

# CH 6

# PROCESS COSTING

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Part 1

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# Introduction

- The Coca-Cola Company ( [www.coca-cola.com](http://www.coca-cola.com) ) is the world's leading manufacturer, marketer, and distributor of soft drink concentrates, syrups, and soft drinks.
- Coca-Cola uses process costing to track product and customer costs such as direct materials, direct labor, and factory overhead costs incurred in three major processes:
  - (1) concentrate and syrup manufacturing
  - (2) blending
  - (3) packaging

# Introduction

- *Process costing* is a product costing system that accumulates costs according to processes or departments and assigns them to a large number of nearly identical products.
- The typical firm that uses process costing employs a standardized production process to manufacture homogeneous products.
- Process costing provides information for managers to analyze product and customer profitability and to make pricing, product-mix, and process improvement decisions.

# Characteristics of Process Costing Systems

- Firms having homogeneous products that pass through a series of similar processes or departments use process costing.
- These firms usually engage in continuous mass production of a few similar products.
- Manufacturing costs are accumulated in each process.
- Unit product cost is calculated by dividing process costs in each department by the number of equivalent units produced during the period.

# Characteristics of Process Costing Systems

- The process cost system is used in many industries such as chemicals, oil refining, textiles, paints, flour, canneries, rubber, steel, glass, food processing, mining, automobile production lines, electronics, plastics, drugs, paper, lumber, leather goods, metal products, sporting goods, cement, and watches.

# Equivalent Units

- A manufacturing firm typically has partially completed units (work-in-process) at the end of an accounting period.
- Under the job costing system, these partially completed units are not difficult to handle because job costs are available on job cost sheets.
- In a process costing system, however, product costs for partially completed units are not readily available.
- The goal is to find the combined unit cost of all product units processed in that period including those that are partially complete at period.

# Equivalent Units

- Note that by *partially complete*, we mean partially complete for that department;
  - a unit could be complete for a given department but still be in the Work-in-Process Inventory.
- **Equivalent units** are the number of the same or similar complete units that could have been produced given the amount of work actually performed on both complete and partially complete units.

# Equivalent Units

- For example,
- Suppose in a given month
  - a chemical company had in process 30,000 gallons of a chemical
  - which 20,000 gallons were complete at the end of the month
  - but the remaining 10,000 gallons were only 50 percent complete.
  - The equivalent units would be 25,000 gallons [20,000 (10,000 50%)].
- The percentage of completion is usually measured by percentage of total cost that has already been incurred in the production of the product.



# Direct Materials

- Direct materials can be added at discrete points or continuously during production.
- If the materials are added uniformly, the proportion used for computing equivalent units of direct materials is the same as the proportion for conversion costs.
- However, if the materials are added all at once, the proportion used in the computation depends on whether the point in the process where the materials are added has been reached.

# Direct Materials

- Determining of equivalent units in direct materials for ending work-in-process (WIP) inventory.
- Four materials-adding situations:
  - (1) materials are added gradually throughout the process,
  - (2) all materials are added at the beginning of the process,
  - (3) all materials are added at the 40 percent point, and
  - (4) all materials are added at the end of the process.
- Note that the equivalent units of materials in ending work-in-process inventory would be 900 ( $1,500 \times 0.6$ ) equivalent units under assumption (1).

