CHAPTER 17

**PROCESS COSTING**

**17-1** Industries using process costing in their manufacturing areas include chemical processing, oil refining, pharmaceuticals, plastics, brick and tile manufacturing, semiconductor chips, beverages, and breakfast cereals.

**17-2** Process costing systems separate costs into cost categories according to the timing of when costs are introduced into the process. Often, only two cost classifications, direct materials and conversion costs, are necessary. Direct materials are frequently added at one point in time, often the start or the end of the process. All conversion costs are added at about the same time but in a pattern different from direct materials costs. Conversion costs are often added throughout the process, which can of any length of time, lasting from seconds to several months.

**17-3** Equivalent units is a derived amount of output units that takes the quantity of each input (factor of production) in units completed or in incomplete units in work in process and converts the quantity of input into the amount of completed output units that could be made with that quantity of input. Each equivalent unit is comprised of the physical quantities of direct materials or conversion costs inputs necessary to produce output of one fully completed unit. Equivalent unit measures are necessary because all physical units are not completed to the same extent at the same time.

**17-4**  The accuracy of the estimates of completion depends on the care and skill of the estimator and the nature of the process. Semiconductor chips may differ substantially in the finishing necessary to obtain a final product. The amount of work necessary to finish a product may not always be easy to ascertain in advance.

**17-5** The five key steps in process costing follow:

Step 1: Summarize the flow of physical units of output.

Step 2: Compute output in terms of equivalent units.

Step 3: Summarize total costs to account for.

Step 4: Compute cost per equivalent unit.

Step 5: Assign total costs to units completed and to units in ending work in process.

**17-6** Three inventory methods associated with process costing are

* weighted average.
* first-in, first-out.
* standard costing.

**17-7** The weighted-average process-costing method calculates the equivalent-unit cost of all the 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.

**17-8** FIFO computations are distinctive because they assign 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 and assign the cost of equivalent units worked on during the current period first to complete beginning inventory, next to start and complete new units, and finally to units in ending work-in-process inventory. In contrast, the weighted-average method costs units completed and transferred out and in ending work in process at the same average cost.

**17-9** FIFO should be called a modified or departmental FIFO method because the goods transferred in during a given period usually bear a single average unit cost (rather than a distinct FIFO cost for each unit transferred in) as a matter of convenience.

**17-10** A major advantage of FIFO is that managers can judge the performance in the current period independently from the performance in the preceding period.

**17-11** The journal entries in process costing are basically similar to those made in job-costing systems. The main difference is that, in process costing, there is often more than one work-in-process account––one for each process.

**17-12** Standard-cost procedures are particularly appropriate to process-costing systems where there are various combinations of materials and operations used to make a wide variety of similar products as in the textiles, paints, and ceramics industries. Standard-cost procedures also avoid the intricacies involved in detailed tracking with weighted-average or FIFO methods when there are frequent price variations over time.

**17-13** There are two reasons why the accountant should distinguish between *transferred-in costs* and *additional direct materials costs* for a particular department:

(a) All direct materials may not be added at the beginning of the department process.

(b) The control methods and responsibilities may be different for transferred-in items and materials added in the department.

**17-14** No. Transferred-in costs or previous department costs are costs incurred in a previous department that have been charged to a subsequent department. These costs may be costs incurred in that previous department during this accounting period or a preceding accounting period.

**17-15**  Materials are only one cost item. Other items (often included in a conversion costs pool) include labor, energy, and maintenance. If the costs of these items vary over time, this variability can cause a difference in cost of goods sold and inventory amounts when the weighted-average or FIFO methods are used.

 A second factor is the amount of inventory on hand at the beginning or end of an accounting period. The smaller the amount of production held in beginning or ending inventory relative to the total number of units transferred out, the smaller the effect on operating income, cost of goods sold, or inventory amounts from the use of weighted-average or FIFO methods.

**17-16** (25 min.) **Equivalent units, zero beginning inventory.**

1. Direct materials cost per unit ($800,000 ÷ 5,000) $ 160.00

 Conversion cost per unit ($805,000 ÷ 5,000) 161.00

 Assembly Department cost per unit $321.00

2a. Solution Exhibit 17-16A calculates the equivalent units of direct materials and conversion costs in the Assembly Department of Candid, Inc. in February 2014.

Solution Exhibit 17-16B computes equivalent unit costs.

2b. Direct materials cost per unit $ 160

Conversion cost per unit 175

Assembly Department cost per unit $335

3. The difference in the Assembly Department cost per unit calculated in requirements 1 and 2 arises because the costs incurred in January and February are the same but fewer equivalent units of work are done in February relative to January. In January, all 5,000 units introduced are fully completed resulting in 5,000 equivalent units of work done with respect to direct materials and conversion costs. In February, of the 5,000 units introduced, 5,000 equivalent units of work is done with respect to direct materials but only 4,600 equivalent units of work is done with respect to conversion costs. The Assembly Department cost per unit is, therefore, higher.

# SOLUTION EXHIBIT 17-16A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units;

### Assembly Department of Candid, Inc., for February 2014.

|  |  |  |
| --- | --- | --- |
|  |  | **(Step 2)** |
|  | **(Step 1)** | **Equivalent Units** |
|  | **Physical** | **Direct** | **Conversion** |
| **Flow of Production** | **Units** | **Materials** | **Costs** |

Work in process, beginning (given) 0

Started during current period (given) 5,000

To account for 5,000

Completed and transferred out

 during current period 4,000 4,000 4,000

Work in process, ending\* (given) 1,000

 1,000 × 100%; 1,000 × 60% 1,000 600

Accounted for 5,000

Equivalent units of work done in current period 5,000 4,600

\*Degree of completion in this department: direct materials, 100%; conversion costs, 60%.

## SOLUTION EXHIBIT 17-16B

Compute the Cost per Equivalent Unit,

Assembly Department of Candid, Inc., for February 2014.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Total****Production****Costs** | **Direct****Materials** | Conversion**Costs** |
| (**Step 3**) Costs added during February | $1,605,000 | $800,000 | $805,000 |
|  Divide by equivalent units of work done in current period (Solution Exhibit 17-l6A) |  |  ÷ 5,000 |  ÷ 4,600 |
|  Cost per equivalent unit |  | $ 160 | $ 175 |

**17-17** (20 min.) **Journal entries (continuation of 17-16).**

1. Work in Process––Assembly 800,000

 Accounts Payable 800,000

To record $800,000 of direct materials

purchased and used in production during

February 2014

2. Work in Process––Assembly 805,000

 Various accounts 805,000

To record $805,000 of conversion costs

for February 2014; examples include energy,

manufacturing supplies, all manufacturing

labor, and plant depreciation

3. Work in Process––Testing 1,340,000

 Work in Process––Assembly 1,340,000

To record 4,000 units completed and

transferred from Assembly to Testing

during February 2014 at

$335 × 4,000 units = $1,340,000

 Postings to the Work in Process––Assembly account follow.

  **Work in Process –– Assembly Department**

#####  Beginning inventory, Feb. 1 0 3. Transferred out to

 1. Direct materials 800,000 Work in Process––Testing 1,340,000

 2. Conversion costs 805,000

 Ending inventory, Feb. 28 265,000

**17-18** (25 min.) **Zero beginning inventory, materials introduced in middle of process.**

1. Solution Exhibit 17-18A shows equivalent units of work done in the current period of Chemical P, 100,000; Chemical Q, 70,000; Conversion costs, 90,000.

2. Solution Exhibit 17-18B summarizes the total Mixing Department costs for July 2014, calculates cost per equivalent unit of work done in the current period for Chemical P, Chemical Q, and conversion costs, and assigns these costs to units completed (and transferred out) and to units in ending work in process.

## SOLUTION EXHIBIT 17-18A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units;

### Mixing Department of Pilar Chemicals for July 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | (Step 2)Equivalent Units |
|  | **Physical** |  |  | **Conversion** |
| **Flow of Production** | **Units** | **Chemical P** | Chemical Q | **Costs** |

Work in process, beginning (given) 0

Started during current period (given) 100,000

To account for 100,000

Completed and transferred out

 during current period 70,000 70,000 70,000 70,000

Work in process, ending\* (given) 30,000

 30,000 × 100%; 30,000 × 0%;

 30,000 × 66 2/3% 30,000 0 20,000

Accounted for 100,000

Equivalent units of work done

in current period 100,000 70,000 90,000

\*Degree of completion in this department: Chemical P, 100%; Chemical Q, 0%; conversion costs, 66 2/3%.

## SOLUTION EXHIBIT 17-18B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Mixing Department of Pilar Chemicals for July 2014.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Total****Production****Costs** | **Chemical P** | **Chemical Q** | Conversion**Costs** |
| (**Step 3**) Costs added during July | $1,100,000 | $600,000 | $140,000 | $360,000 |
|  Total costs to account for | $1,100,000 | $600,000 | $140,000 | $360,000 |
|  |  |  |  |  |
| **(Step 4)** Costs added in current period |  | $600,000 | $140,000 | $360,000 |
|  Divide by equivalent units of work done in current period  (Solution Exhibit 17-l8A) |  | ÷ 100,000 | ÷70,000 | ÷ 90,000 |
|  Cost per equivalent unit |   | $ 6  | $ 2  |  $ 4 |
| **(Step 5)** Assignment of costs: Completed and transferred out (50,000 units) | $840,000 | (70,000\* × $6) + (70,000\* × $2) + (70,000\* × $4) |
|  Work in process, ending  (30,000 units) |  260,000 |  (30,000† × $6) + (0† × $2) + (20,000† × $4) |
|  Total costs accounted for | $1,100,000 |  $600,000 + $140,000 + $360,000 |

\*Equivalent units completed and transferred out from Solution Exhibit 17-18A, Step 2.

 †Equivalent units in ending work in process from Solution Exhibit 17-18A, Step 2.

**17-19** (15 min.) **Weighted-average method,** **equivalent units.**

Under the weighted-average method, equivalent units are calculated as the equivalent units of work done to date. Solution Exhibit 17-19 shows equivalent units of work done to date for the Assembly Division of Fenton Watches, Inc., for direct materials and conversion costs.

SOLUTION EXHIBIT 17-19

Summarize the Flow of Physical Units and Compute Output in Equivalent Units;

Weighted-Average Method of Process Costing, Assembly Division of Fenton Watches, Inc., for May 2014.

 **(Step 2)**

 **(Step 1) Equivalent Units**

 **Physical Direct Conversion**

 **Flow of Production Units Materials Costs**

Work in process beginning (given) 80

Started during current period (given) 500

To account for 580

Completed and transferred out during current period 460 460 460

Work in process, ending\* (120 × 60%; 120 × 30%) 120 72 36

Accounted for 580 \_\_\_ \_\_\_

Equivalent units of work done to date 532 496

\*Degree of completion in this department: direct materials, 60%; conversion costs, 30%.

17-20 (20 min.) Weighted-average method, assigning costs (continuation of 17-19).

