

CHAPTER 4
PROCESS COSTING

AGENDA

- I. Process Costing and differences between job-order and process costing
- II. Overview of process costing
- III. The concept of equivalent (whole) units for partially completed units
- IV. The weighted-average method for determining costs

Appendix 4A The FIFO method for determining costs.

Appendix 4A Comparison of weighted-average and FIFO methods.

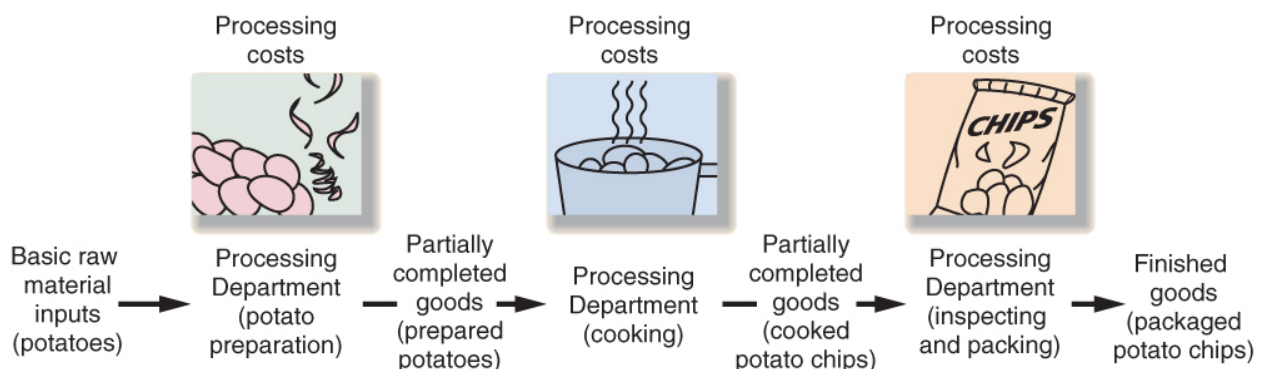
Appendix 4B Service department charges

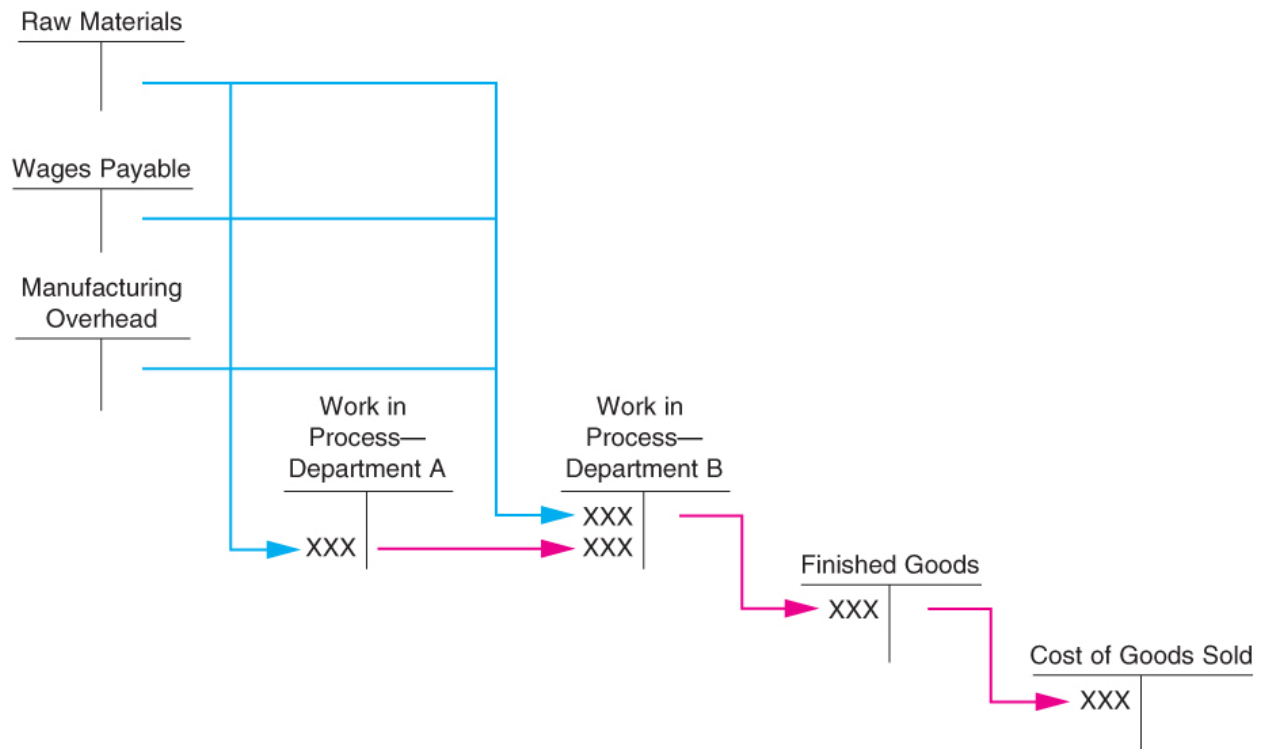
I. DIFFERENCES BETWEEN JOB-ORDER AND PROCESS COSTING

Job-Order Costing	Process Costing
1. Many different jobs are worked on during each period, with each job having different production requirements.	1. A single product is produced either on a continuous basis or for long periods of time. All units of product are identical.
2. Costs are accumulated by individual job.	2. Costs are accumulated by department.
3. Unit costs are computed <i>by job</i> on the job cost sheet.	3. Unit costs are computed <i>by department</i> .

II. OVERVIEW OF PROCESS COSTING

- A. In process costing, costs are accumulated in processing departments.
- B. A separate departmental production report is compiled for each processing department. This report provides the details of how costs are assigned to units that pass through the department.





- C. Costs to be accounted for in each processing department consist of:
1. Costs of the beginning work in process inventory in the department.
 2. Costs added during the period.
 - a. Costs of units transferred in from a preceding department.
 - b. Costs added in the department itself.

$$\text{Materials} + \boxed{\text{Labor} + \text{Overhead}}$$

↑
Conversion Costs

- D. Costs are accounted for by assigning them to:
1. Ending work in process inventory in the department.
 2. Units transferred out to the next department (or to finished goods).

III. THE CONCEPT OF EQUIVALENT (WHOLE) UNITS FOR PARTIALLY COMPLETED UNITS

In process costing, each unit is assigned the average cost of units processed through the department.

Two things must be known to compute the average cost per unit in a department:

1. The total cost.
2. The total number of units processed.

Partially completed units are converted to equivalent (whole) units.

For example, 200 units in ending inventory are 25% complete with respect to conversion costs.

$$\begin{aligned}\text{Equivalent units} &= \text{Number of partially completed units} \times \text{Percentage completion} \\ &= 200 \times 25\% = 50 \text{ EUs}\end{aligned}$$

