

## Process Costing

Process costing is used by firms which mass-produce goods in which one unit is identical to the next (homogeneous). An example of a process-costing firm would be Kellogg's. Kellogg's produces cereal and other snacks. Although they offer many different types of food, each type is mass-produced and sold to distributors.

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Process costing accumulates costs by process department and then the cost per unit is calculated according to the # of units that passed through the process department.

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The flow of costs in a process costing system (e.g. journal entries) is basically the same as in job-order costing with 2 exceptions:

- ① There are separate WIP accounts for each processing department. Thus when units are completed with respect to processing dept. A, they are then transferred to processing dept. B. The costs are also transferred with the following entry:

WIP - Dept. B    XX  
    WIP - Dept. A    XX

then, when the units are completed:

Finished Goods    XX  
    WIP - Dept. B    XX

cost of goods mfg.

XX

② Unit product costs are trickier to calculate than under job-order costs. The reason is that there multiple processing departments, each with partially completed units in beg. and ending WIP for the period.

To overcome this complication it becomes necessary to calculate the equivalent units in WIP.

$$\text{Equivalent Units} = (\# \text{ of units partially completed}) \times (\text{percentage completion of those units})$$

Equivalent units is calculated for both materials and conversion cost (labor & overhead) separately.

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Two methods used in process costing to determine

the equivalent units of production: ① Weighted Avg. , ② FIFO  
(both methods assume a FIFO inventory flow!)

① Weighted Average Method

- Assumes beginning units in WIP are 0% complete with respect to materials and conversion costs.
- The above assumption is made to simplify calculations.
- Equivalent Units of Production = units completed & transferred out  
+ Equivalent units remaining in WIP.
- $\text{Cost per EU} = \frac{\text{Cost of Beg. WIP} + \text{Costs Added to WIP}}{\text{Weighted Avg. Equivalent Units of Production}}$
- blends together costs from previous periods with current period costs in determining total current period costs.

## ② FIFO (first-in first out)

- Considered more meaningful than Weighted Average
  - Equivalent Units of Production
$$= \text{Equivalent units needed to complete beg. WIP} + \text{Units started \& completed during the period} + \text{Equivalent Units in ending WIP}$$
  - Cost per EU = 
$$\frac{\text{Costs added to WIP}}{\text{FIFO Equivalent Units of Production}}$$
  - Produces a similar cost per equivalent unit than the weighted avg. method.
  - If beg. WIP is nearly 0% complete with respect to materials \& conversion then  $\text{FIFO} \approx \text{Weighted Avg.}$
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### Example

Consider NafTel Toy Company. They have two processing departments: Molding \& Finishing. We will walk through an example which illustrates how to apply process costing to NafTel.

The molding dept. places a direct material (plastic vinyl) into production at the beginning of the process.

## Molding Department (June)

Beg. WIP, June 1      10,000 units

Direct Materials	100% complete	\$10,000	} \$12,680 total
Direct Labor	30% complete	\$1,060	
Factory OH	40% complete	\$1,620	

Production started during June      40,000 units  
Production completed during June      44,000 units  
    & transferred out of the  
    Molding Dept.

### Costs added to production during June

Direct materials	\$44,000	} \$110,040
Direct labor	\$22,440	
Factory OH	\$43,600	

Ending WIP, June 30      6,000 units

Direct materials	100% complete
Direct Labor	50% complete
Factory OH	60% complete

## Weighted Average Method

Equivalent Units of production = units completed  
    & transferred out  
    + equivalent units  
    in ending WIP

$$EU_M = 44,000 + 6,000 = 50,000$$

$$EU_L = 44,000 + 6,000 \times 0.5 = 47,000$$

$$EU_{OH} = 44,000 + 6,000 \times 0.6 = 47,600$$

$$\text{Cost per Equivalent Unit} = \frac{\$ \text{Beg. WIP} + \text{Costs Added}}{EU}$$

$$\text{Cost per EU}_M = \frac{\$10,000 + \$44,000}{50,000 \text{ EU}_M} = \boxed{\$1.08 / \text{EU}}$$

$$\text{Cost per EU}_L = \frac{\$1,060 + \$22,440}{47,000 \text{ EU}_L} = \boxed{\$0.5 / \text{EU}}$$

$$\text{Cost per EU}_{OH} = \frac{\$1,620 + \$43,600}{47,600 \text{ EU}_{OH}} = \boxed{\$0.95 / \text{EU}}$$

$$\text{Total Cost Per EU} = \boxed{\$2.53 / \text{EU}}$$

Now we can calculate the cost of ending WIP-Molding & the cost transferred out of WIP-Molding for June.

