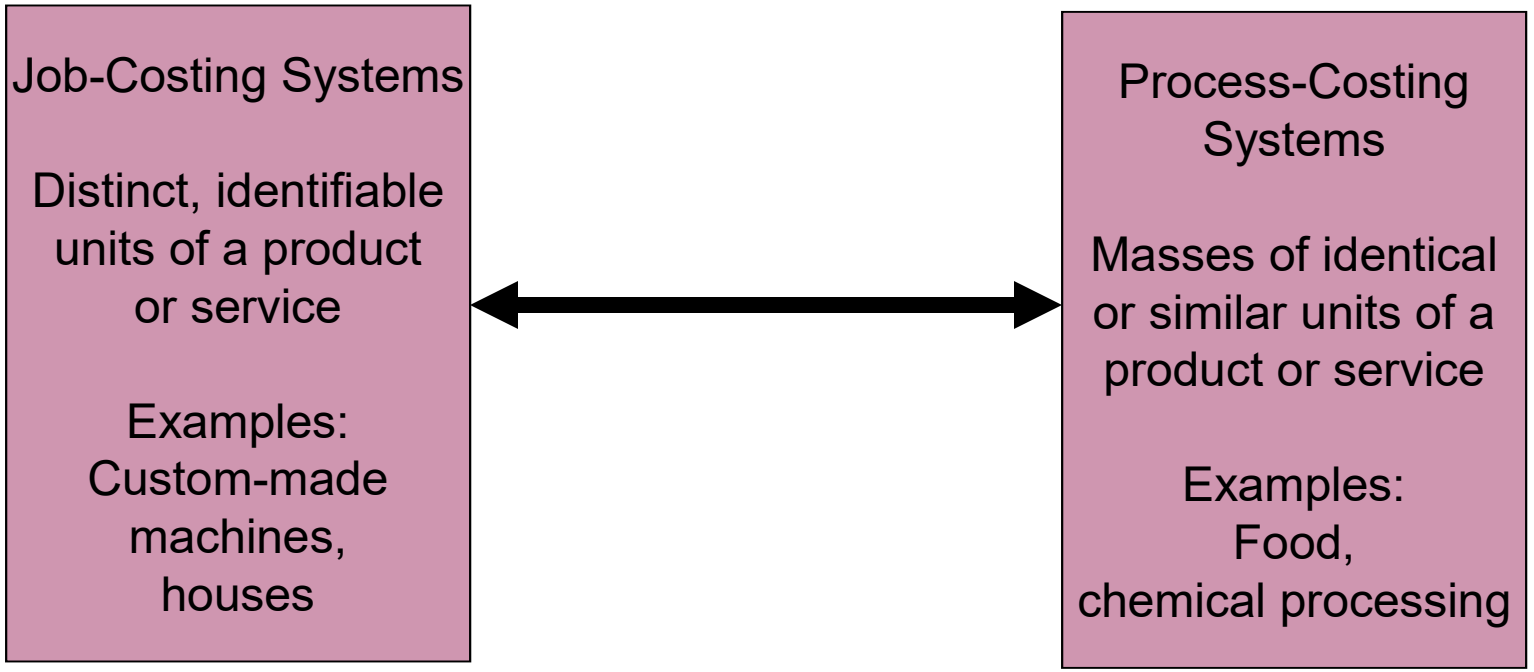
# CHAPTER 17

Process Costing

# JOB VERSUS PROCESS COSTING



# PROCESS COSTING

- Process costing is a system where the unit cost of a product or service is obtained by assigning total costs to many identical or similar units of output.
- Unit costs are computed by dividing total costs incurred by the number of units of output from the production process.
- Each unit receives the same or similar amounts of direct materials costs, direct labor costs, and manufacturing overhead.

# MORE ON JOB-VS-PROCESS-COSTING

- In a job-costing system, individual jobs use different quantities of resources, so it would be incorrect to cost each job at the same average production cost.
- In contrast, when identical or similar units of products or services are mass-produced, process costing is used to calculate an average production cost for all units produced.

# PROCESS-COSTING COST CATEGORIES

- Process-costing systems separate costs into cost categories according to when costs are introduced into the process.
- 1. Direct materials are usually added at the beginning of the production process, or at the start of work in a subsequent department down the assembly line.
- 2. Conversion costs are generally added equally along the production process.

# PROCESS-COSTING: THREE CASES

Let's look at the process-costing process three ways:

1. No beginning or ending work-in-process inventories.
2. No beginning work-in-process inventory and some ending work-in-process inventory.
3. Both beginning and ending work-in-process inventories are present.