Solution Exhibit 17-20 summarizes total costs to account for, calculates cost per equivalent unit of work done to date in the Assembly Division of Fenton Watches, Inc., and assigns costs to units completed and to units in ending work-in-process inventory.

SOLUTION EXHIBIT 17-20

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory;

Weighted-Average Method of Process Costing, Assembly Division of Fenton Watches, Inc., for May 2014.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Total****Production****Costs** | **Direct****Materials** | **Conversion****Costs** |
| **(Step 3**) Work in process, beginning (given) | $ 584,400 |  $ 493,360 | $ 91,040 |
|  Costs added in current period (given) |  4,612,000 |  3,220,000 |  1,392,000 |
|  Total costs to account for | $5,196,400 |  $3,713,360 | $1,483,040 |
|  |  |  |  |
| (**Step 4**) Costs incurred to date |  |  $3,713,360 | $1,483,040 |
| Divide by equivalent units of work done to date (Solution Exhibit 17-19) |  | ÷ 532 | ÷ 496 |
| Cost per equivalent unit of work done to date |   |  $ 6,980 | $ 2,990 |
|   |   |  |  |
| (**Step 5**) Assignment of costs: Completed and transferred out (460 units) |  $4,586,200 |  (460\* × $6,980) + (460\* × $2,990) |
|  Work in process, ending (120 units) |  610,200 |  (72† × $6,980) + (36† × $2,990) |
|  Total costs accounted for |  $5,196,400 |  $3,713,360 + $1,483,040  |

\*Equivalent units completed and transferred out from Solution Exhibit 17-19, Step 2.

† Equivalent units in work in process, ending from Solution Exhibit 17-19, Step 2.

**17-21** (15 min.) **FIFO method, equivalent units.**

Under the FIFO method, equivalent units are calculated as the equivalent units of work done in the current period only. Solution Exhibit 17-21 shows equivalent units of work done in May 2014 in the Assembly Division of Fenton Watches, Inc., for direct materials and conversion costs.

# SOLUTION EXHIBIT 17-21

Summarize the Flow of Physical Units and Compute Output in Equivalent Units;

###### FIFO Method of Process Costing, Assembly Division of Fenton Watches, Inc., for May 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)****Equivalent Units** |
| **Flow of Production** | **Physical****Units** | **Direct****Materials** | **Conversion****Costs** |
| Work in process, beginning (given)Started during current period (given)To account for | 80500580 | (work done before current period) |
| Completed and transferred out during current period: From beginning work in process§ 80(100% − 90%); 80(100% − 40%) | 80 | 8 | 48 |
|  Started and completed 380 100%, 380 100% | 380† | 380 | 380 |
| Work in process, ending\* (given) 120 60%; 120 30% | 120 \_\_\_ | 72 | 36 |
| Accounted for | 580 |   |   |
| Equivalent units of work done in current period |  | 460 | 464 |

§Degree of completion in this department: direct materials, 90%; conversion costs, 40%.

†460 physical units completed and transferred out minus 80 physical units completed and transferred out from beginning work-in-process inventory.

\*Degree of completion in this department: direct materials, 60%; conversion costs, 30%.

**17-22** (20 min.) **FIFO method, assigning costs (continuation of 17-21).**

Solution Exhibit 17-22 summarizes total costs to account for, calculates cost per equivalent unit of work done in May 2014 in the Assembly Division of Fenton Watches, Inc., and assigns total costs to units completed and to units in ending work-in-process inventory.

SOLUTION EXHIBIT 17-22

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory;

FIFO Method of Process Costing, Assembly Division of Fenton Watches, Inc., for May 2014.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Total****Production****Costs** | **Direct****Materials** | **Conversion****Costs** |
| (**Step 3**) Work in process, beginning (given) | $ 584,400 |  $ 493,360 |  $ 91,040 |
|  Costs added in current period (given) |  4,612,000 |  3,220,000 |  1,392,000 |
|  Total costs to account for | $5,196,400 |  $3,713,360 |  $1,483,040 |
|  |  |  |  |
| (**Step 4**) Costs added in current period |  | $3,220,000 |  $1,392,000 |
|  Divide by equivalent units of work done in current period (Solution Exhibit 17-21) |  | ÷ 460 |  ÷ 464 |
|  Cost per equiv. unit of work done in current period |  | $ 7,000 |  $ 3,000 |
|  |  |  |  |
| (**Step 5**) Assignment of costs: Completed and transferred out (460 units): |  |  |  |
|  Work in process, beginning (80 units) Costs added to beginning work in process in current period  | $ 584,400 200,000 |  $493,360 + $91,040 (8\* × $7,000) + (48\* × $3,000) |
|  Total from beginning inventory Started and completed (380 units) Total costs of units completed and  transferred out Work in process, ending (120 units) Total costs accounted for |  784,400 3,800,000 4,584,400 612,000$5,196,400 |   (380† × $7,000) + (380† × $3,000) (72#  × $7,000) + (36# × $3,000) $3,713,360 + $1,483,040 |

#### \*Equivalent units used to complete beginning work in process from Solution Exhibit 17-21, Step 2.

#### †Equivalent units started and completed from Solution Exhibit 17-21, Step 2.

#### #Equivalent units in work in process, ending from Solution Exhibit 17-21, Step 2.

**17-23** (20-25 min.) **Operation costing.**

1. To obtain the conversion-cost rates, divide the budgeted cost of each operation by the number of packages that are expected to go through that operation.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Budgeted****Conversion****Cost** | **Budgeted****Number of Packages** | **Conversion Cost per Package** |
| Mixing | $18,080 |  22,600 | $0.80 |
| Shaping |  3,250 |  13,000 |  0.25 |
| Cutting |  1,440 |  9,600 |  0.15 |
| Baking |  14,690 |  22,600 |  0.65 |
| Slicing |  1,300 |  13,000 |  0.10 |
| Packaging |  16,950 |  22,600 |  0.75 |

2.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Work Order** |  | **Work Order** |
|  | **#215** |  | **#216** |
| Bread type: | Dinner Roll |  | Multigrain Loaves |
| Quantity: | 2,400 |  |  2,800 |
| Direct Materials | $ 1,320 |  | $2,520 |
| Mixing | 1,920 |  | 2,240 |
| Shaping | 0 |  | 700 |
| Cutting | 360 |  | 0 |
| Baking | 1,560 |  | 1,820 |
| Slicing | 0 |  | 280 |
| Packaging |  1,800 |  |  2,100 |
| Total | $ 6,960 |  | $9,660 |

The direct materials costs per unit vary based on the type of bread ($5,280 ÷ 9,600 = $0.55 for the dinner rolls, and $11,700 ÷ 13,000 = $0.90 for the multigrain loaves). Conversion costs are charged using the rates computed in part (1), taking into account the specific operations that each type of bread actually goes through.

3. Work order #215 (Dinner rolls): Work order #216 (Multigrain loaves):

 Total cost $ 6,960 Total cost: $9,660

 Divided by number of Divided by number of

 packages: ÷ 2,400 packages: ÷2,800

 Cost per package Cost per package

of dinner rolls: $ 2.90 of multigrain loaves: $ 3.45

**17-24** (25 min.) **Weighted-average method, assigning costs.**

1. & 2. Solution Exhibit 17-24A shows equivalent units of work done to date for Tomlinson Corporation for direct materials and conversion costs.

Solution Exhibit 17-24B summarizes total costs to account for, calculates the cost per equivalent unit of work done to date for direct materials and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work-in-process inventory.

# SOLUTION EXHIBIT 17-24A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Tomlinson Corporation for July 2014.

|  |  |  |
| --- | --- | --- |
|  |  | **(Step 2)** |
|  | **(Step 1)** | **Equivalent Units** |
|  | **Physical** | **Direct** | **Conversion** |
| **Flow of Production** | **Units** | **Materials** | **Costs** |

Work in process, beginning (given) 8,700

Started during current period (given) 34,500

To account for 43,200

Completed and transferred out during current period 32,000 32,000 32,000

Work in process, ending\* (given) 11,200

 11,200 × 100%; 11,200 × 70% 11,200 7,840

Accounted for 43,200

Equivalent units of work done to date 43,200 39,840

\*Degree of completion: direct materials, 100%; conversion costs, 70%.

SOLUTION EXHIBIT 17-24B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Weighted-Average Method of Process Costing for Tomlinson Corporation for July 2014.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Total****Production****Costs** | **Direct****Materials** | **Conversion****Costs** |
| **(Step 3**) Work in process, beginning (given) |  $104,700 | $ 61,500 | $ 43,200 |
|  Costs added in current period (given) |  800,004 |  301,380 |  498,624 |
|  Total costs to account for | $904,704 | $362,880 | $541,824 |
|  |  |  |  |
| (**Step 4**) Costs incurred to date |  | $362,880 | $541,824 |
| Divide by equivalent units of work done to date (Solution Exhibit 17-24A) |  |  ÷ 43,200 |  ÷ 39,840 |
| Cost per equivalent unit of work done to date |  |  $ 8.40 | $ 13.60 |
|   |  |  |  |
| (**Step 5**) Assignment of costs: Completed and transferred out (32,000 units) | $704,000 | (32,000\* × $8.40) + (32,000\* × $13.60) |
|  Work in process, ending (11,200 units) |  200,704 |  (11,200† × $8.40) + (7,840† × $13.60) |
|  Total costs accounted for | $904,704 |  $362,880 + $541,824 |

\*Equivalent units completed and transferred out (given).

†Equivalent units in ending work in process (given).

**17-25** (30 min.) **FIFO method, assigning costs.**

1. Solution Exhibit 17-25A calculates the equivalent units of work done in the current period. Solution Exhibit 17-25B summarizes total costs to account for, calculates the cost per equivalent unit of work done in the current period for direct materials and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work-in-process inventory.

# SOLUTION EXHIBIT 17-25A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units;

FIFO Method of Process Costing, Tomlinson Corporation for July 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)****Equivalent Units** |
|  **Flow of Production** | **Physical****Units** | **Direct****Materials** | **Conversion****Costs** |
| Work in process, beginning (given)Started during current period (given)To account for | 8,70034,50043,200 | (work done before current period) |
| Completed and transferred out during current period: From beginning work in process§ 8,700 × (100% − 100%); 8,700 × (100% – 25%) | 8,700 | 0 | 6,525 |
|  Started and completed 23,300 100%, 23,300 100% | 23,300† | 23,300 | 23,300 |
| Work in process, ending\* (given) 11,200  100%; 11,200  70% | 11,200 | 11,200 | 7,840 |
| Accounted for | 43,200 |   |   |
| Equivalent units of work done in current period |  | 34,500 | 37,665 |

§Degree of completion in this department: direct materials, 100%; conversion costs, 25%.

†32,000 physical units completed and transferred out minus 8,700 physical units completed and transferred out from beginning work-in-process inventory.

\*Degree of completion in this department: direct materials, 100%; conversion costs, 70%.

