

Equivalent Units of Production

Units of product in work-in-process inventory are assumed to be *partially* completed; otherwise, the units would not be in work-in-process inventory. Process costing requires *partially* completed units in ending work-in-process inventory to be converted to the equivalent *completed* units (called *equivalent units*). If the physical units are 100 per cent complete, equivalent units will be the same as the physical units. However, if the physical units are not 100 per cent complete, the equivalent units will be less than the physical units.

For example, if four physical units of product are 50 per cent complete at the end of the period, an equivalent of two units has been completed (4 physical units × 50 per cent = 2 equivalent units). The formula used to calculate equivalent units is as follows:

Equivalent units = Number of partially completed units × Percentage completion



Equivalent units of production for a period can be computed in different ways:

- 1. The weighted-average method**
- 2. The FIFO method**

The FIFO method of process costing is a method in which equivalent units and unit costs relate only to work done during the current period. In contrast, the weighted average method blends together units and costs from the current period with units and costs from the prior period.

Weighted-Average Method:

Under the weighted-average method, a department’s equivalent units (for each cost category) are computed as follows:

Equivalent units of production	=	Units transferred to the next department or to finished goods	+	Equivalent units in ending work in process inventory
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Equivalent units in work in process are often different for direct materials, direct labour, and manufacturing overhead because these three components of production may enter the process at varying stages. For example, in the Assembly department at Desk Products, Inc., direct materials enter production early in the process while direct labour and overhead are used throughout the process. Thus equivalent units must be calculated for each of the three production costs. (Note that direct labour and manufacturing overhead are sometimes combined in a category called *conversion costs*, which assumes both are added to the process at the same time.)

Question 3: Equivalent Units Determinations

Soap Production Company’s Mixing department shows the following information for the 1,000 units of product remaining in work in process at the end of the period. Assume there was no beginning inventory.

Direct materials	90 per cent complete
Direct labour	30 per cent complete
Manufacturing Overhead	60 per cent complete

Requirement: Calculate the equivalent units for each of the three product costs (direct materials, direct labour, and manufacturing overhead).

Solution (Question 3):

Equivalent units = Number of partially completed units × Percentage completion

Product costs elements	Calculation through the Equation	Equivalent units
Materials	1,000 partially completed units × 90 per cent	900
Labour	1,000 partially completed units × 30 per cent	300
M. Overhead	1,000 partially completed units × 60 per cent	600

Question 4: Equivalent Units of Production Determination

The following information is available from one department of a manufacturing company:

		Percentage Complete	
Shaping and Milling Department	Units	Materials	Conversion
Beginning work in process	200	55%	30%
Units started into production during the period	5,000		
Units completed during the period and transferred to the next department	4,800	100%	100%
Ending work in process	400	40%	25%

NOTE: the beginning WIP inventory was 55% and 30% complete with respect to materials and conversion costs respectively. This means that 45% of the materials costs required to complete the units in the department had already been incurred. Similarly, 70% of the conversion costs required to complete the units had already been incurred.

Requirement: Calculate the equivalent units of production.

Solution (Question 4):

Equivalent units of production	=	Units transferred to the next department or to finished goods	+	Equivalent units in ending work in process inventory
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Shaping and Milling Department	Materials	Conversion
Units transferred to the next department	4,800	4,800
+ Ending work in process:		
Materials: 400 units × 40% complete	160	
Conversion: 400 units × 25% complete		100
Equivalent Units of Production	4,960	4,900

What are the benefits of Equivalent Unit of Production:



Calculating the equivalent units of production can help a company understand how much work and money they have put into their manufacturing process. Specifically, it's a way to understand how much money, material and labor have been invested into items that are partially complete.

Production Report – Weighted Average Method

Production report is a key management document. The purpose of it is to summarise for management all of the activity that takes place in a department's work in process account for a period. This activity includes the units and costs that flow through the work in process account.

Production report under weighted-average method involves the following steps:

1. Preparing the quantity schedule: i.e. finding units in the beginning work in process for the period, units started or units transferred-in from prior departments, units transferred out to next department or units of finished goods, and units in closing work in process.
2. Bringing forward the cost of units in the beginning work in process from last period. The cost should be broken up into all its components: direct materials and conversion costs (=direct labour and manufacturing overheads).
3. Finding the costs added in the current department under different heads: direct materials, direct labour and manufacturing overheads.
4. Finding total cost to be accounted for under each head i.e. direct materials, direct labour and manufacturing overheads. This would involve adding the cost included in the opening work in process on account of direct materials, direct labour and manufacturing overheads to the corresponding amounts added during the period on account of the relevant cost component.
5. Finding total equivalent units.
6. Finding cost per equivalent unit for each cost component by dividing the total cost for the cost component by total equivalent units for the relevant cost component.
7. Allocating the cost between the units transferred out and units included in the closing work in process.

Production report has three separate parts:

1. A quantity schedule, which shows the flow of units through the department and a computation of equivalent units.
2. A computation of cost per equivalent unit.
3. A reconciliation of all cost flow into and out of the department during the period.