The two common methods of computing average costs per unit are the weighted-average method and the FIFO method. The FIFO method is discussed in Appendix 4A.

IV. WEIGHTED-AVERAGE METHOD

- The weighted-average method averages together the beginning work in process inventories with the units started during the current period.
- For each category of cost in each processing department the following calculations are made:

$$\text{Equivalent units of production} = \text{Units transferred out} + \text{Equivalent units in ending WIP inventory}$$

Units transferred out of the department are 100% complete with respect to the work done in the department.

$$\text{Cost per equivalent unit} = \frac{\text{Cost of beginning work in process inventory} + \text{Cost added during the period}}{\text{Equivalent units of production}}$$

$$\text{Cost of units transferred out} = \text{Cost per equivalent unit} \times \text{Units transferred out}$$

EXAMPLE: Halsey Company makes small sailboats. During the most recent month, the following activity was recorded in the Hull Fabrication Department for conversion costs.

Work in process, beginning (80% complete).....	15,000 units
Units started into production.....	180,000 units
Units transferred to the next department.....	175,000 units
Work in process, ending (30% complete).....	20,000 units
<i>Conversion Costs:</i>	
Work in process, beginning	\$24,000
Conversion costs incurred during the month.....	\$338,000

Computation of equivalent units of production:

Units transferred to the next department.....	175,000 EUs
Work in process, ending (20,000 units × 30% complete)	<u>6,000 EUs</u>
Equivalent units of production	<u>181,000 EUs</u>

Computation of cost per equivalent unit:

Cost of beginning work in process inventory.....	\$ 24,000
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Costs added during the period	<u>338,000</u>
Total cost (a).....	<u>\$362,000</u>
Equivalent units of production (b).....	181,000 EUs
Cost per equivalent unit (a) ÷ (b).....	\$2 per EU

Computation of cost of units in ending work in process inventory:

Equivalent units of production of units in ending work in process inventory	6,000 EUs
Cost per equivalent unit (see above) (b)	\$2 per EU
Cost of units in ending work in process inventory (a) × (b).....	\$12,000

Computation of cost of units transferred out:

Units transferred to the next department (a)	175,000 EUs
Cost per equivalent unit (see above) (b)	\$2 per EU
Cost of units transferred out (a) × (b).....	\$350,000

The above computations would be repeated for each classification of costs incurred in the production of the sailboats.