**SOLUTION EXHIBIT 17-25B**

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; FIFO Method of Process Costing, Tomlinson Corporation for July 2014.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Total****Production****Costs** | **Direct****Materials** | **Conversion****Costs** |
| (**Step 3**) Work in process, beginning (given) | $104,700 |  $ 61,500  | $ 43,200 |
|  Costs added in current period (given) |  800,004 |  301,380  |  498,624 |
|  Total costs to account for | $904,704  | $362,880 |  $541,824 |
| (**Step 4**) Costs added in current period |  | $301,380 | $498,624 |
|  Divide by equivalent units of work done in current period (Solution Exhibit 17-25A) |  |  ÷ 34,500 | ÷ 37,665 |
|  Cost per equivalent unit of work done in current period |   |  $ 8.74 | $ 13.24 |
| (**Step 5**) Assignment of costs: Completed and transferred out (33,000 units): |  |  |  |
|  Work in process, beginning (8,500 units) Cost added to beginning work in process in current period | $104,700 86,381 |  $61,500 + $43,200 (0\* × $8.74) + (6,525\* × $13.24) |
|  Total from beginning inventory Started and completed (24,500 units) Total costs of units completed and transferred out Work in process, ending (10,500 units) | 191,081 511,995 703,076 201,628 | (23,300† × $8.74) + (23,300† × $13.24)(11,200# × $8.74) + (7,840# × $13.24) |
| Total costs accounted for | $904,704 | $362,880  |  + $541,824 |

#### \*Equivalent units used to complete beginning work in process from Solution Exhibit 17-25A, Step 2.

####  †Equivalent units started and completed from Solution Exhibit 17-25A, Step 2.

#### #Equivalent units in ending work in process from Solution Exhibit 17-25A, Step 2.

2. Using the weighted average method will result in a greater degree of cost smoothing because the cost of beginning inventory is mixed together with costs added each period. This will produce a more consistent cost per equivalent unit than the FIFO method.

 In the case of Tomlinson Corporation, note that the direct material cost per equivalent unit went from $7.07 in the prior period ($61,500 ÷ 8,700 units) to $8.74 in July, while the conversion cost per equivalent unit decreased from $19.86 ($43,200 ÷ 2,175 equivalent units in opening work-in-process) to $13.24 in July. Under the weighted-average method, these costs and equivalent units are combined into consistent, blended rates of $8.40 and $13.60 for direct materials and conversion costs, respectively.

**17-26** (35–40 min.) **Transferred-in costs, weighted-average method.**

1, 2. & 3. Solution Exhibit 17-26A calculates the equivalent units of work done to date. Solution Exhibit 17-26B summarizes total costs to account for, calculates the cost per equivalent unit of work done to date for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work-in-process inventory.

SOLUTION EXHIBIT 17-26A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Finishing Department of Trendy Clothing for June 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)** |
|   |  | **Equivalent Units** |
| **Flow of Production** | **Physical****Units** | **Transferred-****in Costs** | **Direct****Materials** | **Conversion** **Costs** |

Work in process, beginning (given) 60

Transferred in during current period (given) 100

To account for 160

Completed and transferred out

 during current period 120 120 120 120

Work in process, ending\* (given) 40

 40 × 100%; 40 × 0%; 40 × 75% 40 0 30

Accounted for 160

Equivalent units of work done to date 160 120 150

\*Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 75%.

**SOLUTION EXHIBIT 17-26B**

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Weighted-Average Method of Process Costing, Finishing Department of Trendy Clothing for June 2014.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   |   | **Total Production Costs** | **Transferred-in Costs** | **Direct Materials** | **Conversion** **Costs** |
| **(Step 3)** | Work in process, beginning (given) |  $84,000  | $ 60,000  | $ 0  | $24,000  |
|  | Costs added in current period (given) |  206,400  |  117,000 |  27,000 |  62,400 |
|  | Total costs to account for | $290,400  | $ 177,000 | $27,000 | $86,400 |
|  |  |  |  |  |  |
| **(Step 4)** | Costs incurred to date |  | $ 117,000 | $27,000 |  $86,400 |
|  | Divide by equivalent units of work done to date (Solution Exhibit 17-26A) |  |  ÷ 160 |  ÷ 120 |  ÷ 150 |
|  | Cost per equivalent unit of work done to date |   |  $1,106.25  |  $ 225  |  $ 576  |
|  |  |  |  |  |  |
| **(Step 5)** | Assignment of costs: |  |   |  |  |
|  | Completed and transferred out (120 units) |  $228,870  | (120 a × $1,106.25) + (120 a × $225) + (120a × $576) |
|  | Work in process, ending (40 units): |  61,530  |  (40b × $1,105.25) + (0b × $225) + (30b × $576) |
|  | Total costs accounted for |  $290,400  |  $ 177,000 + $27,000 + $86,400 |
|  |  |  |  |  |  |
|  a Equivalent units completed and transferred out from Sol. Exhibit 17-26A, step 2. |
|  b Equivalent units in ending work in process from Sol. Exhibit 17-26A, step 2.  |

**17-27** (35–40 min.) **Transferred-in costs, FIFO method.**

Solution Exhibit 17-27A calculates the equivalent units of work done in the current period (for transferred-in costs, direct-materials, and conversion costs) to complete beginning work-in-process inventory, to start and complete new units, and to produce ending work in process. Solution Exhibit 17-27B summarizes total costs to account for, calculates the cost per equivalent unit of work done in the current period for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work-in-process inventory.

**SOLUTION EXHIBIT 17-27A**

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; FIFO Method of Process Costing, Finishing Department of Trendy Clothing for June 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)** |
|  |  | **Equivalent Units** |
| **Flow of Production** | **Physical Units** | **Transferred-in Costs** | **Direct Materials** | **Conversion Costs** |
| Work in process, beginning (given) |  60 | (work done before current period) |
| Transferred-in during current period (given) | 100 |  |  |  |
| To account for | 160 |  |  |  |
|

|  |
| --- |
| Completed and transferred out during current period: |

 |  |  |  |  |
|  From beginning work in processa |  60 |  |  |  |
|  [60 (100% – 100%); 60 (100% – 0%); 60 (100% – 50%)] |  |  0 |  60 |  30 |
|  Started and completed |  60b |  |  |  |
|

|  |
| --- |
|  (60 100%; 60 100%; 60 100%) |

 |  |  60 |  60 |  60 |
| Work in process, endingc (given) |  40 |  |  |  |
|

|  |
| --- |
|  (40  100%; 40  0%; 40  75%) |

 | \_\_\_ |  40 |  0 |  30 |
| Accounted for | 160 |  \_\_\_  |  \_\_\_ |  \_\_\_  |
| Equivalent units of work done in current period |  |  100 |  120 | 120 |
|  |  |  |  |  |
| aDegree of completion in this department: Transferred-in costs, 100%; direct materials, 0%; conversion costs, 50%. |
| b120 physical units completed and transferred out minus 60 physical units completed and transferred out from beginning  |
|

|  |
| --- |
|  work-in-process inventory. |

 |
|  cDegree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 75%.  |

**SOLUTION** **EXHIBIT 17-27B**

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; FIFO Method of Process Costing, Finishing Department of Trendy Clothing for June 2014.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   |   | **Total Production Costs** | **Transferred-in Costs** | **Direct Materials** | **Conversion Costs** |
| **(Step 3)** | Work in process, beginning (given) | $ 69,000 | $ 45,000 | $ 0 | $ 24,000 |
|  | Costs added in current period (given) |  203,400 |  114,000  |  27,000  |  62,400  |
|  | Total costs to account for | $272,400 | $159,000 | $27,000 | $86,400 |
|  |  |  |  |  |  |
| **(Step 4)** | Costs added in current period |  | $114,000 | $27,000 | $ 62,400 |
|  | Divide by equivalent units of work done in current period (Solution Exhibit 17-27A) |  |  ÷ 100 |  ÷ 120 |  ÷ 120 |
|  | Cost per equivalent unit of work done in current period |  |  $ 1,140  |  $ 225  |  $ 520  |
|  |  |  |  |  |  |
| **(Step 5)** | Assignment of costs: |  |  |  |  |
|  | Completed and transferred out (160 units) |  |  |  |  |
|  |  Work in process, beginning (60 units) |  $ 69,000 |  $45,000 | + $0 | + $24,000 |
|  |  Costs added to beginning work in process in current period |  29,100 | (0a × $1,140)  | + (60a × $225)  | + (30 a × $520)  |
|  |  Total from beginning inventory |  98,100 |  |  |  |
|  |  Started and completed (60 units) |  113,100 |  (60b × $1,140)  | + (60b × $225)  | + (60b × $520)  |
|  |  Total costs of units completed and transferred out |  211,200 |  |  |  |
|  | Work in process, ending (40 units): |  61,200 |  (40c × $1,140)  | + (0c × $225)  | + (30c × $520)  |
|  | Total costs accounted for |  $272,400 |  $159,000  | + $27,000  | + $86,400 |
|  |  |  |  |  |  |
|  a Equivalent units used to complete beginning work in process from Solution Exhibit 17-27A, step 2. |
|  b Equivalent units started and completed from Solution Exhibit 17-27A, step 2. |
|  c Equivalent units in ending work in process from Solution Exhibit 17-27A, step 2. |

* 1. (15-20 min.) **Operation costing.**
1. Calculate the conversion cost rates for each department:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Breeze** |  **Fresh** |  **Joy** |  **Total** |
| Budgeted 50-oz. containers | 11,000 |  8,000 |  21,000 | 40,000 |
| Budgeted labor hours |  275a |  200c |  525e |  1,000 |
| Budgeted machine hours |  55b |  40d |  105f |  200 |

a 11,000 × 1.5 minutes ÷ 60 minutes/hour = 275 hours

b 11,000 × 0.3 minutes ÷ 60 minutes/hour = 55 hours

c 8,000 × 1.5 minutes ÷ 60 minutes/hour = 200 hours

d 8,000 × 0.3 minutes ÷ 60 minutes/hour = 40 hours

e 21,000 × 1.5 minutes ÷ 60 minutes/hour = 525 hours

f 21,000 × 0.3 minutes ÷ 60 minutes/hour = 105 hours

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Budgeted****Conversion****Cost** | **Cost Driver** | **Budgeted****Quantity of Cost Driver** | **Conversion Cost Rate** |
| Spray Drying |  $ 8,000 | Labor hours |  1,000 |  $8.00 per labor hour |
| Mixing |  22,800 | # of containers |  19,000 |  $1.20 per container |
| Blending |  30,450 | # of containers |  21,000 |  $1.45 per container |
| Packaging |  1,000 | Machine hours |  200 |  $5.00 per machine hour |

2. Budgeted cost of goods manufactured:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Breeze** | **Fresh** |  **Joy** |
| Direct Materials | $21,450 | $20,000 |  $52,500 |
| Spray Dryingg |  2,200 |  1,600 |  4,200 |
| Mixingh |  13,200 |  9,600 |  0 |
| Blending |  0 |  0 |  30,450 |
| Packagingi |  275 |  200 |  525 |
| Total | $37,125 | $31,400 |  $87,675 |

g $8.00 per labor hour × (275; 200; 525 labor hours)

h $1.20 per container × (11,000; 8,000 containers)

i $5.00 per machine hour × (55; 40; 105 machine hours)

3. Budgeted cost per container

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Breeze** | **Fresh** | **Joy** |
| Total budgeted costs | $37,125 | $31,400 | $87,675 |
| Number of containers |  11,000 |  8,000 |  21,000 |
| Budgeted cost per container | $ 3.375 | $ 3.925 | $ 4.175 |

**17-29** (30-35 min.) **Standard-costing with beginning and ending work in process.**

1. Solution Exhibit 17-29A computes the equivalent units of work done in November 2014 by Priscilla’s Pearls Company for direct materials and conversion costs.

