

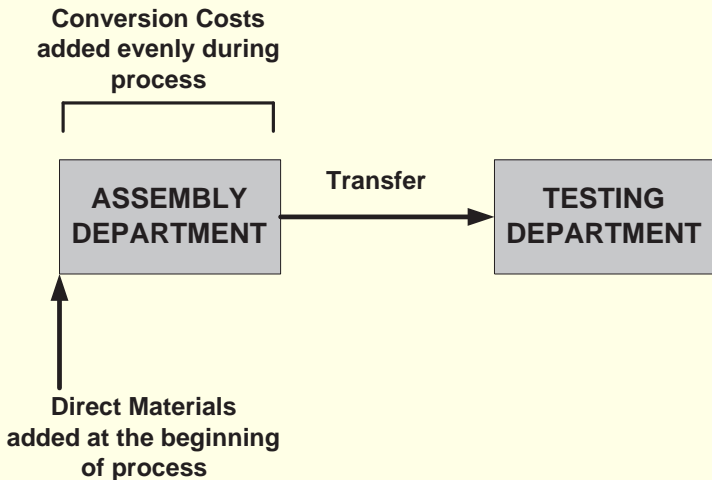
- Process Costing is a system where the unit cost of a product or service is obtained by assigning total costs to many identical or similar units
- Each unit receives the same or similar amounts of direct materials costs, direct labor costs, and manufacturing overhead
- Unit costs are computed by dividing total costs incurred by the number of units of output from the production process
- Process Costing Assumptions
 - Direct Materials are added at the beginning of the production process
 - Conversion Costs are added equally along the production process

- A derived amount of output units that
 - takes the quantity of each input in units completed and in unfinished units of work in process and
 - converts the quantity of input into the amount of completed output units that could be produced with that quantity of input
- Calculated separately for each input (direct materials and conversion cost)

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

Global Defense, Inc., manufactures components for missiles and military equipment. These components are assembled in the Assembly Department. We focus on the assembly process for one component DG-19. The process costing system has a single direct-cost category (direct materials) and a single indirect-cost category (conversion costs). Direct materials are added at the beginning of the process whereas conversion costs are added evenly during assembly. We will consider three cases:

- Case 1: Zero beginning and ending work-in-process inventory
- Case 2: Zero beginning work-in-process inventory but some ending work-in-process inventory
- Case 3: Both some beginning and some ending work-in-process inventory



On January 1, there was no beginning inventory of DG-19. During January, 400 units were started, completely assembled and transferred out to the Testing Department

Physical Units for January

| | |
|--|-----------|
| Work in process, beginning inventory (January 1) | 0 units |
| Started during January | 400 units |
| Completed and transferred out during January | 400 units |
| Work in process, ending inventory, (January 31) | 0 units |

Total Costs for January

| | |
|--|-----------------|
| Direct material costs added during January | \$32,000 |
| Conversion costs added during January | 24,000 |
| Total Assembly Department costs added during January | <u>\$56,000</u> |

| | |
|--|--------------|
| Direct material cost per unit ($\$32,000 / 400$) | \$80 |
| Conversion cost per unit ($\$24,000 / 400$) | 60 |
| Assembly Department cost per unit | <u>\$140</u> |

In February, another 400 units are placed into production. Only 175 units are completed and transferred to the Testing Department. The partially assembled units are 60% complete from the perspective of conversion costs.

Physical Units for February

| | |
|---|-----------|
| Work in process, beginning inventory (February 1) | 0 units |
| Started during February | 400 units |
| Completed and transferred out during February | 175 units |
| Work in process, ending inventory, (February 28) | 225 units |

Total Costs for February

| | |
|---|-----------------|
| Direct material costs added during February | \$32,000 |
| Conversion costs added during February | 18,600 |
| Total Assembly Department costs added during February | <u>\$50,600</u> |

| Flow of Production | Step 1 | Step 2 | |
|--|-------------------|---------------------|---|
| | Physical Units | Direct Materials | Equivalent Units Conversion Costs |
| Work in process, beginning | 0 | | |
| Started during current period | 400 | | |
| To account for | 400 | | |
| Completed during current period | 175 | 175 | 175 |
| Work in process, ending (225×100%; 225×60%) | 225 | 225 | 135 |
| Accounted for | 400 | | |
| Work done in current period only | | 400 | 310 |

- Step 3:

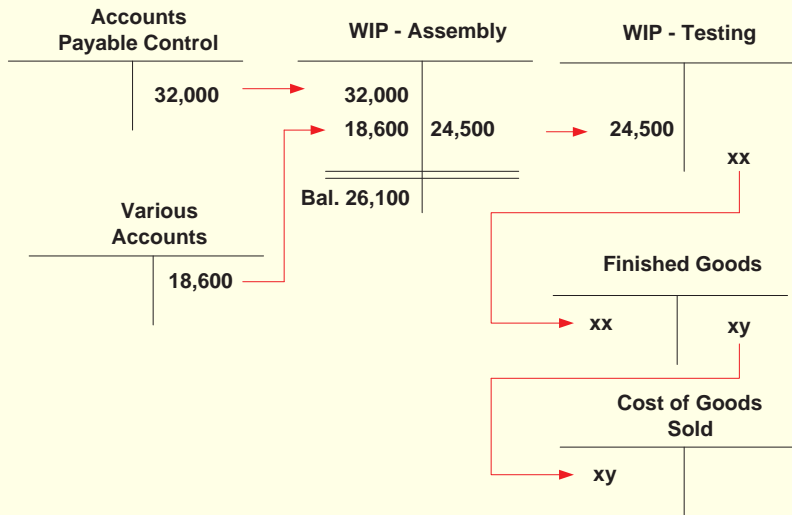
Material Cost per Equivalent Unit = $\$32,000 / 400 = \80

Conversion Cost per Equivalent Unit = $\$18,600 / 310 = \60

- Step 4: Total Costs to Account for: \$50,600

- Step 5:

| | |
|---|----------|
| Completed and transferred out (175 × (\$80 + \$60)) | \$24,500 |
| Work in process, ending | |
| Direct materials (225 × \$80) | 18,000 |
| Conversion Costs (135 × \$60) | 8,100 |
| Total work in process | 26,100 |
| Total costs accounted for | 50,600 |



| | | |
|----------------------------|--------|--------|
| Work in Process - Assembly | 32,000 | |
| Accounts Payable Control | | 32,000 |

| | | |
|--|--------|--------|
| Work in Process - Assembly | 18,600 | |
| Various Accounts (Accumulated Depr., Wages Payable) | | 18,600 |

| | | |
|----------------------------|--------|--------|
| Work in Process - Testing | 24,500 | |
| Work in Process - Assembly | | 24,500 |

At the beginning of March, the company had 225 partially assembled DG-19 units. It started production of another 275 units in March.

Physical Units for March

| | |
|--|-----------|
| Work in process, beginning inventory (March 1) | 225 units |
| Direct materials 100%, conversion costs 60% complete | |
| Started during march | 275 units |
| Completed and transferred out during March | 400 units |
| Work in process, ending inventory, (March 31) | 100 units |
| Direct materials 100%, conversion costs 50% complete | |

Total Costs for March

| | | |
|--|--------|-----------------|
| Work in process beginning inventory | | |
| Direct materials (225 equivalent units × \$80) | 18,000 | |
| Conversion costs (135 equivalent units × \$60) | 8,100 | 26,100 |
| Direct material costs added during March | | \$19,800 |
| Conversion costs added during March | | 16,380 |
| Total costs to account for | | <u>\$62,280</u> |

- This method calculates the equivalent-unit cost of **all the work done to date** and assigns this cost to equivalent-units completed and equivalent-units in ending work-in-process inventory
- Weighted-average cost is the **total of all cost entering Work in Process account** (both from beginning WIP and started during current period) divided by equivalent units of work done to date
- Equivalent units of work done to date = equivalent units in beginning work in process + equivalent units of work done in current period
- Equivalent units in beginning work in process + equivalent units of work done in current period = Equivalent units completed and transferred out + Equivalent units in ending inventory

| Flow of Production | Step 1 | Step 2 | |
|--|-------------------|---------------------|---|
| | Physical Units | Direct Materials | Equivalent Units Conversion Costs |
| Work in process, beginning | 225 | | |
| Started during current period | 275 | | |
| To account for | 500 | | |
| Completed during current period | 400 | 400 | 400 |
| Work in process, ending (100×100%; 100×50%) | 100 | 100 | 50 |
| Accounted for | 500 | | |
| Work done to date | | 500 | 450 |

- Step 3

| | Total Costs | Direct Materials | Conversion Costs |
|-------------------------------|----------------|---------------------|---------------------|
| Work in process, beginning | 26,100 | 18,000 | 8,100 |
| Costs added in current period | 36,180 | 19,800 | 16,380 |
| Costs incurred to date | | <u>37,800</u> | <u>24,480</u> |

Direct Material cost per equivalent unit of work done to date:

$$37,800 / 500 = \$75.6$$

Conversion cost per equivalent unit of work done to date:

$$24,480 / 450 = \$54.4$$

- Total costs to account for = \$62,280

- Step 5

| | |
|--|---------------|
| Completed and transferred out ($400 \times (\$75.6 + \$54.4)$) | \$52,000 |
| Work in process, ending | |
| Direct materials ($100 \times \$75.6$) | 7,560 |
| Conversion Costs ($50 \times \$54.4$) | 2,720 |
| Total work in process | <u>10,280</u> |
| Total costs accounted for | <u>62,280</u> |