The Cost Reconciliation Report:

Costs to be accounted for:

Cost of beginning work in process inventory	\$24,000
Costs added to production during the period	<u>338,000</u>
Total costs to be accounted for	<u>\$362,000</u>

Costs accounted for as follows:

Cost of ending work in process inventory.....	\$12,000
Cost of units transferred out	<u>350,000</u>
Total cost accounted for	<u>\$362,000</u>

APPENDIX 4A: FIFO METHOD

- The FIFO method separates the costs of beginning inventory from the costs incurred during the current period. (The weighted-average method combines them.)
- FIFO assumes the beginning inventory is completed before any new units are started.

$$\begin{aligned} \text{Equivalent units of production} &= \text{Equivalent units to complete beginning WIP inventory} + \text{Units started and completed during the period} + \text{Equivalent units in ending WIP inventory} \\ &\quad \swarrow \\ &\quad \text{Units in beginning inventory} \times \\ &\quad (100\% - \text{Percentage completion of beginning WIP inventory}) \end{aligned}$$

$$\text{Cost per equivalent unit} = \frac{\text{Cost added during the period}}{\text{Equivalent units of production}}$$

$$\begin{aligned} \text{Cost of units transferred out} &= \text{Cost in beginning WIP inventory} + \text{Cost to complete units in beginning WIP inventory} + \text{Cost of units started and completed this period} \\ &\quad \swarrow \quad \searrow \\ &\quad \text{Equivalent units to complete beginning WIP inventory} \times \text{Cost per equivalent unit} \\ &\quad \text{Units started and completed this period} \times \text{Cost per equivalent unit} \end{aligned}$$

$$\text{Cost of units in ending WIP inventory} = \text{Cost per equivalent unit} \times \text{Equivalent units in ending WIP inventory}$$

EXAMPLE: Halsey Company makes small sailboats. During the most recent month, the following activity was recorded in the Hull Fabrication Department for conversion costs.

Work in process, beginning (80% complete).....	15,000 units
Units started into production.....	180,000 units
Units transferred to the next department.....	175,000 units
Work in process, ending (30% complete).....	20,000 units
<i>Conversion Costs:</i>	
Work in process, beginning.....	\$24,000
Conversion costs incurred during the month.....	\$338,000

- Computation of equivalent units of production:

To complete beginning work in process inventory (15,000 units × 20% complete).....	3,000 EUs
Units started and completed during the period (180,000 units started – 20,000 units in ending inventory).....	160,000 EUs
Work in process, ending (20,000 units × 30% complete).....	<u>6,000 EUs</u>
Equivalent units of production	<u>169,000 EUs</u>

- Computation of cost per equivalent unit:

Costs added during the period (a).....	\$338,000
Equivalent units of production (b).....	169,000 EUs
Cost per equivalent unit (a) ÷ (b).....	\$2 per EU

FIFO METHOD (continued)

Computation of cost of units in ending work in process inventory:

Equivalent units of production of units in ending work in process inventory (see above)	6,000 EUs
Cost per equivalent unit (see above) (b)	\$2 per EU
Cost of units in ending work in process inventory (a) × (b)	\$12,000

