

Chapter *Four*

Supplement Process Costing Using the FIFO Method

Supplement Outline

- Equivalent Units—FIFO Method
- Comparison of Equivalent Units of Production Under the Weighted-Average and FIFO Methods
- Production Report—FIFO Method
- A Comparison of Costing Methods

Learning Objectives:

After studying this Supplement to Chapter 4, you should be able to:

- L01** Compute the equivalent units of production using the FIFO method.
- L02** Prepare a quantity schedule using the FIFO method.
- L03** Compute the costs per equivalent unit using the FIFO method.
- L04** Prepare a cost reconciliation using the FIFO method.

The FIFO method of process costing differs from the weighted-average method in two basic ways: (1) the computation of equivalent units, and (2) the way in which costs of beginning inventory are treated in the cost reconciliation report. The FIFO method is generally considered more accurate than the weighted-average method, but it is more complex. The complexity is not a problem for computers, but the FIFO method is a little more difficult to understand and to learn than the weighted-average method.

Equivalent Units—FIFO Method

Learning Objective 1

Compute the equivalent units of production using the FIFO method.

The computation of equivalent units under the FIFO method differs from the computation under the weighted-average method in two ways.

First, the “units transferred out” figure is divided into two parts. One part consists of the units from the beginning inventory that were completed and transferred out, and the other part consists of the units that were both *started* and *completed* during the current period.

Second, full consideration is given to the amount of work expended during the current period on units in the *beginning* work in process inventory as well as on units in the ending inventory. Thus, under the FIFO method, it is necessary to convert both inventories to an equivalent units basis. For the beginning inventory, the equivalent units represent the work done to *complete* the units; for the ending inventory, the equivalent units represent the work done to bring the units to a stage of partial completion at the end of the period (the same as with the weighted-average method):

The formula for computing the equivalent units of production under the FIFO method is more complex than under the weighted-average method:

FIFO Method (a separate calculation is made for each cost category in each processing department)

$$\begin{aligned} \text{Equivalent units of production} = & \text{Equivalent units to complete beginning inventory}^* \\ & + \text{Units started and completed during the period} \\ & + \text{Equivalent units in ending work in process} \\ & \text{inventory} \end{aligned}$$

$$\text{*Equivalent units to complete beginning inventory} = \frac{\text{Units in beginning inventory}}{\text{inventory}} \times \left(100\% - \frac{\text{Percentage completion of beginning inventory}}{\text{of beginning inventory}} \right)$$

Or, the equivalent units of production can also be determined as follows:

$$\begin{aligned} \text{Equivalent units of production} = & \text{Units transferred out} \\ & + \text{Equivalent units in ending work in process} \\ & \text{inventory} \\ & - \text{Equivalent units in beginning inventory} \end{aligned}$$

To illustrate the FIFO method, refer to the data for the Shaping and Milling Department at Double Diamond Skis in Chapter 4 of the text. The department completed and transferred 4,800 units to the next department, the Graphics Application Department, during May. Since 200 of these units came from the beginning inventory, the Shaping and Milling Department must have started and completed 4,600 units during May. The 200 units in the beginning inventory were 50% complete with respect to materials and only 30% complete with respect to conversion costs when the month started. Thus, to complete these units the department must have added another 50% of materials costs and another 70% of conversion costs ($100\% - 30\% = 70\%$). Following this line of reasoning, the equivalent units for the department for May would be computed as shown in Exhibit 4S-1.

	Materials	Conversion
Work in process, May 1:		
200 units \times (100% - 50%)*	100	
200 units \times (100% - 30%)*		140
Units started and completed in May	4,600†	4,600†
Work in process, May 31:		
400 units \times 40%	160	
400 units \times 25%		100
Equivalent units of production	<u>4,860</u>	<u>4,840</u>

*This is the work needed to complete the units in beginning inventory.
†4,800 units transferred out to the next department \times 200 units in beginning inventory. The FIFO method assumes that the units in beginning inventory are finished first.