2. and 3. Solution Exhibit 17-29B summarizes total costs of the Priscilla’s Pearls Company for November 30, 2014, and using the standard cost per equivalent unit for direct materials and conversion costs, assigns these costs to units completed and transferred out and to units in ending work in process. The exhibit also summarizes the cost variances for direct materials and conversion costs for November 2014.

SOLUTION EXHIBIT 17-29A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Standard Costing Method of Process Costing, Priscilla’s Pearls Company for the Month Ended November 30, 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)****Equivalent Units** |
|  **Flow of Production** | **Physical****Units** | **Direct****Materials** | **Conversion****Costs** |
| Work in process, beginning (given)Started during current period (given)To account for | 29,000124,200153,200 | (work done before current period) |
| Completed and transferred out during current period: From beginning work in process§ 29,000 × (100% − 100%); 29,000 × (100% – 60%) |  29,000 | 0 | 11,600 |
|  Started and completed 98,000 100%, 98,000 100% |  98,000† | 98,000 | 98,000 |
| Work in process, ending\* (given) 26,200  100%; 26,200  40% |  26,200 \_\_\_\_\_\_\_ | 26,200 | 10,480 |
| Accounted for |  153,200 |  \_\_\_\_\_\_\_ |  \_\_\_\_\_\_\_ |
| Equivalent units of work done in current period |  | 124,200 | 120,080 |

§Degree of completion in this department: direct materials, 100%; conversion costs, 60%.

†127,000 physical units completed and transferred out minus 29,000 physical units completed and transferred out from beginning work-in-process inventory.

\*Degree of completion in this department: direct materials, 100%; conversion costs, 40%.

**SOLUTION EXHIBIT 17-29B**

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Standard-Costing Method of Process Costing, Priscilla’s Pearls Company for the Month Ended November 30, 2014.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Total****Production****Costs** | **Direct****Materials** | **Conversion****Costs** |
|  **(Step 3**) Work in process, beginning (given) |  $ 226,200 |  $ 69,600 + $ 156,600 |
| Costs added in current period at standard costs |  1,378,800 | (124,200 × 2.40) + (120,080 × $9.00) |
|  Total costs to account for | $1,605,000 |  $367,680 + $1,237,320 |
| **(Step 4)** Standard cost per equivalent unit (given) |  |  $ 2.40 |  $ 9.00 |
| **(Step 5**) Assignment of costs at standard costs: |  |  |  |
|  Completed and transferred out (127,000 units): Work in process, beginning (29,000 units) Costs added to beg. work in process in current period Total from beginning inventory | $ 226,200 104,400330,600 |  $69,600 + $156,600 (0\* × $2.40) + (11,600\* × $9.00) |
|  Started and completed (98,000 units) Total costs of units transferred out |  1,117,200 1,447,800 | (98,000† × $2.40) + (98,000† × $9.00) |
|  Work in process, ending (26,200 units) |  157,200 |  (26,200# × $2.40) + (10,480# × $9.00) |
|  Total costs accounted for | $1,605,000 |  $367,680 + $1,237,320 |
| Summary of variances for current performance:Costs added in current period at standard costs (see Step 3 above)Actual costs incurred (given)Variance |  |   $298,080 327,500 $ 29,420 U |   $1,080,720 1,222,000 $ 141,280 U |

\*Equivalent units to complete beginning work in process from Solution Exhibit 17-29A, Step 2.

†Equivalent units started and completed from Solution Exhibit 17-29A, Step 2.

#Equivalent units in ending work in process from Solution Exhibit 17-29A, Step 2.

**17-30** (30 min.) **Equivalent units, comprehensive.**

1. Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Louisville Sports for May 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)** |
|   |  | **Equivalent Units** |
| **Flow of Production** | **Physical****Units** | **Ash Cork** | **Ink** | **Conversion****Costs** |

Work in process, beginning (given) 100

Started during current period (given) 60

To account for 160

Completed and transferred out

 during current period 120 120 120 120 120

Work in process, ending\* (given) 40

 40 × 80%; 50%; 0%; 68% 32 20 0 27.2

Accounted for 160

Equivalent units of work done to date 152 140 120 147.2

\*Degree of completion in this department: Step 12 of production process: Ash, 80%; Cork, 50%; Ink, 0%; Conversion costs, (6% × 10 steps) + (4% × 2 steps) = 68%.

2. Summarize the Flow of Physical Units and Compute Output in Equivalent Units; FIFO Method of Process Costing, Louisville Sports for May 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)** |
|   |  | **Equivalent Units** |
| **Flow of Production** | **Physical****Units** | **Ash Cork** | **Ink** | **Conversion****Costs** |

Work in process, beginning (given) 100

Started during current period (given) 60

To account for 160

Completed and transferred out

 during current period:

 From beginning work in process§ 100

 100 × 20%; 50%; 100%; 46% 20 50 100 46

 Started and completed† 20

 20 × 100%; 100%; 100%; 100% 20 20 20 20

Work in process, ending\* (given) 40

 40 × 80%; 50%; 0%; 68% 32 20 0 27.2

Accounted for 160

Equivalent units of work done in May 72 90 120 93.2

§Degree of completion in this department: Step 9 of production process: Ash, 80%; Cork, 50%; Ink, 0%; conversion costs, 6% × 9 steps = 54%. The difference between 100% and these numbers represents the amount of work done to complete the beginning work in process in this period.

†120 bats completed and transferred out minus 100 bats completed and transferred out from beginning work-in-process inventory.

\*Degree of completion in this department: Step 12 of production process: Ash, 80%; Cork, 50%; Ink, 0%; conversion costs, (6% × 10 steps) + (4% × 2 steps) = 68%.

17-31 (25 min.) Weighted-average method.

1. Because direct materials are added at the beginning of the assembly process, the units in this department must be 100% complete with respect to direct materials. Solution Exhibit 17-31A shows equivalent units of work done to date:

Direct materials 25,000 equivalent units

Conversion costs 24,250 equivalent units

SOLUTION EXHIBIT 17-31A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Assembly Department of Larsen Company for October 2014.

 **(Step 1) (Step 2)**

 **Equivalent Units**

 **Physical Direct Conversion**

 **Flow of Production Units Materials Costs**

Work in process, beginning (given) 5,000

Started during current period (given) 20,000

To account for 25,000

Completed and transferred out

 during current period 22,500 22,500 22,500

Work in process, ending\* (given) 2,500

 2,500 × 100%; 2,500 × 70% 2,500 1,750

Accounted for 25,000

Equivalent units of work done to date 25,000 24,250

\*Degree of completion in this department: direct materials, 100% (because they are added at the start of the process); conversion costs, 70%.

2. To show better performance, a department supervisor might report a higher degree of completion resulting in understated cost per equivalent unit and overstated operating income. If performance for the period is very good, the department supervisor may be tempted to report a lower degree of completion, reducing income in the current period. This has the effect of reducing the costs carried in ending inventory and the costs carried to the following year in beginning inventory. In other words, estimates of degree of completion can help to smooth earnings from one period to the next.

To guard against the possibility of bias, managers should ask supervisors specific questions about the process they followed to prepare estimates. Top management should always emphasize obtaining the correct answer, regardless of how it affects reported performance. This emphasis drives ethical actions throughout the organization.

3. & 4. Solution Exhibit 17-31B summarizes the total Assembly Department costs for October 2014, calculates cost per equivalent unit of work done to date, and assigns these costs to units completed (and transferred out) and to units in ending work in process using the weighted-average method.

SOLUTION EXHIBIT 17-31B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work in Process Inventory; Weighted-Average Method of Process Costing, Assembly Department of Larsen Company for October 2014.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Total****Production****Costs** | **Direct****Materials** | **Conversion** **Costs** |
| **(Step 3**) Work in process, beginning (given) | $1,652,750 | $1,250,000 | $ 402,750 |
|  Costs added in current period (given) |  6,837,500 |  4,500,000 |  2,337,500 |
|  Total costs to account for | $8,490,250 | $5,750,000 | $2,740,250 |
|  |  |  |  |
| (**Step 4**) Costs incurred to date |  | $5,750,000 | $2,740,250 |
| Divide by equivalent units of work done to date (Solution Exhibit 17-31A) |  |  ÷ 25,000 |  ÷ 24,250 |
| Cost per equivalent unit of work done to date |   | $ 230 | $ 113 |
|  |  |  |  |
| (**Step 5**) Assignment of costs: Completed and transferred out (22,500 units) | $7,717,500 | (22,500\* × $230) + (22,500\* × $113) |
|  Work in process, ending (2,500 units) |  772,750 |  (2,500† × $230) + (1,750† × $113) |
|  Total costs accounted for |  $8,490,250 |  $5,750,000 + $2,740,250 |

\*Equivalent units completed and transferred out from Solution Exhibit 17-31A, Step 2.

†Equivalent units in work in process, ending from Solution Exhibit 17-31A, Step 2.

**17-32** (10 min.) **Journal entries** **(continuation of 17-31).**

1. Work in Process––Assembly Department 4,500,000

 Accounts Payable 4,500,000

 Direct materials purchased and used in

 production in October.

2. Work in Process––Assembly Department 2,337,500

 Various accounts 2,337,500

 Conversion costs incurred in October.

3. Work in Process––Testing Department 7,717,500

 Work in Process––Assembly Department 7,717,500

 Cost of goods completed and transferred out

 in October from the Assembly Department to the Testing Department.

|  |
| --- |
| Work in Process––Assembly Department |
|  Beginning inventory, October 1 1,652,750 1. Direct materials 4,500,000 2. Conversion costs 2,337,500 | 3. Transferred out to Work in Process–Testing 7,717,500 |
|  Ending Inventory, October 31 772,750 |  |

**17-33** (20 min.) **FIFO method (continuation of 17-31).**

1. The equivalent units of work done in the Assembly Department in October 2014 for direct materials and conversion costs are shown in Solution Exhibit 17-33A.