- Assigns the cost of the **previous** accounting period's equivalent units in beginning work in process inventory to the **first units completed**
- Assigns the **cost of equivalent units worked** on during the **current period**
 - First to complete beginning inventory
 - Next to start and complete new units
 - Finally to units in ending work in process inventory
- Work done in beginning inventory before the current period is kept separate from work done in the current period

- First physical units completed during the period are from the beginning work-in-process inventory
- The remaining completed units ($400-225=175$) were started and completed during March
- Ending work-in process consists of 100 units that started in March
- The equivalent unit calculations for each cost category focus on the equivalent units of **work done in the current period**
 - Work done on the beginning WIP inventory (0% of direct materials and 40% of conversion costs)
 - work done on 175 units that were started and completing during March (100% of direct materials and 100% of conversion costs)
 - work done on 100 units that are in ending WIP inventory (100% of direct materials and 50% of conversion costs)

| Flow of Production | Step 1 | Step 2 | |
|--|----------------|------------------|------------------|
| | Physical Units | Direct Materials | Conversion Costs |
| Work in process, beginning | 225 | | |
| Started during current period | 275 | | |
| To account for | 500 | | |
| Completed during current period | | | |
| From beginning work in process | 225 | | |
| [$225 \times (100\% - 100\%)$; $225 \times (100\% - 60\%)$] | | 0 | 90 |
| Started and completed | 175 | 175 | 175 |
| Work in process, ending | 100 | | |
| ($100 \times 100\%$; $100 \times 50\%$) | | 100 | 50 |
| Accounted for | 500 | | |
| Work done in current period only | | 275 | 315 |

- Step 3

Direct material cost per equivalent unit of work done in current period:

$$19,800 / 275 = \$72$$

Conversion cost per equivalent unit of work done in current period:

$$16,380 / 315 = \$52$$

- Step 4

Total costs to account for: \$62,280

- Step 5

| | |
|--|-----------------|
| Completed and transferred out (400 units) | |
| Work in process, beginning (225 units) | \$26,100 |
| Direct materials added in current period | 0 |
| Conversion costs added in current period (90 × \$52) | 4,680 |
| Total from beginning inventory | <u>30,780</u> |
| Started and completed (175 × (\$72 + \$52)) | 21,700 |
| Total costs of units completed | <u>52,480</u> |
| Work in process, ending (100 units) | |
| Direct materials (100 × \$72) | 7,200 |
| Conversion costs (50 × \$52) | 2,600 |
| Total work in process, ending | <u>9,800</u> |
| Total costs accounted for | <u>\$62,280</u> |

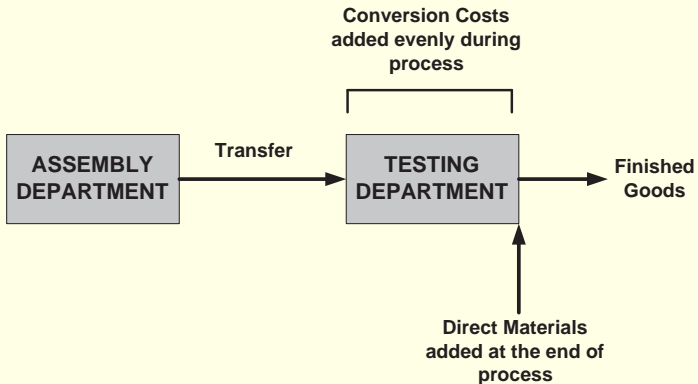
Costs to account for

| | |
|-----------------------------------|----------|
| Beginning work in process | \$26,100 |
| Costs added in the current period | 36,180 |
| | <hr/> |
| Total costs to account for | \$62,280 |

Costs accounted for Calculated on a FIFO basis

| | |
|--|---------------|
| Completed and transferred out | |
| Beginning work in process | \$26,100 |
| Used to complete beginning work in process | 4,680 |
| Started and completed | <u>21,700</u> |
| Completed and transferred out | 52,480 |
| Ending work in process | <u>9,800</u> |
| Total costs accounted for | \$62,280 |

- Many process costing systems have two or more processes in the production cycle
- We extend our example to include the Testing department. As the assembly process is completed, the units are immediately transferred to the Testing Department. Here, the units receive additional direct materials at the end of the process. Conversion costs are added evenly during the process. As units are completed in testing, they are transferred to Finished Goods