Exhibit 4S-1Equivalent Units of Production:
FIFO Method

Comparison of Equivalent Units of Production under the Weighted-Average and FIFO Methods

Stop at this point and compare the data in Exhibit 4S-1 with the data in Exhibit 4-5 in Chapter 4, which shows the computation of equivalent units under the weighted-average method. Also refer to Exhibit 4S-2, which provides a visual comparison of the two methods.

The essential difference between the two methods is that the weighted-average method blends work and costs from the prior period with work and costs in the current period, whereas the FIFO method cleanly separates the two periods. To see this more clearly, consider the following comparison of the two calculations of equivalent units:

Shaping and Milling Department

	Materials	Conversion
Equivalent units—weighted-average method	4,960	4,900
Less equivalent units in beginning inventory:		
200 units \times 50%	100	
200 units \times 30%		60
Equivalent units of production—FIFO method	<u>4,860</u>	<u>4,840</u>

From the above, it is evident that the FIFO method removes the equivalent units that were already in beginning inventory from the equivalent units as defined using the weighted-average method. Thus, the FIFO method isolates the equivalent units due to work performed during the current period. The weighted-average method blends together the equivalent units already in beginning inventory with the equivalent units due to work performed in the current period.

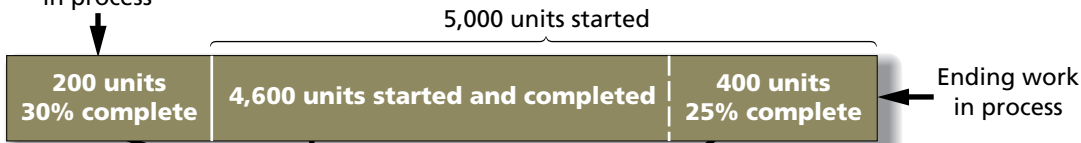
Production Report—FIFO Method

The steps followed in preparing a production report under the FIFO method are the same as those discussed earlier for the weighted-average method. However, since the FIFO method makes a distinction between units in the beginning inventory and units started during the year, the cost reconciliation portion of the report is more complex under the FIFO method than it is under the weighted-average method. To illustrate the FIFO method, we will again use the data for Double Diamond Skis on pages 166 and 167 in Chapter 4 in the text.

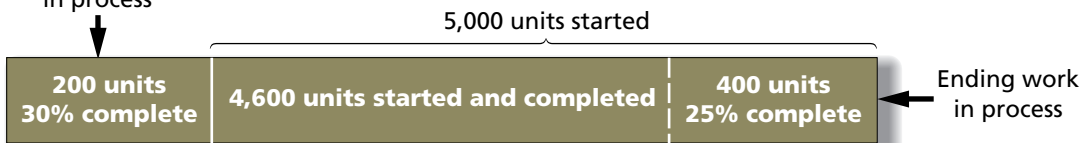
Exhibit 4S-2

Visual Perspective of Equivalent Units of Production

DOUBLE DIAMOND SKIS
Shaping and Milling Department
Conversion Costs

Weighted-Average MethodBeginning work
in process

Units completed and
transferred to next department 4,800
 Work in process, ending:
 400 units × 25% 100
 Equivalent units of production 4,900

FIFO MethodBeginning work
in process

Work in process, beginning:
 200 units × 70%* 140
 Units started and completed 4,600
 Work in process, ending:
 400 units × 25% 100
 Equivalent units of production 4,840

* 100% – 30% = 70%. This 70% represents the work needed to complete the units in the beginning inventory.

Learning Objective 2

Prepare a quantity schedule
using the FIFO method.

Step 1: Prepare a Quantity Schedule and Compute the Equivalent Units

There is only one difference between a quantity schedule prepared under the FIFO method and one prepared under the weighted-average method. This difference relates to units transferred out. As explained earlier in our discussion of equivalent units, the FIFO method divides units transferred out into two parts. One part consists of the units in the beginning inventory, and the other part consists of the units started and completed during the current period. A quantity schedule showing this format for units transferred out is presented in Exhibit 4S-3, along with a computation of equivalent units for the month.