Step1: Prepare a quantity schedule and compute the equivalent units

X Department Quantity Schedule and Equivalent Units			
	Quantity Schedule		
Units to be accounted for:			
Beginning work in process	xxx		
+ Started into production	<u>xxx</u>		
Total units to be accounted for	<u>xxxx</u>		
		Equivalent Units	
		Materials	Conversion
Units accounted for:			
Transferred to the next department	xxx	xxx	xxx
+Ending work in process	<u>xxx</u>	<u>xx</u>	<u>xx</u>
Total units accounted for	<u>xxxx</u>	<u>xxxx</u>	<u>xxxx</u>

Step 2: Compute costs per equivalent unit

X Department Cost per Equivalent Unit				
	Total Cost	Materials	Conversion	Cost of Unit
Cost to be accounted for:				
Beginning work in process	xxx	xx	xx	
+ Cost added during the period	<u>xxx</u>	<u>xx</u>	<u>xx</u>	
Total cost to be accounted for	<u>xxx</u>	<u>xxx</u>	<u>xxx</u>	
÷ Total units accounted for		<u>xx</u>	<u>xx</u>	
= Cost per equivalent unit		<u>xxx</u>	<u>xxx</u>	<u>xxxx</u>

Step 3: Prepare cost reconciliation

X Department Cost Reconciliation			
	Total Cost	Equivalent Units	
		Materials	Conversion
Cost accounted for:			
Transferred to the next department	xxx	xxx	xxx
Work in process			
Materials	xx	xx	
Conversion	xx		xx
Total work in process	<u>xxx</u>		
Total cost accounted for	<u>xxxx</u>		

Note: All the above three steps are calculated in one statement report to prepare a production report for work in process department.

Question 5:

Consider the following details regarding Shaping department for January 2016 operation:

Work in process, January 1	
Units in process	200
Stage of completion regarding materials	55%
Stage of completion regarding conversion	30%
Cost in the beginning WIP inventory:	
Materials cost	\$ 9,600
Conversion cost	<u>5,575</u>
Total cost in the beginning WIP inventory	\$ 15,175
Units started into production during January	5,000
Units completed and transferred out	4,800
Costs added to production during January:	
Materials cost	\$368,600
Conversion cost	<u>350,900</u>
Total cost added in the department	\$719,500
Work in process, January 31	
Units in process	400
Stage of completion regarding materials	40%
Stage of completion regarding conversion	25%

Required: Prepare production report for the Shaping department for January, using weighted average method.

Solution (Question 5):

Step1: Prepare a quantity schedule and compute the equivalent units

Shaping Department Quantity Schedule and Equivalent Units			
	Quantity Schedule		
<u>Units to be accounted for:</u>			
Beginning work in process	200		
+ Started into production	<u>5,000</u>		
Total units to be accounted for	5,200		
		Equivalent Units	
		Materials	Conversion
<u>Units accounted for:</u>			
Transferred to the next department	4,800	4,800	4,800
+Ending work in process	<u>400</u>	<u>160</u>	<u>100</u>
Total units accounted for	5,200	4,960	4,900

Step 2: Compute costs per equivalent unit

Shaping Department Cost per Equivalent Unit				
	Total Cost	Materials	Conversion	Cost of Unit
<u>Cost to be accounted for:</u>				
Beginning work in process	15,175	9,600	5,575	
+ Cost added during the period	<u>719,500</u>	<u>368,600</u>	<u>350,900</u>	
Total cost to be accounted for	734,675	378,200	356,475	
÷ Total units accounted for		<u>4,960</u>	<u>4,900</u>	
= Cost per equivalent unit		76.25	72.75	149

Step 3: Prepare cost reconciliation

Shaping Department Cost Reconciliation			
	Total Cost	Equivalent Units	
		Materials	Conversion
Cost accounted for:			
Transferred to the next department	715,200	4,800	4,800
Work in process:			
Materials	12,200	160	
Conversion	<u>7,275</u>		100
Total work in process	<u>19,475</u>		
Total cost accounted for	<u>734,675</u>		

Question 6:

Consider the following details regarding Mixing department for February 2103 operation:

Work in process, January 1	
Units in process	800
Stage of completion regarding materials	55%
Stage of completion regarding conversion	30%
Cost in the beginning WIP inventory:	
Materials cost	\$ 38,400
Conversion cost	<u>22,300</u>
Total cost in the beginning WIP inventory	\$ 60,700
Units started into production during January	20,000
Units completed and transferred out	19,200
Costs added to production during January:	
Materials cost	\$737,200
Conversion cost	<u>701,800</u>
Total cost added in the department	\$1,439,000
Work in process, January 31	
Units in process	1,600
Stage of completion regarding materials	40%
Stage of completion regarding conversion	25%

Required: Prepare production report for the Mixing department for February, **using weighted average method.**

Solution (Question 6):