# PROCESS COSTING – CASE 1

When using process costing without any beginning or ending work-in-process inventory, all costs that were introduced to the process during the period will be assigned to the finished units leaving work-in-process inventory at the end of the period.

# PROCESS COSTING - CASE 2 AND 3

## EQUIVALENT UNITS

- A derived amount of output units that:
  1. Takes the quantity of each input in units completed and in unfinished units of work in process and
  2. *Converts* the quantity of input into the amount of completed output units that *could be* produced with that quantity of input.
- Are calculated separately for each input. (direct materials and conversion cost)
- When calculating equivalent units, focus on quantities and disregard dollar amounts until after the equivalent units are computed.

# FIVE-STEP PROCESS-COSTING ALLOCATION

1. Summarize the flow of physical units of output.
2. Compute output in terms of equivalent units.
3. Summarize total costs to account for.
4. Compute cost per equivalent unit.
5. Assign total costs to units completed and to units in ending work-in-process.

# EXAMPLE, CASE 2 (NO BEG WIP, SOME ENDING WIP)

| | Physical units | DM | Conversion cost | Total costs |
|---|---|---|---|---|
| WIP, beginning inventory (Feb. 1) | 0 | $0 | $0 | $0 |
| Started during Feb | 400 | | | |
| Completed and TO during Feb. | 175 | | | |
| WIP, ending inventory | 225 | | | |
| Degree of completion of ending WIP | | Added at the beginning of the process | 60% | |
| Total costs added during Feb. | | $32,000 | $18,600 | $50,600 |

# STEPS 1 AND 2 EXAMPLE, CASE 2 (NO BEG WIP, SOME ENDING WIP)

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| | A | B | C | D |
|---|---|---|---|---|
| 1 | | (Step 1) | (Step 2) | |
| 2 | | | Equivalent Units | |
| 3 | **Flow of Production** | **Physical Units** | **Direct Materials** | **Conversion Costs** |
| 4 | Work in process, beginning | 0 | | |
| 5 | Started during current period | 400 | | |
| 6 | To account for | 400 | | |
| 7 | Completed and transferred out during current period | 175 | 175 | 175 |
| 8 | Work in process, ending[a] | 225 | | |
| 9 | (225 x 100%; 225 x 60%) | | 225 | 135 |
| 10 | Accounted for | 400 | | |
| 11 | Work done in current period only | | 400 | 310 |
| 12 | | | | |
| 13 | [a]Degree of completion in this department; direct materials, 100%; conversion costs, 60%. | | | |