We explained earlier that in computing equivalent units under the FIFO method, we must first show the amount of work required to *complete* the units in the beginning inventory. We then show the number of units started and completed during the period, and finally we show the amount of work *completed* on the units still in process at the end of the period. Carefully trace through these computations in Exhibit 4S-3.

Exhibit 4S-3

Production Report—FIFO Method

DOUBLE DIAMOND SKIS Shaping and Milling Department Production Report (FIFO method) Quantity Schedule and Equivalent Units				
Quantity Schedule				
Units to be accounted for:				
Work in process, May 1 (50% materials; 30% conversion added last month)	200			
Started into production	5,000			
Total units	<u>5,200</u>			
Equivalent Units (EU)				
		Materials	Conversion	
Units accounted for as follows:				
Transferred to next department:				
From the beginning inventory*	200	100	140	
Started and completed this month†	4,600	4,600	4,600	
Work in process, May 31 (40% materials; 25% conversion added this month)‡	400	160	100	
Total units and equivalent units of production	<u>5,200</u>	<u>4,860</u>	<u>4,840</u>	
Costs per Equivalent Unit				
	Total Cost	Materials	Conversion	Whole Unit
Cost to be accounted for:				
Work in process, May 1	\$ 4,000			
Cost added in the department (a)	144,000	\$74,000	\$70,000	
Total cost	<u>\$148,000</u>			
Equivalent units of production (above) (b)		4,860	4,840	
Costs per EU, (a) ÷ (b)		\$15.226	\$14.463	= \$29.689
Cost Reconciliation				
	Total Cost	Equivalent Units (above)		
		Materials	Conversion	
Cost accounted for as follows:				
Transferred to next department:				
From the beginning inventory:				
Cost in the beginning inventory	\$ 4,000			
Cost to complete these units:				
Materials, at \$15.226 per EU	1,523	100*		
Conversion, at \$14.463 per EU	2,025		140*	
Total cost	7,548			
Units started and completed this month, at \$29.689 per unit	136,570	4,600†	4,600†	
Total cost transferred	<u>144,118</u>			
Work in process, May 31:				
Materials, at \$15.226 per EU	2,436	160‡		
Conversion, at \$14.463 per EU	1,446		100‡	
Total work in process, May 31	3,882			
Total cost	<u>\$148,000</u>			
*Materials: $200 \times (100\% - 50\%) = 100$ equivalent units. Conversion: $200 \times (100\% - 30\%) = 140$ equivalent units.				
†5,000 units started – 400 units in ending inventory = 4,600 units started and completed.				
‡Materials: $400 \times (40\%) = 160$ equivalent units. Conversion: $400 \times (25\%) = 100$ equivalent units.				
EU = Equivalent units.				

Exhibit 4S-4

A Comparison of Production Report Content

Weighted-Average Method	FIFO Method
Quantity Schedule and Equivalent Units	
<ol style="list-style-type: none"> 1. The quantity schedule includes all units transferred out in a single figure. 2. In computing equivalent units, the units in the beginning inventory are treated as if they were started and completed during the current period. 	<ol style="list-style-type: none"> 1. The quantity schedule divides the units transferred out into two parts. One part consists of units in the beginning inventory, and the other part consists of units started and completed during the current period. 2. Only work needed to <i>complete</i> units in the beginning inventory is included in the computation of equivalent units. Units started and completed during the current period are shown as a separate figure.
Total and Unit Costs	
<ol style="list-style-type: none"> 1. The “Cost to be accounted for” part of the report is the same for both methods. 2. Costs in the beginning inventory are added in with costs of the current period in computations of costs per equivalent unit. 	<ol style="list-style-type: none"> 1. The “Cost to be accounted for” part of the report is the same for both methods. 2. Only costs of the current period are included in computations of costs per equivalent unit.
Cost Reconciliation	
<ol style="list-style-type: none"> 1. All units transferred out are treated the same, regardless of whether they were part of the beginning inventory or started and completed during the period. 2. Units in the ending inventory have cost applied to them in the same way under both methods. 	<ol style="list-style-type: none"> 1. Units transferred out are divided into two groups: (a) units in the beginning inventory, and (b) units started and completed during the period. 2. Units in the ending inventory have cost applied to them in the same way under both methods.