 Physical Units for March

| | |
|---|-----------|
| Work in process, beginning inventory (March 1) | 240 units |
| Transferred in costs 100% complete, Direct materials 0%, conversion costs 62.5% complete | |
| Transferred in during March | 400 units |
| Completed during March | 440 units |
| Work in process, ending inventory, (March 31) | 200 units |
| Transferred in costs 100% complete, Direct materials 0%, conversion costs 80% complete | |

 Total Costs of Testing Department for March

| | | |
|---|---------------|---------------|
| Work in process, beginning inventory | | |
| Transferred in costs (240 × \$140) | 33,600 | |
| Direct materials | 0 | |
| Conversion costs (150 equivalent units × \$120) | <u>18,000</u> | 51,600 |
| Transferred in costs during March | | |
| Weighted average | | 52,000 |
| FIFO | | 52,480 |
| Direct material costs added during March | | \$13,200 |
| Conversion costs added during March | | <u>48,600</u> |

| Flow of Production | Step 1 | Step 2 | | |
|---|----------------|----------------------|--------------------------------------|------------------|
| | Physical Units | Transferred in Costs | Equivalent Units Direct Materials | Conversion Costs |
| Work in process, beginning | 240 | | | |
| Transferred in during current period | 400 | | | |
| To account for | 640 | | | |
| Completed during current period | 440 | 440 | 440 | 440 |
| Work in process, ending (200×100%; 200×0%;200×80%) | 200 | 200 | 0 | 160 |
| Accounted for | 640 | | | |
| Work done to date | | 640 | 440 | 600 |

- Step 3:

Transferred in costs per equivalent unit of work done to date:

$$(33,600 + 52,000) / 640 = \$133.75$$

Direct material costs per equivalent unit of work done to date:

$$(0 + 13,200) / 440 = \$30$$

Conversion costs per equivalent unit of work done to date:

$$(18,000 + 48,600) / 600 = \$111$$

- Step 4: Total Costs to account for:

$$(51,600 + 52,000 + 13,200 + 48,600) = 165,400$$

- Step 5

| | |
|--|----------------|
| Completed and transferred out (440 units) | |
| $[(440 \times \$133.75) + (440 \times \$30) + (440 \times \$111)]$ | \$120,890 |
| Work in process, ending (200 units) | |
| Transferred in cost $(200 \times \$133.75)$ | 26,750 |
| Direct Materials $(0 \times \$30)$ | 0 |
| Conversion Costs $(160 \times \$111)$ | 17,760 |
| Total work in process, ending | <u>44,510</u> |
| Total costs accounted for | <u>165,400</u> |

| Flow of Production | Step 1 | Step 2 | | |
|--|----------------|-----------------|--------------------------------------|------------------|
| | Physical Units | Trans. in Costs | Equivalent Units Direct Materials | Conversion Costs |
| Work in process, beginning | 240 | | | |
| Transferred in during current period | 400 | | | |
| To account for | 640 | | | |
| Completed during current period | | | | |
| From beginning WIP | 240 | | | |
| [$240 \times (100\% - 100\%)$; $240 \times (100\% - 0\%)$; $240 \times (100\% - 62.5\%)$] | | 0 | 240 | 90 |
| Started and completed | 200 | 200 | 200 | 200 |
| Work in process, ending | 200 | | | |
| ($200 \times 100\%$; $200 \times 0\%$; $200 \times 80\%$) | | 200 | 0 | 160 |
| Accounted for | 640 | | | |
| Work done in current period only | | 400 | 440 | 450 |

- Step 3:

Transferred in costs per equivalent unit of work done in current period:

$$52,480 / 400 = \$131.20$$

Direct material costs per equivalent unit of work done in current period:

$$13,200 / 440 = \$30$$

Conversion costs per equivalent unit of work done in current period:

$$48,600 / 450 = \$108$$

- Step 4: Total Costs to account for:

$$(51,600 + 52,480 + 13,200 + 48,600) = 165,880$$

- Step 5

| | |
|--|----------------|
| Completed and transferred out (440 units) | |
| Work in process, beginning (240 units) | \$51,600 |
| Transferred in costs added in current period | 0 |
| Direct materials added in current period(240×\$30) | 7,200 |
| Conversion costs added in current period(90×\$108) | 9720 |
| Total from beginning inventory | <u>68,520</u> |
| Started and completed (200×(\$131.2+\$30+\$108)) | 53,840 |
| Total costs of units completed | <u>122,360</u> |
| Work in process, ending (200 units) | |
| Transferred in cost (200×\$131.2) | 26,240 |
| Direct Materials (0×\$30) | 0 |
| Conversion Costs (160×\$108) | 17,280 |
| Total work in process, ending | <u>43,520</u> |
| Total costs accounted for | <u>165,880</u> |