# STEPS 3, 4, AND 5, EXAMPLE, CASE 2 (NO BEG WIP, SOME ENDING WIP)

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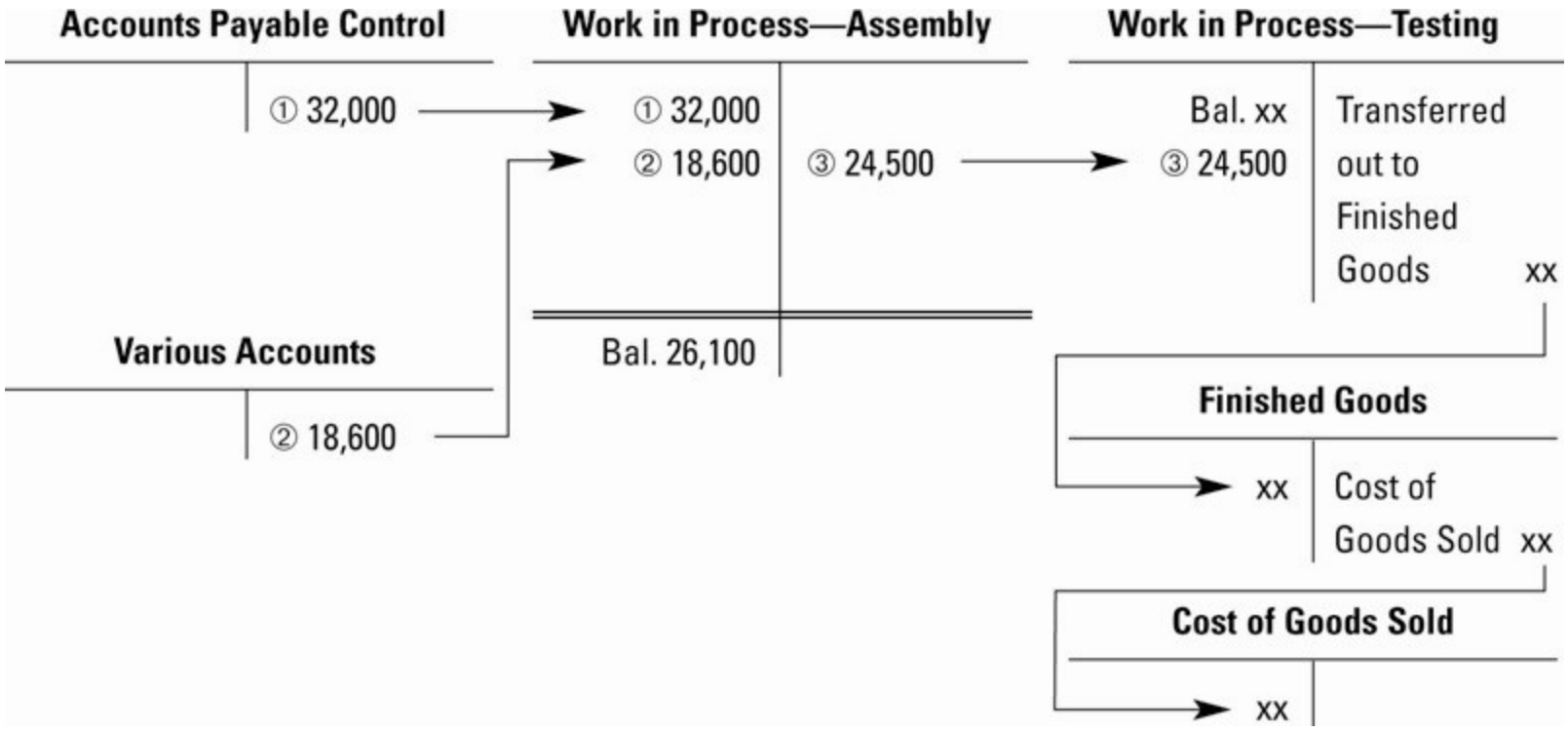
| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | | | **Total Production Costs** | **Direct Materials** | **Conversion Costs** |
| 2 | **(Step 3)** | Costs added during February | $50,600 | $32,000 | $18,600 |
| 3 | | Total costs to account for | $50,600 | $32,000 | $18,600 |
| 4 | | | | | |
| 5 | **(Step 4)** | Costs added in current period | $50,600 | $32,000 | $18,600 |
| 6 | | Divide by equivalent units of work done in current period (Exhibit 17-1) | | ÷ 400 | ÷ 310 |
| 7 | | Cost per equivalent unit | | $ 80 | $ 60 |
| 8 | | | | | |
| 9 | **(Step 5)** | Assignment of costs: | | | |
| 10 | | Completed and transferred out (175 units) | $24,500 | (175[a] x $80) + | (175[a] x $60) |
| 11 | | Work in process, ending (225 units): | 26,100 | (225[b] x $80) + | (135[b] x $60) |
| 12 | | Total costs accounted for | $50,600 | $32,000 + | $18,600 |
| 13 | | | | | |
| 14 | [a] Equivalent units completed and transferred out from Exhibit 17-1, step 2. | | | | |
| 15 | [b] Equivalent units in ending work in process from Exhibit 17-1, step 2. | | | | |

# GENERAL LEDGER COST FLOWS ILLUSTRATED



# CASE 3 (WITH BEG WIP AND ENDING WIP)

**Two Valuation Methods:**
**1- Weighted Average Method**
**2- FIFO Method**

# WEIGHTED-AVERAGE PROCESS-COSTING METHOD

- Process costing can be accomplished using the weighted-average method or the FIFO method. We'll look first at weighted-average.
- Calculates cost per equivalent unit of all work done to date. (regardless of the accounting period in which it was done)
- Assigns this cost to equivalent units completed and transferred out of the process, and to equivalent units in ending work-in-process inventory.

# WEIGHTED-AVERAGE PROCESS-COSTING METHOD

- The Weighted-average cost is the total of all costs entering the work-in-process account divided by the total equivalent units of work done to date.
- The beginning balance of the work-in-process account (work done in a prior period) is *blended in* with current period costs.
- Let's look at Case 3 (with both beginning and ending work-in-process inventory using the Weighted Average method.)