Learning Objective 3

Compute the costs per equivalent unit using the FIFO method.

Learning Objective 4

Prepare a cost reconciliation report using the FIFO method.

Step 2: Compute the Costs per Equivalent Unit In computing unit costs under the FIFO method, we use only those costs that were incurred during the current period, and we ignore any costs in the beginning work in process inventory. Under the FIFO method, *unit costs relate only to work done during the current period.*

The costs per equivalent unit (EU) computed in Exhibit 4S-3 are used to cost units of product transferred to the next department; in addition, they are used to show the cost attached to partially completed units in the ending work in process inventory.

Step 3: Prepare a Cost Reconciliation The purpose of cost reconciliation is to show how the costs charged to a department are accounted for. With the FIFO method, two cost elements are associated with the units in the beginning work in process inventory. The first element is the cost carried over from the prior period. The second element is the cost needed *to complete* these units. For the Shaping and Milling Department, \$4,000 in cost was carried over from last month. In the cost reconciliation in Exhibit 4S-3, we add to this figure the \$1,523 in materials cost and \$2,025 in conversion cost needed to complete these units. Note from the exhibit that these materials and conversion cost figures are computed by multiplying the costs per equivalent unit for materials and conversion times the equivalent units of work needed *to complete* the items that were in the beginning inventory. (The equivalent units figures used in this computation are brought down from the “Equivalent units” portion of the production report.)

For units started and completed during the month, we simply multiply the number of units started and completed by the total cost per unit to determine the amount transferred out. This would be \$136,570 (4,600 units × \$29.689 = \$136,570) for the department.

Finally, the amount of cost attached to the ending work in process inventory is computed by multiplying the cost per equivalent unit figures times the equivalent units for materials and conversion costs in the ending inventory. Once again, the equivalent units needed for this computation are brought down from the “Equivalent units” portion of the production report.

Exhibit 4S-4 summarizes the major similarities and differences between production reports prepared under the weighted-average and FIFO methods.

A Comparison of Costing Methods

In most situations, the weighted-average and FIFO methods will produce very similar unit costs. If there never are any ending inventories, as in an ideal JIT environment, the two methods will produce identical results. The reason for this is that without any ending inventories, no costs can be carried forward into the next period and the weighted-average method will base unit costs on just the current period’s costs—just as in the FIFO method. If there *are* ending inventories, either erratic input prices or erratic production levels would also be required to generate much of a difference in unit costs under the two methods. This is because the weighted-average method will blend the unit costs from the prior period with the unit costs of the current period. Unless these unit costs differ greatly, the blending will not make much difference.

Nevertheless, from the standpoint of cost control, the FIFO method is superior to the weighted-average method. Current performance should be measured in relation to costs of the current period only, and the weighted-average method mixes costs of the current period with costs of the prior period. Thus, under the weighted-average method, the manager’s apparent performance is influenced by what happened in the prior period. This problem does not arise under the FIFO method, since it makes a clear distinction between costs of prior periods and costs incurred during the current period. For the same reason, the FIFO method also provides more up-to-date cost data for decision-making purposes.

Summary

LO1 Compute the equivalent units of production using the FIFO method.

To compute unit costs in a department, the department’s output in terms of equivalent units must be determined. In the FIFO method, the equivalent units for a period are the sum of the equivalent units required to complete the beginning inventory, the units started and completed during the period, and the equivalent units in ending work in process inventory at the end of the period.

LO2 Prepare a quantity schedule using the FIFO method.

The quantity schedule shows the units to be accounted for—the units in beginning work in process inventory and the units started into production. These units are accounted for by detailing the units transferred to the next department and the units still in process in the department at the end of the period. This part of the report also shows the equivalent units of production. This part of the production report differs from the report prepared using the weighted-average method in that the units transferred out are divided into units that were in beginning inventory and those that were started and completed during the period.

LO3 Compute the costs per equivalent unit using the FIFO method.