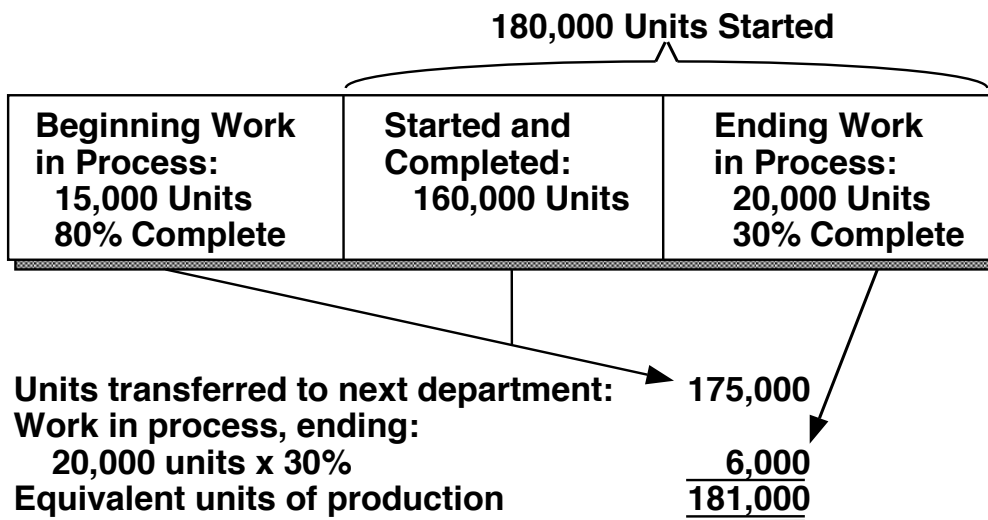
Computation of cost of units transferred out:

<i>Cost in beginning work in process inventory</i>	\$24,000
<i>Cost to complete the units in beginning work in process inventory:</i>	
Equivalent units of production required to complete the units in beginning work in process inventory (see above) (a)	3,000 EUs
Cost per equivalent unit (see above) (b)	\$2 per EU
Cost to complete the units in beginning inventory (a) × (b)	\$6,000
<i>Cost of units started and completed this period:</i>	
Units started and completed this period (see above) (a)	160,000 EUs
Cost per equivalent unit (see above) (b)	\$2 per EU
Cost of units started and completed this period (a) × (b)	\$320,000
Total cost of units transferred out (\$24,000 + \$6,000 + \$320,000)	\$350,000

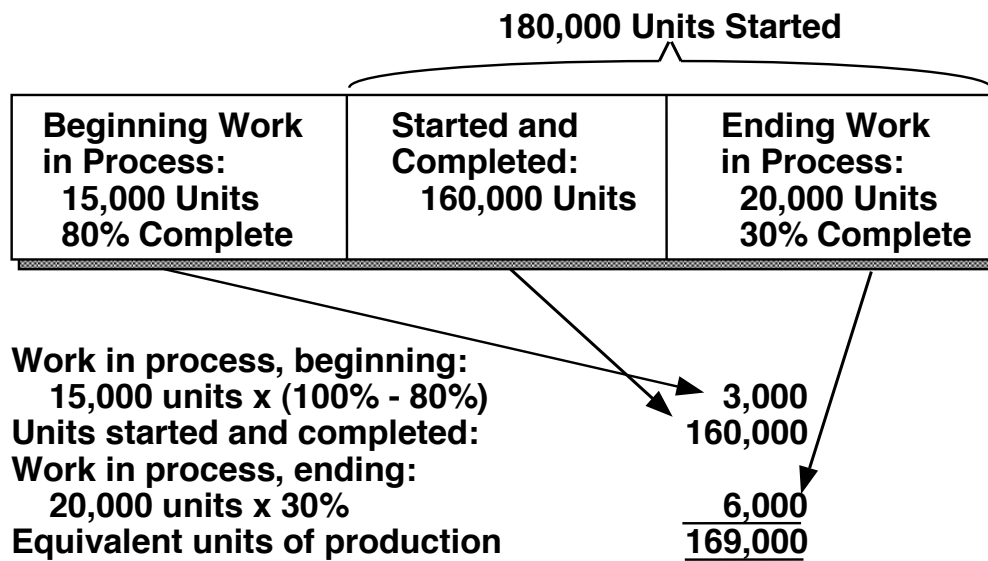
Note: The costs of ending inventory and of the units transferred to the next department are the same in this example under the weighted-average and FIFO methods. Therefore, the FIFO method cost reconciliation would look the same as the cost reconciliation shown for the weighted-average method. This will not be true in most cases.

COMPARISON OF EQUIVALENT UNITS

Weighted-Average Method



FIFO Method



APPENDIX 4B: SERVICE DEPARTMENT ALLOCATIONS

Reciprocal Services

- Services that service departments provide to each other are known as reciprocal or interdepartmental services.

The approaches commonly used to allocate the costs of service departments are the direct method, the step-down method, and the reciprocal method.