## SOLUTION EXHIBIT 17-33A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; FIFO Method of Process Costing, Assembly Department of Larsen Company for October 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)****Equivalent Units** |
| **Flow of Production** | **Physical****Units** | **Direct****Materials** | **Conversion****Costs** |
| Work in process, beginning (given)Started during current period (given)To account for |  5,000 20,000 25,000 | (work done before current period) |
| Completed and transferred out during current period: From beginning work in process§ 5,000 × (100% − 100%); 5,000 × (100% − 60%) |  5,000 | 0 |  2,000 |
|  Started and completed 17,500 ×100%, 17,500 × 100% |  17,000† | 17,500 |  17,500 |
| Work in process, ending\* (given)2,500 × 100%; 2,500 × 70% |  2,500 \_\_\_\_\_ | 2,500 |  1,750 |
| Accounted for | 25,000 |   |  \_\_\_\_\_\_ |
| Equivalent units of work done in current period |  | 20,000 |  21,250 |

§Degree of completion in this department: direct materials, 100%; conversion costs, 60%.

†22,500 physical units completed and transferred out minus 5,000 physical units completed and transferred out from beginning work-in-process inventory.

\*Degree of completion in this department: direct materials, 100%; conversion costs, 70%

The cost per equivalent unit of work done in the Assembly Department in October 2014 for direct materials and conversion costs is calculated in Solution Exhibit 17-33B. This exhibit also summarizes the total Assembly Department costs for October 2014 and assigns these costs to units completed (and transferred out) and units in ending work in process under the FIFO method.

**SOLUTION EXHIBIT 17-33B**

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; FIFO Method of Process Costing, Assembly Department of Larsen Company for October 2014.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Total****Production****Costs** | **Direct****Materials** | **Conversion****Costs** |
| (**Step 3**) Work in process, beginning (given) | $1,652,750 | $1,250,000 |  $ 402,750 |
|  Costs added in current period (given) |  6,837,500 |  4,500,000 |  2,337,500 |
|  Total costs to account for | $8,490,250 | $5,750,000 | $2,740,250 |
|  |  |  |  |
| (**Step 4**) Costs added in current period |  | $4,500,000 | $2,337,500 |
|  Divide by equivalent units of work done in current period (Solution Exhibit 17-33A) |  |  ÷ 20,000 | ÷ 21,250 |
|  Cost per equivalent unit of work done in current period |   | $ 225 | $ 110 |
|  |  |  |  |
| (**Step 5**) Assignment of costs: Completed and transferred out (22,500 units): |  |   |  |
|  Work in process, beginning (5,000 units) Costs added to beg. work in process in current period | $1,652,750 220,000 |  $1,250,000 + $ 402,750 (0\* × $225) + (2,000\* × $110) |
|  Total from beginning inventory Started and completed (17,500 units) Total costs of units completed & transferred out Work in process, ending (2,500 units) Total costs accounted for |  1,872,750 5,862,500 7,735,250 755,000  $8,490,250 | (17,500† × $225) + (17,500† × $110)  (2,500# × $225) + (1,750# × $110) $5,750,000 + $2,740,250 |
|  |  |   |

#### \*Equivalent units used to complete beginning work in process from Solution Exhibit 17-33A, Step 2.

#### †Equivalent units started and completed from Solution Exhibit 17-33A, Step 2.

#### #Equivalent units in ending work in process from Solution Exhibit 17-33A, Step 2.

2. The cost per equivalent unit of beginning inventory and of work done in the current period differ:

|  |  |  |
| --- | --- | --- |
|  | **Beginning** **Inventory** | **Work Done in** **Current Period** |
| Direct materialsConversion costsTotal cost per unit | $250.00 ($1,250,000 ÷ 5,000 equiv. units) 134.25 ($ 402,750 ÷ 3,000 equiv. units)$384.25 | $225.00 110.00$335.00 |

|  |  |  |
| --- | --- | --- |
|  | **Direct****Materials** | **Conversion****Costs** |
| Cost per equivalent unit (weighted-average) | $230\* | $113\* |
| Cost per equivalent unit (FIFO) |  $225\*\* |  $110\*\* |

\*from Solution Exhibit 17-31B

\*\*from Solution Exhibit 17-33B

The cost per equivalent unit differs between the two methods because each method uses different costs as the numerator of the calculation. FIFO uses only the costs added during the current period, whereas weighted-average uses the costs from the beginning work-in-process as well as costs added during the current period. Both methods also use different equivalent units in the denominator.

 The following table summarizes the costs assigned to units completed and those still in process under the weighted-average and FIFO process-costing methods for our example.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Weighted Average****(Solution Exhibit 17-31B)** | **FIFO****(Solution Exhibit 17-33B)** | **Difference** |
| Cost of units completed and transferred outWork in process, endingTotal costs accounted for | $7,717,500 772,750$8,490,250 | $7,735,250 755,000$8,490,250 | + $17,750 − $17,750 |

The FIFO ending inventory is lower than the weighted-average ending inventory by $17,750. This is because FIFO assumes that all the higher-cost prior-period units in work in process are the first to be completed and transferred out, while ending work in process consists of only the lower-cost current-period units. The weighted-average method, in contrast, smoothes the cost per equivalent unit by assuming that more of the lower-cost units are completed and transferred out, while some higher-cost units in beginning work in process are placed in ending work in process. So, in this case, the weighted-average method results in a lower cost of units completed and transferred out and a higher ending work-in-process inventory relative to the FIFO method.

 Larsen’s managers should consider the FIFO method because even though it shows lower operating income and higher cost of goods sold, it lowers taxes. Managers may have an incentive, however, to use the weighted-average method and show higher income if the managers’ compensation increases with higher operating income or if there are debt covenants that would be violated by showing lower income. Another advantage of the FIFO method is that it provides better information for managing the business because it keeps separate the costs of the current period from costs incurred in previous periods.

**17-34** (30 min.) **Transferred-in costs, weighted-average method (related to 17-31 to 17-33).**

1. Transferred-in costs are 100% complete, and direct materials are 0% complete in both beginning and ending work-in-process inventory. The reason is that transferred-in costs are always 100% complete as soon as they are transferred in from the Assembly Department to the Testing Department. Direct materials in beginning or ending work in process for the Testing Department are 0% complete because direct materials are added only when the testing process is 90% complete and the units in beginning and ending work in process are only 70% and 60% complete, respectively.

2. Solution Exhibit 17-34A computes the equivalent units of work done to date in the Testing Department for transferred-in costs, direct materials, and conversion costs.

3. Solution Exhibit 17-34B summarizes total Testing Department costs for October 2014, calculates the cost per equivalent unit of work done to date in the Testing Department for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work in process using the weighted-average method.

4. Journal entries:

a. Work in Process––Testing Department 7,717,500

 Work in Process––Assembly Department 7,717,500

 Cost of goods completed and transferred out

 during October from the Assembly

 Department to the Testing Department

b. Finished Goods 23,459,600

 Work in Process––Testing Department 23,459,600

 Cost of goods completed and transferred out

 during October from the Testing Department

 to Finished Goods inventory

SOLUTION EXHIBIT 17-34A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Testing Department of Larsen Company for October 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)**  | **(Step 2)** |
|  |  | **Equivalent Units** |
| **Flow of Production** | **Physical****Units**  | **Transferred-in** **Costs** | **Direct****Materials** | **Conversion** **Costs** |

Work in process, beginning (given) 7,500

Transferred in during current period (given) 22,500

To account for 30,000

Completed and transferred out

 during current period 26,300 26,300 26,300 26,300

Work in process, ending\* (given) 3,700

 3,700 × 100%; 3,700 × 0%; 3,700 × 60% 3,700 0 2,220

Accounted for 30,000

Equivalent units of work done to date 30,000 26,300 28,520

\*Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 60%.

SOLUTION EXHIBIT 17-34B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Weighted-Average Method of Process Costing, Testing Department of Larsen Company for October 2014.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Total****Production****Costs** | **Transferred****-in Costs** |  **Direct** **Materials** | **Conversion****Costs** |
| (**Step 3**) Work in process, beginning (given) | $ 3,767,960 |  $ 2,932,500 | $ 0 | $ 835,460 |
|  Costs added in current period (given) |  21,378,100 |  7,717,500 |  9,704,700 |  3,955,900 |
|  Total costs to account for | $25,146,060 | $10,650,000 | $9,704,700 | $4,791,360 |
|  |  |  |  |  |
| (**Step 4**) Costs incurred to date |  | $10,650,000 | $9,704,700 | $4,791,360 |
| Divide by equivalent units of work done to date (Solution Exhibit 17-34A) |   | ÷ 30,000 | ÷ 26,300 | ÷ 28,520 |
| Equivalent unit costs of work done to date |   |  $ 355 |  $ 369 |  $ 168 |
|  |  |  |  |  |
| (**Step 5**) Assignment of costs: Completed and transferred out (26,300 units) | $23,459,600 |  (26,300\* × $355) + (26,300\* × $369) + (26,300\* × $168) |
|  Work in process, ending (3,700 units) |  1,686,460 |  (3,700† × $355) + (0† × $369) + (2,220† × $168) |
|  Total costs accounted for | $25,146,060 |  $10,650,000 + $9,704,700 + $4,791,360 |

\*Equivalent units completed and transferred out from Solution Exhibit 17-34A, Step 2.

†Equivalent units in ending work in process from Solution Exhibit 17-34A, Step 2.

**17-35** (30 min.) **Transferred-in costs, FIFO method (continuation of 17-34).**

1. As explained in Problem 17-34, requirement 1, transferred-in costs are 100% complete and direct materials are 0% complete in both beginning and ending work-in-process inventory.

2. The equivalent units of work done in October 2014 in the Testing Department
for transferred-in costs, direct materials, and conversion costs are calculated in Solution Exhibit 17-35A.

3. Solution Exhibit 17-35B summarizes total Testing Department costs for October 2014, calculates the cost per equivalent unit of work done in October 2014 in the Testing Department for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work in process using the FIFO method.

4. Journal entries:

a. Work in Process––Testing Department 7,735,250

 Work in Process––Assembly Department 7,735,250

Cost of goods completed and transferred out

 during October from the Assembly Dept. to

 the Testing Dept.

b. Finished Goods 23,381,891

 Work in Process––Testing Department 23,381,891

Cost of goods completed and transferred out

 during October from the Testing Department

 to Finished Goods inventory.

**SOLUTION** **EXHIBIT 17-35A**

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; FIFO Method of Process Costing, Testing Department of Larsen Company for October 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)****Equivalent Units** |
| **Flow of Production** | **Physical****Units** | **Transferred-****in Costs** | **Direct****Materials** | **Conversion****Costs** |
| Work in process, beginning (given)Transferred-in during current period (given)To account for | 7,50022,50030,000 | (work done before current period) |
| Completed and transferred out during current period: From beginning work in process§7,500(100% − 100%); 7,500(100% − 0%);  7,500(100% − 70%) | 7,500 | 0 |  7,500 | 2,250 |
|  Started and completed18,800 100%; 18,800100%; 18,800100% | 18,800† | 18,800 |  18,800 | 18,800 |
| Work in process, ending\* (given)3,700100%; 3,7000%; 3,70060% | 3,700\_\_\_\_\_\_ | 3,700 |  0 | 2,220 |
| Accounted for | 30,000 |   |  ­­­­\_\_\_\_\_ |  \_\_\_\_\_\_  |
| Equivalent units of work done in current period |  | 22,500 | 26,300 | 23,270 |

§ Degree of completion in this department: Transferred-in costs, 100%; direct materials, 0%; conversion costs, 70%.