The cost per equivalent unit is computed by dividing the total cost added during the period for a particular cost category such as conversion costs by the equivalent units of production for that cost category for the period. This part of the report differs from the report under the weighted-average method due to the exclusion of the costs of beginning inventory.

LO4 Prepare a cost reconciliation using the FIFO method.

In the cost reconciliation report, the costs of beginning work in process inventory and the costs added during the period are reconciled with the costs of the units transferred out of the department and the costs of

ending work in process inventory. This part of the production report differs from the report prepared under the weighted-average method due to the additional details concerning the costs of the units transferred out during the period.

Questions

4S-1 How does the computation of equivalent units under the FIFO method differ from the computation of equivalent units under the weighted-average method?

4S-2 On the cost reconciliation part of the production report, the weighted-average method treats all units transferred out in the same way. How does this differ from the FIFO method of handling units transferred out?

4S-3 From the standpoint of cost control, why is the FIFO method superior to the weighted-average method?

Brief Exercises

BRIEF EXERCISE 4S-1 Computation of Equivalent Units—FIFO Method (LO1)

Refer to the data for Clonex Labs, Inc., in Brief Exercise 4-2 in Chapter 4 of the text.

Required:

Compute the equivalent units of production for October assuming that the company uses the FIFO method of accounting for units and costs.

BRIEF EXERCISE 4S-2 Preparation of Quantity Schedule—FIFO Method (LO2)

Refer to the data for Hielta Oy in Brief Exercise 4-3 in Chapter 4 in the text.

Required:

1. Compute the number of tons of pulp completed and transferred out during June.
2. Prepare a quantity schedule for June assuming that the company uses the FIFO method.

BRIEF EXERCISE 4S-3 Cost per Equivalent Unit—FIFO Method (LO3)

Superior Micro Products uses the FIFO method in its process costing system. Data for the Assembly Department for May appear below:

	Materials	Labor	Overhead
Cost added during May	\$193,320	\$62,000	\$310,000
Equivalent units of production	27,000	25,000	25,000

Required:

1. Compute the cost per equivalent unit for materials, for labor, and for overhead.
2. Compute the total cost per equivalent whole unit.

BRIEF EXERCISE 4S-4 Cost Reconciliation—FIFO Method (LO4)

Jarvene Corporation uses the FIFO method in its process costing system. The following data are for the most recent month of operations in one of the company's processing departments:

Units in beginning inventory	400
Units started into production	3,000
Units in ending inventory	300
Units transferred to the next department	3,100

	Materials	Conversion
Percentage completion of beginning inventory	80%	40%
Percentage completion of ending inventory	70%	60%

The cost of beginning inventory according to the company's costing system was \$11,040 and the costs added during the month amounted to \$132,730. The costs per equivalent unit for the month were:

	Materials	Conversion
Cost per equivalent unit	\$25.40	\$18.20

Required:

1. Compute the total cost per equivalent unit for the month.
2. Compute the equivalent units of material and of conversion in the ending inventory.
3. Compute the equivalent units of material and of conversion that were required to complete the beginning inventory.
4. Determine the number of units started and completed during the month.
5. Prepare the cost reconciliation portion of the department’s production report for the month.

Exercises

EXERCISE 4S-1 Quantity Schedule and Equivalent Units—FIFO Method (LO1, LO2)

Refer to the data for The Alaskan Fisheries, Inc., in Exercise 4-2 in Chapter 4 in the text.

Required:

Prepare a quantity schedule and a computation of equivalent units for July for Department 1 assuming that the company uses the FIFO method of accounting for units.

EXERCISE 4S-2 Equivalent Units and Cost per Equivalent Unit—FIFO Method (LO1, LO2, LO3)

Refer to the data for Helox, Inc., in Exercise 4-3 in Chapter 4 in the text. Assume that the company uses the FIFO cost method.

Required:

1. Prepare a quantity schedule and a computation of equivalent units for the month for the first process.
2. Compute the costs per equivalent unit for the month for the first process.

EXERCISE 4S-3 Cost Reconciliation—FIFO Method (LO4)

(This exercise should be assigned only if Exercise 4S-2 is also assigned.) Refer to the data for Helox, Inc., in Exercise 4-3 in Chapter 4 in the text and to the equivalent units and costs per equivalent unit that you computed in Exercise 4S-2.