### Cost in Ending WIP

Direct Materials	$(6,000 * 1) * \$1.08 =$	$\$6,480$
Direct Labor	$(6,000 * 0.5) * \$0.5 =$	$\$1,500$
Direct Materials	$(6,000 * 0.6) * \$0.95 =$	$\$3,420$
Total		<u><u>\$11,400</u></u>

### Cost Transferred Out

Total	$44,000 * \$2.53 =$	<u><u>\$111,320</u></u>
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### Cost Reconciliation

Costs to be accounted for:

Beg WIP	$\$12,680$
Costs Added to WIP	<u><u>110,040</u></u>
Total	<u><u>\$122,720</u></u>

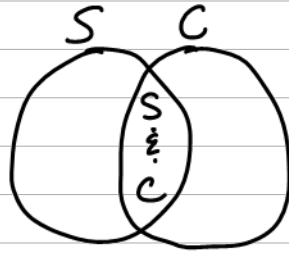
Costs accounted for as follows:

End WIP	$\$11,400$
Costs transferred out of WIP	<u><u>\$111,320</u></u>
Total	<u><u>\$122,720</u></u>



## FIFO Method

First calculate units started & completed



$$S \& C = S - \text{end} \quad \underline{\underline{\text{or}}}$$

$$S \& C = C - \text{beg}$$

$$S \& C = 40,000 - 6,000 = 34,000 \quad \underline{\underline{\text{or}}}$$

$$S \& C = 44,000 - 10,000 = 34,000$$

Equivalent Units of Production = equivalent units needed to complete beg. WIP + units started and completed + equivalent units in end WIP.

$$EU_M = 10,000 * (1-1) + 34,000 + 6,000 * 1 = 40,000$$

$$EU_L = 10,000 * (1-0.3) + 34,000 + 6,000 * 0.5 = 44,000$$

$$EU_{OH} = 10,000 * (1-0.4) + 34,000 + 6,000 * 0.6 = 43,600$$

Cost per Equivalent Unit =  $\frac{\text{costs added to WIP}}{EU}$

$$\text{Cost per } EU_M = \frac{\$44,000}{40,000 EU} = \boxed{\$1.10 / EU}$$

$$\text{Cost per } EU_L = \frac{\$22,440}{44,000 EU} = \boxed{\$0.51 / EU}$$

$$\text{Cost per } EU_{OH} = \frac{\$43,600}{43,600 EU} = \boxed{\$1.00 / EU}$$

$$\text{Total} = \boxed{\$2.61 / EU}$$

## Cost in Ending WIP

Materials	$(6,000 * 1) * \$1.10$	\$6,600
Labor	$(6,000 * 0.5) * \$0.51$	\$1,530
OH	$(6,000 * 0.6) * \$1$	\$3,600
Total		<u>\$11,730</u>

## Costs Transferred Out:

Cost in Beg. WIP

Materials	\$10,000
Labor	1,060
OH	1,620

Total

\$12,680

Costs to Complete Beg WIP

Materials	$10,000 * (1-1) * \$1.1$	\$0
Labor	$10,000 * (1-0.3) * \$0.51$	\$3,570
OH	$10,000 * (1-0.4) * \$1$	\$6,000

Total

\$9,570

Cost of Units Started and Completed

Total  $34,000 * \$2.61$

\$88,740

Total Cost Transferred Out

\$110,990

## Cost Reconciliation

Costs to be accounted for:

Beg WIP	\$12,680
Costs Added to WIP	110,040
Total	<u>\$122,720</u>

Costs accounted for as follows:

End WIP	\$11,730
Costs transferred out of WIP	\$110,990
Total	<u>\$122,720</u>

## Finishing Dept. (June)

Suppose molding dept. transfers its production units to the finishing dept. In the finishing dept. materials are added at the end of the process, while conversion costs (labor & overhead) are applied evenly throughout the finishing department's process. The finishing dept. uses direct labor cost as the cost driver to apply factory overhead costs.