# EXAMPLE, CASE 3 (SOME BEG WIP, SOME ENDING WIP)

| | Physical units | DM | Conversion cost | Total costs |
|---|---|---|---|---|
| WIP, beginning inventory (Feb. 1) | 225 | $18,000 | $8,100 | $26,100 |
| Started during Feb | 275 | | | |
| Completed and TO during Feb. | 400 | | | |
| WIP, ending inventory | 100 | | | |
| Degree of completion of ending WIP | | 100% | 50% | |
| Total costs added during Feb. | | $19,800 | $16,380 | $36,180 |

# STEPS 1 AND 2 EXAMPLE, CASE 3, WITH BEG & ENDING WIP

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| | A | B | C | D |
|---|---|---|---|---|
| 1 | | (Step 1) | (Step 2) | |
| 2 | | | Equivalent Units | |
| 3 | Flow of Production | Physical Units | Direct Materials | Conversion Costs |
| 4 | Work in process, beginning (given, p. 613) | 225 | | |
| 5 | Started during current period (given, p. 613) | 275 | | |
| 6 | To account for | 500 | | |
| 7 | Completed and transferred out during current period | 400 | 400 | 400 |
| 8 | Work in process, ending[a] (given, p. 613) | 100 | | |
| 9 | (100 × 100%; 100 × 50%) | | 100 | 50 |
| 10 | Accounted for | 500 | | |
| 11 | Equivalent units of work done to date | | 500 | 450 |
| 12 | | | | |
| 13 | [a]Degree of completion in this department; direct materials, 100%; conversion costs, 50%. | | | |

# STEPS 3, 4, AND 5, EXAMPLE, CASE 3, WITH BEG & ENDING WIP

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| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | | | Total Production Costs | Direct Materials | Conversion Costs |
| 2 | (Step 3) | Work in process, beginning (given, p. 613) | $26,100 | $18,000 | $ 8,100 |
| 3 | | Costs added in current period (given, p. 613) | 36,180 | 19,800 | 16,380 |
| 4 | | Total costs to account for | $62,280 | $37,800 | $24,480 |
| 5 | | | | | |
| 6 | (Step 4) | Costs incurred to date | | $37,800 | $24,480 |
| 7 | | Divide by equivalent units of work done to date (Exhibit 17-4) | | ÷ 500 | ÷ 450 |
| 8 | | Cost per equivalent unit of work done to date | | $ 75.60 | $ 54.40 |
| 9 | | | | | |
| 10 | (Step 5) | Assignment of costs: | | | |
| 11 | | Completed and transferred out (400 units) | $52,000 | ($400^a$ × $75.60) | + ($400^a$ × $54.40) |
| 12 | | Work in process, ending (100 units): | 10,280 | ($100^b$ × $75.60) | + ($50^b$ × $54.40) |
| 13 | | Total costs accounted for | $62,280 | $37,800 | + $24,480 |
| 14 | | | | | |
| 15 | $^a$Equivalent units completed and transferred out from Exhibit 17-4, Step 2. | | | | |
| 16 | $^b$Equivalent units in ending work in process from Exhibit 17-4, Step 2. | | | | |

# RESULT OF THE PROCESS

- Two critical figures arise out of step 5 of the cost allocation process:
  1. The amount of the journal entry transferring the allocated cost of units completed and sent from work-in-process inventory to finished goods inventory
  2. The ending balance of the work-in-process inventory account that will appear on the balance sheet.

# FIRST-IN, FIRST-OUT (FIFO) PROCESS-COSTING METHOD

- 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.
- Assigns the cost of equivalent units worked on during the current period first to complete beginning inventory, next to started and completed new units, and finally to units in ending work-in-process inventory.

# FIRST-IN, FIRST-OUT PROCESS-COSTING METHOD

- A distinctive feature of FIFO process-costing method is that work done on beginning inventory is kept separate from work done in the current period.
- There is no blending of costs as we saw with the weighted-average method.

# EXAMPLE, CASE 2 (NO BEG WIP, SOME ENDING WIP)

| | Physical units | DM | Conversion cost (CC) | Total costs |
|---|---|---|---|---|
| WIP, beginning inventory (Feb. 1) | 225 (100% complete for DM, 60% for CC) | $18,000 | $8,100 | $26,100 |
| Started during Feb | 275 | | | |
| Completed and TO during Feb. | 400 | | | |
| WIP, ending inventory | 100 | | | |
| Degree of completion of ending WIP | | 100% | 50% | |
| Total costs added during Feb. | | $19,800 | $16,380 | $36,180 |