†26,300 physical units completed and transferred out minus 7,500 physical units completed and transferred out from beginning work-in-process inventory.

\*Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 60%.

**SOLUTION** **EXHIBIT 17-35B**

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; FIFO Method of Process Costing, Testing Department of Larsen Company for October 2014.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Total****Production****Costs** | **Transferred-in Costs** | **Direct****Materials** | **Conversion****Costs** |
| (**Step 3**) Work in process, beginning (given) | $ 3,635,460 |  $ 2,800,000 | $ 0 | $ 835,460 |
|  Costs added in current period (given) |  21,395,850 |  7,735,250 |  9,704,700 |  3,955,900 |
|  Total costs to account for | $25,031,310 |  $10,535,250 | $9,704,700 | $4,791,360 |
|  |  |  |  |  |
| (**Step 4**) Costs added in current period |  | $ 7,735,250 | $9,704,700 | $3,955,900 |
| Divide by equivalent units of work done in  current period (Solution Exhibit 17-35A) |  | ÷ 22,500 | ÷ 26,300 |  ÷ 23,270 |
|  Cost per equiv. unit of work done in current period |  |  $ 343.79 |  $ 369.00 |  $ 170.00 |
|  |  |  |  |  |
| (**Step 5**) Assignment of costs: Completed and transferred out (26,300 units): |  |  |  |  |
|  Work in process, beginning (7,500 units) Costs added to beg. work in process in current period | $ 3,635,460 3,150,000 |  $2,800,000 + $0 + $835,460 (0\* × $343.79) + (7,500\* × $369.00) + (2,250\* × $170.00) |
|  Total from beginning inventory Started and completed (18,800 units) Total costs of units completed & transferred out Work in process, ending (3,700 units) |  6,785,460 16,596,431 23,381,891 1,649,419 | (18,800† × $343.79) + (18,800† × $369.00) + (18,800† ×$170.00) (3,700# × $343.79) + (0# × $369.00) + (2,220# × $170.00) |
|  Total costs accounted for | $25,031,310 |  $10,617,125  | + $9,704,700 | + $4,791,360 |
|  |  |  |

\*Equivalent units used to complete beginning work in process from Solution Exhibit 17-35A, Step 2.

†Equivalent units started and completed from Solution Exhibit 17-35A, Step 2.

#Equivalent units in ending work in process from Solution Exhibit 17-35A, Step 2.

**17-36** (25 min.) **Weighted-average method.**

1. Solution Exhibit 17-36A shows equivalent units of work done to date of

Direct materials 570 equivalent units

Conversion costs 468 equivalent units

 Note that direct materials are added when the Assembly Department process is 10% complete. Both the beginning and ending work in process are more than 10% complete and, hence, are 100% complete with respect to direct materials.

Solution Exhibit 17-35B summarizes the total Assembly Department costs for April 2014, calculates cost per equivalent unit of work done to date for direct materials and conversion costs, and assigns these costs to units completed (and transferred out), and to units in ending work in process using the weighted-average method.

SOLUTION EXHIBIT 17-36A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Assembly Department of McKnight Handcraft for April 2014.

 **(Step 1) (Step 2)**

 Equivalent Units

 **Physical Direct Conversion**

 **Flow of Production Units Materials Costs**

Work in process, beginning (given) 60

Started during current period (given) 510

To account for 570

Completed and transferred out

 during current period 450 450 450

Work in process, ending\*(given) 120

 120 × 100%; 120 × 15% 120 18

Accounted for 570

Equivalent units of work done to date 570 468

\*Degree of completion in this department: direct materials, 100%; conversion costs, 15%.

SOLUTION EXHIBIT 17-36B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Weighted-Average Method of Process Costing, Assembly Department of McKnight Handcraft for April 2014.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Total****Production****Costs** | **Direct****Materials** | **Conversion****Costs** |
| **(Step 3**) Work in process, beginning (given) | $ 1,686 | $ 1,530 | $ 156 |
|  Costs added in current period (given) |  29,394 |  17,850 |  11,544 |
|  Total costs to account for | $31,080 | $19,380 | $11,700 |
|  |  |  |  |
| (**Step 4**) Costs incurred to date |  | $19,380 | $11,700 |
| Divide by equivalent units of work done to date (Solution Exhibit 17-36A) |  |  ÷ 570 |  ÷ 468 |
|  Cost per equivalent unit of work done to date |  | $ 34 | $ 25 |
|  |  |  |  |
| (**Step 5**) Assignment of costs: Completed and transferred out (450 units) | $26,550 |  (450\* × $34) + (450\* × $25) |
|  Work in process, ending (120 units) |  4,530 |  (120† × $34) + (18† × $25) |
|  Total costs accounted for |  $31,080 |  $19,380  | + $11,700 |

\*Equivalent units completed and transferred out from Solution Exhibit 17-36A, Step 2.

†Equivalent units in ending work in process from Solution Exhibit 17-36A, Step 2.

2. To show better performance, a department supervisor might report a higher degree of completion, resulting in understated cost per equivalent unit and overstated operating income. If performance for the period is very good, the department supervisor may be tempted to report a lower degree of completion, reducing income in the current period. This has the effect of reducing the costs carried in ending inventory and the costs carried to the following year in beginning inventory. In other words, estimates of degree of completion can help to smooth earnings from one period to the next.

To guard against the possibility of bias, managers should ask supervisors specific questions about the process they followed to prepare estimates. Top management should always emphasize obtaining the correct answer, regardless of how it affects reported performance. This emphasis drives ethical actions throughout the organization.

**17-37** (20 min.) **FIFO method (continuation of 17-36).**

1. & 2. The equivalent units of work done in April 2014 in the Assembly Department for direct materials and conversion costs are shown in Solution Exhibit 17-37A.

 Solution Exhibit 17-37B summarizes the total Assembly Department costs for April 2014, calculates the cost per equivalent unit of work done in April 2014 in the Assembly Department for direct materials and conversion costs, and assigns these costs to units completed (and transferred out) and to units in ending work in process under the FIFO method.

 The equivalent units of work done in beginning inventory is direct materials, 60 × 100% = 60 and conversion costs 60 × 40% = 24. The cost per equivalent unit of beginning inventory and of work done in the current period are

|  |  |  |
| --- | --- | --- |
|  | **Beginning** Inventory | **Work Done in** **Current Period****(Calculated Under** **FIFO Method)** |
| Direct materialsConversion costs | $25.50 ($1,530 ÷ 60)$6.50 ($156 ÷ 24) |  $35$26 |

 The following table summarizes the costs assigned to units completed and those still in process under the weighted-average and FIFO process-costing methods for our example.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Weighted Average****(Solution Exhibit 17-36B)** | **FIFO****(Solution Exhibit 17-37B)** | **Difference** |
| Cost of units completed and transferred outWork in process, endingTotal costs accounted for | $26,550 4,530$31,080 | $26,412 4,668$31,080 | –$138+$138 |

 The FIFO ending inventory is higher than the weighted-average ending inventory by $138. This is because FIFO assumes that all the lower-cost prior-period units in work in process are the first to be completed and transferred out while ending work in process consists of only the higher-cost current-period units. The weighted-average method, however, smoothes out cost per equivalent unit by assuming that more higher-cost units are completed and transferred out, while some of the lower-cost units in beginning work in process are placed in ending work in process. Hence, in this case, the weighted-average method results in a higher cost of units completed and transferred out and a lower ending work-in-process inventory relative to the FIFO method.

 Given the relatively small difference in the income numbers generated by the two methods, McKnight’s managers would likely be indifferent between the two methods. If the differences are expected to be larger in future years, the managers should decide on the firm’s method and choose the method that will lower McKnight’s operating income and taxes. They may have an incentive, however, to use the alternate method in order to obtain higher levels of income-based compensation or if there are debt covenants that would be violated by showing lower income. One advantage of the FIFO method worth considering is that it provides better information for managing the business because it keeps separate the costs of the current period from costs incurred in previous periods.

# SOLUTION EXHIBIT 17-37A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units;

FIFO Method of Process Costing, Assembly Department of McKnight Handcraft for April 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)****Equivalent Units** |
| **Flow of Production** | **Physical****Units** | **Direct****Materials** | **Conversion****Costs** |
| Work in process, beginning (given)Started during current period (given)To account for | 60510570 | (work done before current period) |
| Completed and transferred out during current period: From beginning work in process§ 60(100% − 100%); 60(100% − 40%) | 60 | 0 | 36 |
|  Started and completed 390 100%; 390 100% | 390† | 390 | 390 |
| Work in process, ending\* (given) 120  100%; 120  15% | 120  | 120 | 18 |
| Accounted for | 570 |   |   |
| Equivalent units of work done in current period |  | 510 | 444 |

§Degree of completion in this department: direct materials, 100%; conversion costs, 40%.

†450 physical units completed and transferred out minus 60 physical units completed and transferred out from beginning work-in-process inventory.

\*Degree of completion in this department: direct materials, 100%; conversion costs, 15%.

SOLUTION EXHIBIT 17-37B

Summarize the Total Costs to Account For, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory;

FIFO Method of Process Costing, Assembly Department of McKnight Handcraft for April 2014.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Total****Production****Costs** | **Direct****Materials** | **Conversion****Costs** |
| (**Step 3**) Work in process, beginning (given) | $ 1,686 |  $ 1,530 |  $ 156 |
|  Costs added in current period (given) |  29,394 |  17,850 |  11,544 |
|  Total costs to account for | $31,080 | $19,380 | $11,700 |
| (**Step 4**) Costs added in current period |  |  $17,850 |  $11,544 |
|  Divide by equivalent units of work done in current period (Exhibit 17-37A) |  |  ÷ 510 |  ÷ 444 |
|  Cost per equivalent unit of work done in current  period |   | $ 35 |  $ 26 |
| (**Step 5**) Assignment of costs: Completed and transferred out (455 units): |  |  |  |
|  Work in process, beginning (95 units) Costs added to begin. work in process in current period | $ 1,686 936 |  $1,530 + $156 (0\* × $35) + (36\* × $26) |
|  Total from beginning inventory Started and completed (360 units) Total costs of units completed & tsfd. out Work in process, ending (130 units) Total costs accounted for |  2,622 23,790 26,412 4,668$31,080 |  (390† × $35) + (390† × $26) (120# × $35) + (18# × $26) $19,380 + $11,700 |

#### \*Equivalent units used to complete beginning work in process from Solution Exhibit 17-37A, Step 2.

#### †Equivalent units started and completed from Solution Exhibit 17-37A, Step 2.

#### #Equivalent units in ending work in process from Solution Exhibit 17-37A, Step 2.

* 1. (30 min.) **Transferred-in costs, weighted average.**

1. Solution Exhibit 17-38A computes the equivalent units of work done to date in the Binding Department for transferred-in costs, direct materials, and conversion costs.