Very similar to Molding dept. in doing weighted avg. & FIFO method with one exception. Must deal with costs transferred in from Molding department

Beg WIP, June 1 14,000 units

Transferred-in	100% complete	>	\$ 34,250	>	\$ 41,250
Direct Materials	0% complete		\$ 0		<u>Total</u>
Conversion	50% complete		\$ 7,000		

Units transferred-in during June 44,000 units

Transferred-in costs during June

Weighted Avg. method (from earlier)	\$ 111,320
FIFO Method (from earlier)	\$ 110,990

Units completed 50,000 units

Ending WIP, June 30

Transferred-in	100% complete
Direct Materials	0% complete
Conversion	50% complete

Costs added by the finishing dept. during June

Direct Materials	\$ 25,000	>	\$ 72,000
Conversion	\$ 47,000		<u>Total</u>



## Weighted Average Method

Calculate equivalent units. Ending inventory units are always assumed 100% complete with respect to transferred in costs because those costs were incurred in the prior department.

$$EU_T = 50,000 + 8,000 * 1 = 58,000$$

$$EU_M = 50,000 + 8,000 * 0 = 50,000$$

$$EU_C = 50,000 + 8,000 * 0.5 = 54,000$$

$$\text{Cost per } EU_T = \frac{\$34,250 + \$111,320}{58,000} \approx \boxed{\$2.5098/EU}$$

$$\text{Cost per } EU_M = \frac{\$0 + \$25,000}{50,000} = \boxed{\$0.5/EU}$$

$$\text{Cost per } EU_C = \frac{\$7,000 + \$47,000}{54,000} = \boxed{\$1/EU}$$

$$\text{Total } \boxed{\$4.0098/EU}$$

## Cost in Ending WIP

Transferred-in	$(8000 * 1) * \$2.5098$	$= \$20,078$
Conversion	$(8000 * 0.5) * \$1$	$= \$4,000$
Total		$\underline{\underline{\$24,078}}$

## Costs Transferred Out

$$\text{Total } 50,000 * \$4.0098 = \$200,490$$

S.E.

Finished Goods 200,490  
WIP Inventory - Finishing 200,490

## Cost Reconciliation

Costs to be accounted for:

Beg WIP	\$41,250
Costs Added to WIP:	
Transferred - in from molding dept.	\$111,320
Added by finishing dept.	\$72,000
Total	<u>\$224,570*</u>

Costs accounted for as follows:

End WIP	\$24,078
Costs transferred out of WIP	\$200,490
Total	<u>\$224,568</u>

\* Off by \$2 due to rounding Cost per EU<sub>T</sub> to 4 decimal places

## FIFO Method

Units started & completed = units completed - beg. units

$$= 50,000 - 14,000$$

$$= 36,000$$

$$EU_T = 14,000(1-1) + 36,000 + 8,000*1 = 44,000$$

$$EU_M = 14,000(1-0) + 36,000 + 8,000*0 = 50,000$$

$$EU_C = 14,000(1-0.5) + 36,000 + 8,000*0.5 = 47,000$$

$$\text{Cost per } EU_T = \frac{\$110,990}{44,000} \approx \boxed{\$2.5225 / EU}$$

$$\text{Cost per } EU_M = \frac{\$25,000}{50,000} = \boxed{\$0.50 / EU}$$

$$\text{Cost per EU}_c = \frac{\$47,000}{47,000} \approx \boxed{\$1/\text{EU}}$$

$$\text{Total} \quad \boxed{\$4.0225/\text{EU}}$$

### Cost in Ending WIP

Transferred-in	$(8000 * 1) * \$2.5225$	\$20,180
Conversion	$(8000 * 0.5) * \$1$	4,000
		<u>\$24,180</u>

### Costs Transferred Out

Costs in beg. WIP:		
Transferred-in		\$34,250
Conversion		7,000
Total		<u>\$41,250</u>

### Costs to complete beg. WIP:

Materials	$14,000 * (1-0) * \$0.50$	= \$7,000
Conversion	$14,000 * (1-0.5) * \$1$	\$7,000
Total		<u>\$14,000</u>

### Costs of Units Started & Completed:

Total	$36,000 * \$4.0225$	\$144,810
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Total Costs Transferred Out	<u>\$200,060</u>
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### Cost Reconciliation

#### Costs to be accounted for:

Beg WIP	\$41,250
Costs Added to WIP:	
Transferred-in from molding dept.	\$110,990
Added by finishing dept.	\$72,000
Total	<u>\$224,240</u>

#### Costs accounted for as follows:

End WIP	\$24,180
Costs transferred out of WIP	\$200,060
Total	<u>\$224,240</u>