- 1) The direct method ignores reciprocal services. Service department costs are allocated directly to operating departments.
- 2) The step-down method provides for the allocation of a service department's costs to other service departments, as well as to operating departments. This sequential method takes into account many of the reciprocal services, but not all of them.
- 3) Unlike the direct and step-down methods, the reciprocal method fully accounts for all of the reciprocal services. However, the reciprocal method is relatively complex and is seldom used.

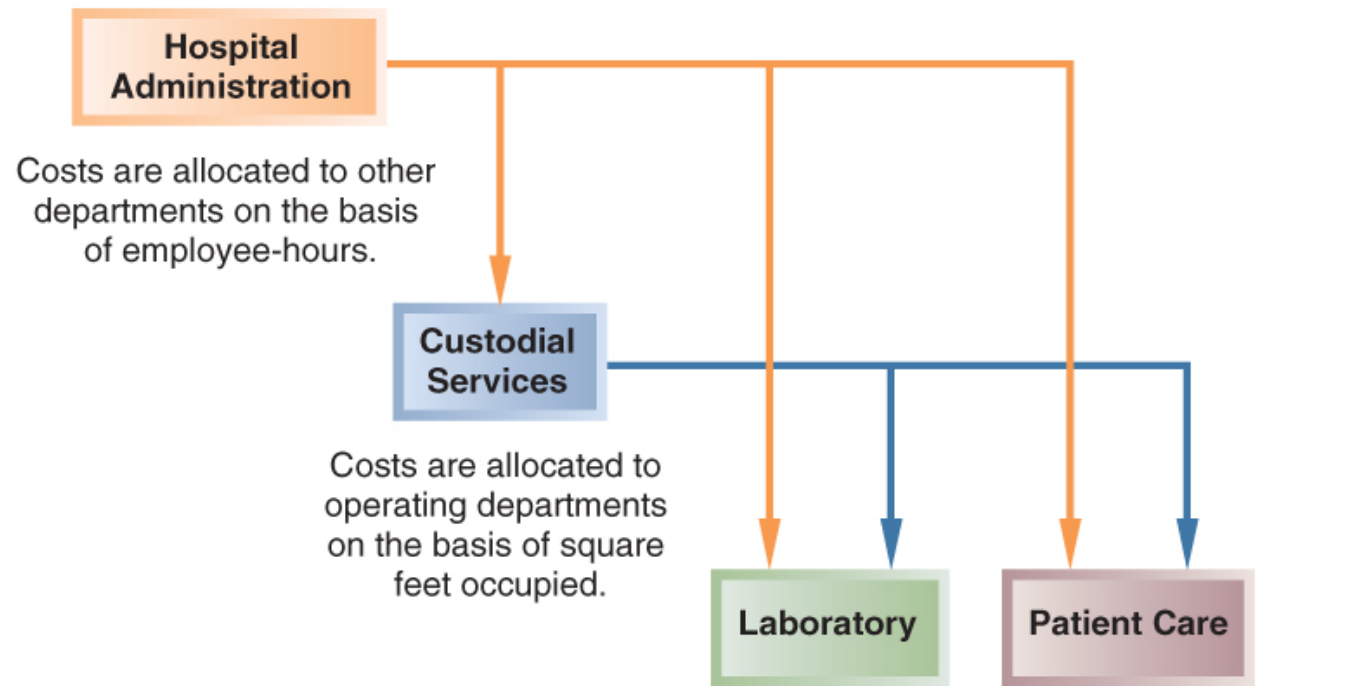
DIRECT METHOD

In the example that follows, Personnel Department costs are allocated on the basis of number of employees and Custodial Services Department costs are allocated on the basis of space occupied. Assume the following data:

	<i>Personnel</i>	<i>Custodial Services</i>	<i>Machining</i>	<i>Assembly</i>	<i>Total</i>
Departmental costs	\$720,000	\$180,000	\$970,000	\$630,000	\$2,500,000
Number of employees	20	10	100	50	180
Space occupied-square feet..	9,000	6,000	30,000	70,000	115,000

STEP-DOWN METHOD

When allocating costs by the step-down method, the sequence begins with the department that provides the greatest amount of service to other departments.



	<i>Personnel</i>	<i>Custodial Services</i>	<i>Machining</i>	<i>Assembly</i>	<i>Total</i>
Departmental costs	\$720,000	\$180,000	\$970,000	\$630,000	\$2,500,000
Number of employees	20	10	100	50	180
Space occupied-square feet..	9,000	6,000	30,000	70,000	115,000