 Solution Exhibit 17-38B summarizes total Binding Department costs for April 2014, calculates the cost per equivalent unit of work done to date in the Binding Department for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work in process using the weighted-average method.

2. Journal entries:

a. Work in Process–– Binding Department 155,520

 Work in Process––Printing Department 155,520

 Cost of goods completed and transferred out

 during April from the Printing Department

 to the Binding Department

b. Finished Goods 264,708

 Work in Process–– Binding Department 264,708

 Cost of goods completed and transferred out

 during April from the Binding Department

 to Finished Goods inventory

SOLUTION EXHIBIT 17-38A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Binding Department of Publishers, Inc., for April 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)** |
|  |  | **Equivalent Units** |
| **Flow of Production** | **Physical Units** | **Transferred-in Costs** | **Direct Materials** | **Conversion Costs** |
| Work in process, beginning (given) | 1,260 |  |  |  |
| Transferred-in during current period (given) | 2,880 |  |  |  |
| To account for | 4,140 |  |  |  |
| Completed and transferred out during current period: | 3,240 | 3,240 | 3,240 | 3,240 |
| Work in process, endinga (given)  |  900 |  |  |  |
|  (900  100%; 900  0%; 900  70%) |   |  900 |  0 |  630 |
| Accounted for | 4,140 |  |  |  |
| Equivalent units of work done to date |  | 4,140 | 3,240 | 3,870 |
|  |  |  |  |  |
| aDegree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 70%.  |

**SOLUTION EXHIBIT 17-38B**

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Weighted-Average Method of Process Costing, Binding Department of Publishers, Inc., for April 2014.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   |   | **Total Production Costs** | **Transferred-in Costs** | **Direct Materials** | **Conversion Costs** |
| **(Step 3)** | Work in process, beginning (given) | $ 55,440 |  $ 39,060  | $ 0  |  $16,380  |
|  | Costs added in current period (given) |  267,948 |  155,520 |  28,188 |  84,240 |
|  | Total costs to account for | $323,388 | $194,580 | $28,188 |  $100,620 |
|  |  |  |  |  |  |
| **(Step 4)** | Costs incurred to date |  | $194,580 | $28,188 |  $100,620 |
|  | Divide by equivalent units of work done to date (Solution Exhibit 17-38A) |  | ÷ 4,140 | ÷ 3,240 |  ÷ 3,870 |
|  | Cost per equivalent unit of work done to date |  |  $ 47.00  | $ 8.70  |  $ 26.00  |
|  |  |  |  |  |  |
| **(Step 5)** | Assignment of costs: |  |  |  |  |
|  | Completed and transferred out (3,240 units) | $264,708 |  (3,240a × $47.00) + (3,240a × $8.70) + (3,240a × $26)  |
|  | Work in process, ending (900 units): |  58,680 |  (900b × $47.00) + (0b × $8.70) + (630b × $26)  |
|  | Total costs accounted for | $323,388 |  $194,580  | + $28,188 |  + $100,620 |
|  |  |  |  |  |  |
| a Equivalent units completed and transferred out from Sol. Exhibit 17-38A, step 2. |
| b Equivalent units in ending work in process from Sol. Exhibit 17-38A, step 2.  |

**17-39** (30 min.) **Transferred-in costs, FIFO method (continuation of 17-38).**

1. Solution Exhibit 17-39A calculates the equivalent units of work done in April 2014 in the Binding Department for transferred-in costs, direct materials, and conversion costs.

 Solution Exhibit 17-39B summarizes total Binding Department costs for April 2014, calculates the cost per equivalent unit of work done in April 2014 in the Binding Department for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work in process using the FIFO method.

 Journal entries:

a. Work in Process–– Binding Department 149,760

 Work in Process––Printing Department 149,760

Cost of goods completed and transferred out

 during April from the Printing Department to

 the Binding Department.

b. Finished Goods 259,488

 Work in Process–– Binding Department 259,488

Cost of goods completed and transferred out

during April from the Binding Department

to Finished Goods inventory.

2. The equivalent units of work done in beginning inventory is as follows: Transferred-in costs, 1,260 × 100% = 1,260; direct materials, 1,260 × 0% = 0; and conversion costs, 1,260 × 50% = 630. The cost per equivalent unit of beginning inventory and of work done in the current period are

|  |  |  |
| --- | --- | --- |
|  | **Beginning** **Inventory** | **Work Done in** **Current Period** |
| Transferred-in costs (weighted average)Transferred-in costs (FIFO)Direct materialsConversion costs | $31.00 ($39,060 ÷ 1,260)$35.00 ($44,100 ÷ 1,260)—$26.00 ($16,380 ÷ 630) | $54.00 ($155,520 ÷ 2,880)$52.00 ($149,760 ÷ 2,880)$ 8.70$26.00 |

 The following table summarizes the costs assigned to units completed and those still in process under the weighted-average and FIFO process-costing methods for the Binding Department.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Weighted Average****(Solution Exhibit 17-38B)** | **FIFO****(Solution Exhibit 17-39B)** | **Difference** |
| Cost of units completed and transferred outWork in process, endingTotal costs accounted for | $264,708 58,680$323,388 | $259,488 63,180$322,668 | –$5,220 +$4,500 |

 The FIFO ending inventory is higher than the weighted-average ending inventory by $4,500. This is because FIFO assumes that all the lower-cost prior-period units in work in process (resulting from the lower transferred-in costs in beginning inventory) are the first to be completed and transferred out while ending work in process consists of only the higher-cost current-period units. The weighted-average method, however, smoothes out cost per equivalent unit by assuming that more of the higher-cost units are completed and transferred out, while some of the lower-cost units in beginning work in process are placed in ending work in process. Hence, in this case, the weighted-average method results in a higher cost of units completed and transferred out and a lower ending work-in-process inventory relative to FIFO. Note that the difference in cost of units completed and transferred out (–$5,220) does not exactly offset the difference in ending work-in-process inventory (+$4,500). This is because the FIFO and weighted-average methods result in different values for transferred-in costs with respect to both beginning inventory and costs transferred in during the period.

**SOLUTION EXHIBIT 17-39A**

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; FIFO Method of Process Costing, Binding Department of Publishers, Inc., for April 2014.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)** |
|  |  | **Equivalent Units** |
| **Flow of Production** | **Physical Units** | **Transferred-in Costs** | **Direct Materials** | **Conversion Costs** |
| Work in process, beginning (given) |  1,260 | (work done before current period) |
| Transferred-in during current period (given) |  2,880 |  |  |  |
| To account for |  4,140 |  |  |  |
| Completed and transferred out during current period: |  |  |  |  |
|  From beginning work in processa |  1,260 |  |  |  |
|  [1,260 (100% – 100%); 1,260  (100% – 0%); 1,260 (100% – 50%)] |  |  0 |  1,260 |  630 |
|  Started and completed |  1,980b |  |  |  |
|  (1,980 100%; 1,980 100%; 1,980 100%) |  | 1,980 | 1,980 | 1,980 |
| Work in process, endingc (given) |  900 |  |  |  |
|  (900 100%; 900 x 0%; 900 70%) |  \_\_\_\_ |  900 |  0 |  630 |
| Accounted for | 4,140 | \_\_\_\_  | \_\_\_\_  | \_\_\_\_  |
| Equivalent units of work done in current period |  | 2,880 | 3,240 | 3,240 |
|  |  |  |  |  |
| a Degree of completion in this department: Transferred-in costs, 100%; direct materials, 0%; conversion costs, 50%. |
| b 3,240 physical units completed and transferred out minus 1,260 physical units completed and transferred out from beginning  |
|

|  |
| --- |
|  work-in-process inventory. |

 |
| c Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 70%.  |

SOLUTION EXHIBIT 17-39B

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; FIFO Method of Process Costing, Binding Department of Publishers, Inc., for April 2014.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   |   | **Total Production Costs** | **Transferred-in Costs** |  **Direct** **Materials** | **Conversion** **Costs** |
|  **(Step 3)** | Work in process, beginning (given) | $ 60,480 | $ 44,100 | $ 0 | $16,380 |
|  | Costs added in current period (given) |  262,188 |  149,760  |  28,188  |  84,240  |
|  | Total costs to account for | $322,668 | $193,860 | $28,188 | $100,620 |
|  |  |  |  |  |  |
| **(Step 4)** | Costs added in current period |  |  $149,760  |  $28,188  |  $84,240  |
|  | Divide by equivalent units of work done in current period (Sol. Exhibit 17-39A) |  |  ÷ 2,880 |  ÷ 3,240 |  ÷ 3,240 |
|  | Cost per equivalent unit of work done in current period |  |  $ 52.00  |  $ 8.70  |  $ 26.00  |
|  |  |  |  |  |  |
| **(Step 5)** | Assignment of costs: |  |  |  |  |
|  | Completed and transferred out (3,240 units) |  |  |  |  |
|  |  Work in process, beginning (1,260 units) | $ 60,480 |  $44,100 + $0 + $16,380  |
|  |  Costs added to beginning work in process in current period |  27,342 |  (0a × $52) + (1,260a × $8.70) + (630a × $26)  |
|  |  Total from beginning inventory |  87,822 |  |  |  |
|  |  Started and completed (1,980 units) |  171,666 |  (1,980b × $52) + (1,980b × $8.70) + (1,980b × $26)  |
|  |  Total costs of units completed and transferred out |  259,488 |  |  |  |
|  | Work in process, ending (900 units): |  63,180 |  (900c × $52) + (0c × $8.70) + (630c × $26)  |
|  | Total costs accounted for | $322,668 |  $193,860  | + $28,188  | + $100,620 |
|  |  |  |  |  |  |
|  a Equivalent units used to complete beginning work in process from Solution Exhibit 17-39A, step 2. |
|  b Equivalent units started and completed from Solution Exhibit 17-39A, step 2. |
|  c Equivalent units in ending work in process from Solution Exhibit 17-39A, step 2.  |

**17-40** (45 min.) **Transferred-in costs, weighted-average and FIFO methods.**

1. Solution Exhibit 17-40A computes the equivalent units of work done to date in the fermenting department for transferred-in costs, direct materials, and conversion costs. Solution Exhibit 17-40B summarizes total fermenting department costs for July, calculates the cost per equivalent unit of work done to date in the fermenting department for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work in process using the weighted-average method.

2. Solution Exhibit 17-40C computes the equivalent units of work done in July in the fermenting department for transferred-in costs, direct materials, and conversion costs. Solution Exhibit 17-40D summarizes total fermenting department costs for July, calculates the cost per equivalent unit of work done in July in the fermenting department for transferred-in costs, direct materials, and conversion costs, and assigns these costs to units completed and transferred out and to units in ending work in process using the FIFO method.