# STEPS 1 AND 2, EXAMPLE, CASE 3, WITH BEG & ENDING WIP (FIFO)

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| | A | B | C | D |
|---|---|---|---|---|
| 1 | | (Step 1) | (Step 2) | |
| 2 | | | Equivalent Units | |
| 3 | Flow of Production | Physical Units | Direct Materials | Conversion Costs |
| 4 | Work in process, beginning (given, p. 613) | 225 | (work done before current period) | |
| 5 | Started during current period (given, p. 613) | 275 | | |
| 6 | To account for | 500 | | |
| 7 | Completed and transferred out during current period: | | | |
| 8 | From beginning work in process[a] | 225 | | |
| 9 | [225 × (100% – 100%); 225 × (100% – 60%)] | | 0 | 90 |
| 10 | Started and completed | 175[b] | | |
| 11 | (175 × 100%; 175 × 100%) | | 175 | 175 |
| 12 | Work in process, ending[c] (given, p. 613) | 100 | | |
| 13 | (100 × 100%; 100 × 50%) | | 100 | 50 |
| 14 | Accounted for | 500 | | |
| 15 | Equivalent units of work done in current period | | 275 | 315 |
| 16 | | | | |
| 17 | [a]Degree of completion in this department; direct materials, 100%; conversion costs, 60%. | | | |
| 18 | [b]400 physical units completed and transferred out minus 225 physical units completed and | | | |
| 19 | transferred out from beginning work-in-process inventory. | | | |
| 20 | [c]Degree of completion in this department: direct materials, 100%; conversion costs, 50%. | | | |

# STEPS 3, 4, AND 5, EXAMPLE, CASE 3, WITH BEG & ENDING WIP (FIFO)

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| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | | | Total Production Costs | Direct Material | Conversion Costs |
| 2 | (Step 3) | Work in process, beginning (given, p. 613) | $26,100 | $18,000 | $ 8,100 |
| 3 | | Costs added in current period (given, p. 613) | 36,180 | 19,800 | 16,380 |
| 4 | | Total costs to account for | $62,280 | $37,800 | $24,480 |
| 5 | | | | | |
| 6 | (Step 4) | Costs added in current period | | $19,800 | $16,380 |
| 7 | | Divide by equivalent units of work done in current period (Exhibit 17-6) | | ÷ 275 | ÷ 315 |
| 8 | | Cost per equivalent unit of work done in current period | | $ 72 | $ 52 |
| 9 | | | | | |
| 10 | (Step 5) | Assignment of costs: | | | |
| 11 | | Completed and transferred out (400 units): | | | |
| 12 | | Work in process, beginning (225 units) | $26,100 | $18,000 + | $8,100 |
| 13 | | Costs added to beginning work in process in current period | 4,680 | ($0^a$ × $72) + | ($90^a$ × $52) |
| 14 | | Total from beginning inventory | 30,780 | | |
| 15 | | Started and completed (175 units) | 21,700 | ($175^b$ × $72) + | ($175^b$ × $52) |
| 16 | | Total costs of units completed and transferred out | 52,480 | | |
| 17 | | Work in process, ending (100 units): | 9,800 | ($100^c$ × $72) + | ($50^c$ × $52) |
| 18 | | Total costs accounted for | $62,280 | $37,800 + | $24,480 |
| 19 | | | | | |
| 20 | [a]Equivalent units used to complete beginning work in process from Exhibit 17-6, Step 2. | | | | |
| 21 | [b]Equivalent units started and completed from Exhibit 17-6, Step 2. | | | | |
| 22 | [c]Equivalent units in ending work in process from Exhibit 17-6, Step 2. | | | | |

# RESULT OF THE PROCESS (NO CHANGE FROM WEIGHTED AVERAGE)

- Two critical figures arise out of step 5 of the cost-allocation process:
  1. The amount of the journal entry transferring the allocated cost of units completed and sent from work-in-process inventory to finished goods inventory.
  2. The ending balance of the work-in-process inventory account that will appear on the balance sheet.

# COMPARING WEIGHTED-AVERAGE AND FIFO METHODS

- FIFO assumes that all the higher-cost units (from our example) from the previous period in beginning WIP are the first to be completed and transferred out and that ending WIP consists of only the lower-cost current-period units.
- The weighted-average method smooths out the cost per equivalent unit by assuming that more lower-cost units are transferred out and some higher-cost remain in ending WIP.

# COMPARING WEIGHTED-AVERAGE AND FIFO METHODS, CONCLUDED

- Managers use information from process-costing systems to make pricing and product-mix decisions and understand how well a firm's processes are performing.
- FIFO provides managers with information about changes in the costs per unit from one period to the next.
- In a period of rising prices, the weighted-average method will decrease taxes because cost of goods sold will be higher and operating income lower.