Required:

Complete the following cost reconciliation for the first process:

Cost Reconciliation

	Total Cost	Equivalent Units	
		Materials	Conversion
Cost accounted for as follows:			
Transferred to the next process:			
From the beginning inventory:			
Cost in the beginning inventory	\$?		
Cost to complete these units:			
Materials, at _____ per EU	?	?	
Conversion, at _____ per EU	?		?
Total cost	?		
Units started and completed this month: _____ units × _____ each	?	?	?
Total cost transferred	?		
Work in process, May 31:			
Materials, at _____ per EU	?	?	
Conversion, at _____ per EU	?		?
Total work in process	?		
Total cost	\$?		

EXERCISE 4S-4 Quantity Schedule, Equivalent Units, and Cost per Equivalent Unit—FIFO Method (LO1, LO2, LO3)

Refer to the data for Pureform, Inc., in Exercise 4-5 in Chapter 4 in the text.

Required:

1. Assume that the company uses the FIFO method of accounting for units and costs. Prepare a quantity schedule and a computation of equivalent units for the month.
2. Determine the costs per equivalent unit for the month.

Problems

PROBLEM 4S-1 Step-by-Step Production Report—FIFO Method (LO1, LO2, LO3, LO4)

Selzik Company makes super-premium cake mixes that go through two processes, blending and packaging. The following activity was recorded in the Blending Department during July:

CHECK FIGURE
 (2) Conversion: \$1.48 per unit
 (3) 7/31 WIP: \$28,240

Production data:		
Units in process, July 1; 30% complete		
as to conversion costs	.....	10,000
Units started into production	.....	170,000
Units completed and transferred to Packaging	.....	?
Units in process, July 31; 40% complete		
as to conversion costs	.....	20,000
Cost data:		
Work in process inventory, July 1:		
Materials cost	.....	\$ 8,500
Conversion cost	.....	4,900
		\$ 13,400
Cost added during the month:		
Materials cost	.....	139,400
Conversion cost	.....	244,200
		383,600
Total cost	.....	\$397,000

All materials are added at the beginning of work in the Blending Department. Conversion costs are added uniformly during processing. The company uses the FIFO cost method.

Required:

Prepare a production report for the Blending Department for July. Use the following three steps as a guide in preparing your report:

1. Prepare a quantity schedule and compute the equivalent units.
2. Compute the costs per equivalent unit for the month.
3. Using the data from (1) and (2) above, prepare a cost reconciliation.

CHECK FIGURE
 6/30 WIP: \$89,800

PROBLEM 4S-2 Production Report—FIFO Method (LO1, LO2, LO3, LO4)

Refer to the data for the Blending Department of Sunspot Beverages, Ltd., in Problem 4-3 in Chapter 4 in the text. Assume that the company uses the FIFO method to compute unit costs rather than the weighted-average method.

Required:

Prepare a production report for the Blending Department for June.

PROBLEM 4S-3 Preparation of Production Report from Analysis of Work in Process—FIFO**Method (LO1, LO2, LO3, LO4)**

Superior Brands, Inc., manufactures paint. The paint goes through three processes—cracking, mixing, and cooking. Activity in the Cracking Department during a recent month is summarized in the department's Work in Process account below:

CHECK FIGURE
Materials: \$1.85 per
unit; 4/30
WIP: \$98,700

Work in Process—Cracking Department			
Inventory, April 1 (10,000 gallons, 80% processed)	39,000	Completed and transferred to mixing (<u>?</u> gallons)	<u>?</u>
April costs added:			
Materials (140,000 gallons)	259,000		
Labor and overhead	312,000		
Inventory, April 30 (30,000 gallons, 60% processed)	<u>?</u>		

The materials are entered into production at the beginning of work in the Cracking Department. Labor and overhead costs are incurred uniformly throughout the cracking process. The company uses the FIFO cost method.

Required:

Prepare a production report for the Cracking Department for the month.