SOLUTION EXHIBIT 17-40A

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; Weighted-Average Method of Process Costing, Fermenting Department of Portland Pale Ale, Inc., for July.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)** |
|   |  | **Equivalent Units** |
| **Flow of Production** | **Physical****Units**  | **Transferred-****in Costs** | **Direct****Materials** | **Conversion** **Costs** |

Work in process, beginning (given) 2,500

Transferred in during current period (given) 10,000

To account for 12,500

Completed and transferred out

 during current period 10,500 10,500 10,500 10,500

Work in process, ending\* (given) 2,000

 2,000 × 100%; 2,000 × 0%; 2,000 × 50% 2,000 0 1,000

Accounted for 12,500

Equivalent units of work done to date 12,500 10,500 11,500

\*Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 50%.

**SOLUTION EXHIBIT 17-40B**

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; Weighted-Average Method of Process Costing, Fermenting Department of Portland Pale Ale, Inc., for July.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | **Total****Production****Costs** | **Transferred****-in Costs** | **Direct****Materials** | **Conversion****Costs** |
| **(Step 3)** | Work in process, beginning (given) | $153,500 | $116,000 | $ 0 | $ 37,500 |
|  | Costs added in current period (given) |  647,025 |  384,000 |  110,775 |  152,250 |
|  | Total costs to account for | $800,525 | $500,000 | $110,775 | $189,750 |
|  |  |  |  |  |  |
| **(Step 4)** | Costs incurred to date |  | $500,000 | $110,775 | $189,750 |
|  | Divide by equivalent units of work done  to date (Solution Exhibit 17-40A) |  | ÷ 12,500 | ÷ 10,500 | ÷ 11,500 |
|  | Equivalent unit costs of work done to date |  |  $ 40.00 |  $ 10.55 | $ 16.50 |
|  |  |  |  |  |  |
| **(Step 5)** | Assignment of costs:Completed and transferred out (10,500 units) | $704,025 | (10,500a × $40.00) + (10,500a × $10.55) + (10,500a × $16.50) |
|  | Work in process, ending (2,000 units) |  96,500 |  (2,000b × $40.00) + (0b × $10.55) + (1,000b × $16.50) |
|  | Total costs accounted for | $800,525 |  $500,000 + $110,775 + $189,750 |

a Equivalent units completed and transferred out from Solution Exhibit 17-40A, Step 2.

b Equivalent units in ending work in process from Solution Exhibit 17-40A, Step 2.

**SOLUTION EXHIBIT 17-40C**

Summarize the Flow of Physical Units and Compute Output in Equivalent Units; FIFO Method of Process Costing, Fermenting Department of Portland Pale Ale, Inc., for July.

|  |  |  |
| --- | --- | --- |
|  | **(Step 1)** | **(Step 2)****Equivalent Units** |
| **Flow of Production** | **Physical****Units** | **Transferred-****in Costs** | **Direct****Materials** | **Conversion****Costs** |
| Work in process, beginning (given)Transferred-in during current period (given)To account for | 2,50010,00012,500 | (work done before current period) |
| Completed and transferred out during current period: From beginning work in process§ 2,500(100% − 100%); 2,500(100% − 0%);  2,500(100% − 25%) | 2,500 | 0 | 2,500 | 1,875 |
|  Started and completed 8,000100%; 8,000100%; 8,000100% | 8,000† | 8,000 | 8,000 | 8,000 |
| Work in process, ending\* (given) 2,000100%; 2,0000%; 2,00050% | 2,000  | 2,000 | 0 | 1,000 |
| Accounted for | 10,800 |   |   |   |
| Equivalent units of work done in current period |  | 10,000 | 10,500 | 10,875 |

§Degree of completion in this department: Transferred-in costs, 100%; direct materials, 0%; conversion costs, 25%.

†10,500 physical units completed and transferred out minus 2,500 physical units completed and transferred out from beginning work-in-process inventory.

\*Degree of completion in this department: transferred-in costs, 100%; direct materials, 0%; conversion costs, 50%.

**SOLUTION EXHIBIT 17-40D**

Summarize the Total Costs to Account for, Compute the Cost per Equivalent Unit, and Assign Costs to the Units Completed and Units in Ending Work-in-Process Inventory; FIFO Method of Process Costing, Fermenting Department of Portland Pale Ale, Inc., for July.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  **Total****Production** **Costs** | **Transferred****-in Costs** |  **Direct** **Materials** | **Conversion****Costs** |
| **(Step 3)** | Work in process, beginning (given) | $153,180 |  $115,680  |  $ 0 |  $ 37,500 |
|  |  Costs added in current period (given) |  639,025 |  376,000 |  110,775 |  152,250 |
|  |  Total costs to account for | $792,205 | $491,680 | $110,775 | $189,750 |
|  |  |  |  |  |  |
| **(Step 4)** | Costs added in current period |  |  $ 376,000 | $110,775 | $152,250 |
|  | Divide by equivalent units of work done in current period (Solution Exhibit 17-40C) |  |  ÷ 10,000 |  ÷ 10,500 | ÷10,875 |
|  | Cost per equivalent unit of work done in current period |  |  $ 37.60 |  $ 10.55 |  $ 14.00 |
|  |  |  |  |  |  |
| **(Step 5)** | Assignment of costs:Completed and transferred out (10,500 units): |  |  |  |  |
|  |  Work in process, beginning (2,500 units) Costs added to beg. work in process in current period | $153,180 52,625 |  $115,680 + $0 + $37,500 (0a × $37.60) + (2,500a × $10.55) + (1,875a × $14.00); |
|  |  Total from beginning inventory Started and completed (8,000 units)Total costs of units completed & transferred outWork in process, ending (2,000 units) |  205,805 497,200 703,005 89,200  |  (8,000b × $37.60) + (8,000b × $10.55) + (8,000b × $14.00) (2,000c × $37.60) + (0c × $10.55) + (1,000c × $14.00); |
|  | Total costs accounted for |  $792,205 |  $491,680 + $110,775 + $189,750 |
|  |  |  |  |  |  |

a Equivalent units used to complete beginning work in process from Solution Exhibit 17-40C, Step 2.

b Equivalent units started and completed from Solution Exhibit 17-40C, Step 2.

c Equivalent units in ending work in process from Solution Exhibit 17-40C, Step 2

**17-41** (25 min.) **Multiple processes or operations, costing.**

1. Conversion costs incurred in March = $68,850

 Equivalent units of work:

 Units completed and transferred: 12,000 × 100% = 12,000

 Units formed but not assembled: 4,000 × 60% = 2,400

 Units assembled but not finished: 2,000 × 90% = 1,800

 Total equivalent units: 16,200

 Conversion cost per equivalent unit = $68,850/16,200 = $4.25

2. Cost per equivalent unit for the three materials categories:

 Cullets:  = $3.50

 Silicone:  = $1.50

 Polypropylene:  = $0.50

3. Cost of 12,000 bottles completed and transferred:

 Materials: 12,000 × ($3.50 + $1.50 + $0.50) = $ 66,000

 Conversion costs: 12,000 × $4.25 = $ 51,000

 $117,000

4. Cost of 4,000 units formed but not assembled (i.e., at end of first operation):

 Materials (only cullets): 4,000 × $3.50 = $14,000

 Conversion costs: 4,000 × 60% × $4.25 = $10,200

 $24,200

5. Cost of 2,000 units assembled but not finished (i.e., at end of second operation):

 Materials (cullets and silicone): 2,000 × ($3.50 + $1.50) = $10,000

 Conversion costs: 2,000 × 90% × $4.25 = $ 7,650

 $17,650

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**17-42** (20 min.) **Benchmarking, ethics.**

1. The reported monthly cost per equivalent unit of either direct materials or conversion costs is lower when the plant manager overestimates the percentage of completion of ending work in process; the overestimate increases the denominator and, thus, decreases the cost per equivalent unit. The plant manager has two motivations to report lower cost per equivalent unit numbers (1) to get a bonus and (2) to be recognized in the company newsletter.

2. Although the plant controller has responsibility for preparing the accounting reports for the plant, in most cases, the plant controller reports directly to the plant manager. If this reporting relationship exists, McNall may create a conflict of interest situation for the plant controller. Only if the plant controller reports directly to the corporate controller, and indirectly to the plant manager, should McNall show the letters to the plant controller without simultaneously showing them to the plant manager.

3. The plant controller’s ethical responsibilities to McNall and to Scott Quarry are the same. These include:

* *Competence:* The plant controller is expected to have the competence to make equivalent unit computations. This competence does not always extend to making estimates of the percentage of completion of a product. In Scott Quarry’s case, however, the products are probably easy to understand and observe. Hence, a plant controller could obtain reasonably reliable evidence on percentage of completion at a plant.
* *Objectivity:* The plant controller should not allow the possibility of the plant being written about favorably in the company newsletter to influence the way equivalent unit costs are computed. The plant controller has a responsibility to communicate information fairly and objectively.

4. McNall could seek evidence on possible manipulations as follows:

a. Have plant controllers report detailed breakdowns on the stages of production and then conduct end-of-month audits to verify the actual stages completed for ending work in process.

b. Examine trends in ending work in process. Divisions that report low amounts of ending work in process relative to total production are not likely to be able to greatly affect equivalent unit cost amounts by manipulating percentage of completion estimates. Divisions that show sizable quantities of total production in ending work in process are more likely to be able to manipulate equivalent cost computations by manipulating percentage of completion estimates.

**17-43** (30 min.) **Standard-costing method.**

1. Because there was no additional work needed on the beginning inventory with respect to materials, the phones in inventory must have been 100% complete with respect to materials. For conversion costs, the work done to complete the opening inventory was 521,000 ÷ 1,158,000 = 45%. Therefore, the unfinished phones in opening inventory must have been 55% complete with respect to conversion costs.
2. It is clear that the ending WIP is also 100% complete with respect to direct materials (2,180,400 ÷ 2,180,400), and it is 60% (1,308,240 ÷ 2,180,400) complete with regard to conversion costs.
3. We can first obtain the total standard costs per unit. The number of units started and completed during August is 1,014,000, and a total cost of $8,061,300 is attached to them. The per unit standard cost is therefore ($8,061,300 ÷ 1,014,000) = $7.95. If *x* and *y* represent the per unit cost for direct materials and conversion costs, respectively, we know that:

*x* + *y* = 7.95

We also know that the ending inventory is costed at $14,630,484 and contains 2,180,400 equivalent units of materials and 1,308,240 equivalent units of conversion costs. This provides a second equation:

2,180,400 *x* + 1,308,240 *y* = 14,630,484.

 Solving these two equations reveals that the direct materials cost per unit, *x,* is $4.85, while the conversion cost per unit, *y,* is $3.10.

4. The opening WIP inventory contained 1,158,000 equivalent units of materials and (1,158,000 – 521,100) = 636,900 equivalent units of conversion costs. Applying the standard costs computed in step (3), the cost of the opening inventory must have been:

(1,158,000 × $4.85) + (636,900 × $3.10) = $7,590,690.