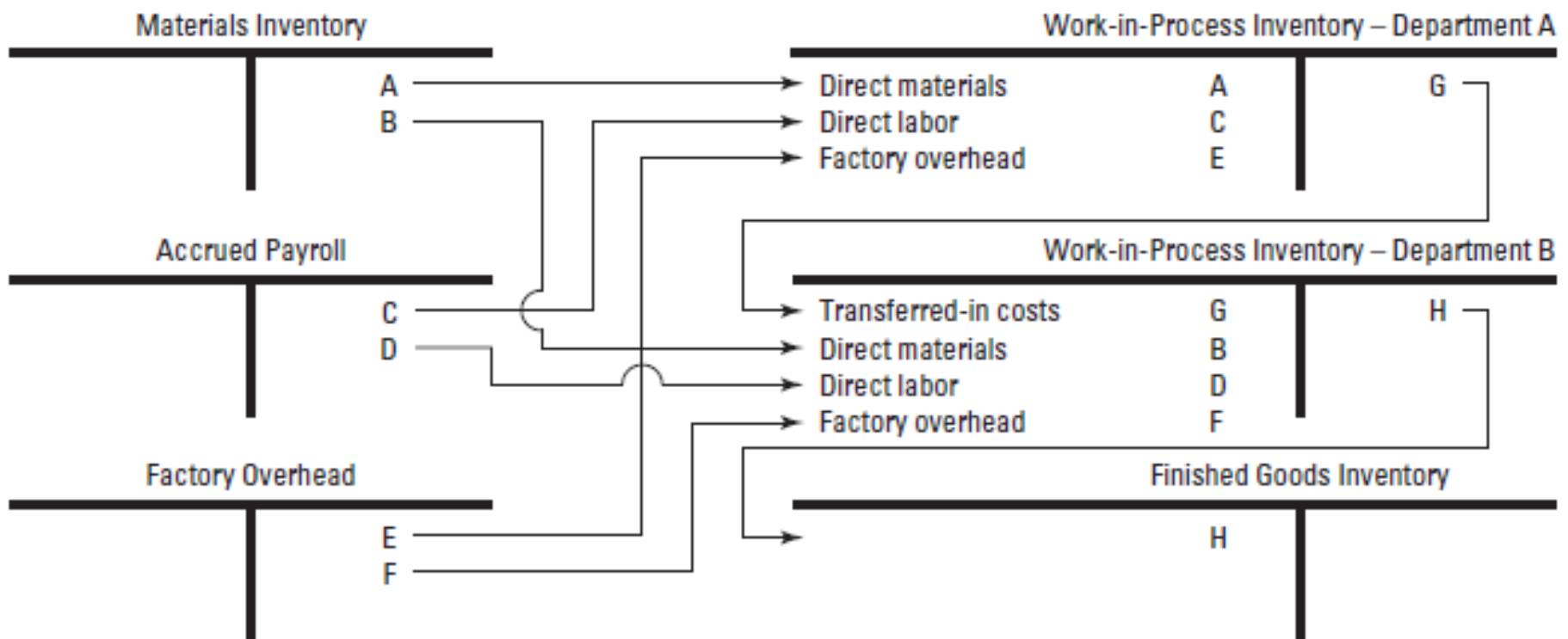
# Direct Materials

**EXHIBIT 6.1** Equivalent Units for Direct Materials in Work-in-Process Ending Inventory

Type of Inventory	Physical Units Partially Complete	Percentage of Completion for Conversion	Equivalent Units in Ending Work-in-Process Inventory for Direct Materials			
			Materials Added Gradually	All Materials Added at the Beginning	All Materials Added at 40 Percent Point	All Materials Added at the End
Ending work-in-process inventory	1,500	60%	$1,500 \times 60\%$ = 900	$1,500 \times 100\%$ = 1,500	$1,500 \times 100\%$ = 1,500	0

# Flow of Costs in Process Costing

**EXHIBIT 6.2** T-Account Model of Flow of Costs for Two Departments in Process Costing



# Steps in Process Costing

- Step 1: Analyze the Physical Flow of Production Units
- Step 2: Calculate Equivalent Units for Each Manufacturing Cost Element
- Step 3: Determine Total Costs for Each Manufacturing Cost Element
- Step 4: Compute Cost per Equivalent Unit for Each Manufacturing Cost Element
- Step 5: Assign Total Manufacturing Costs to Units Completed and Ending WIP

# Process Costing Methods

- The two methods used to prepare the departmental production cost:
  - weighted-average method
  - first-in, first-out (FIFO) method.
- The **weighted-average method** includes all costs in calculating the unit cost, including both costs incurred during the current period and costs incurred in the prior period that are shown as the beginning work-in-process inventory of the current period.
- In this method, prior period costs and current period costs are averaged; hence, the name *weighted average*.

## Process Costing: Weighted-Average Method

- Naftel Toy Company has two production departments, molding and finishing. The molding department places a direct material (plastic vinyl) into production at the beginning of the process. Direct labor and factory overhead costs are incurred gradually throughout the process with different proportions.
- Exhibit 6.4 summarizes the molding department's units and costs during June.

Work-in-process inventory, June 1	10,000 units
Direct materials: 100 percent complete	\$10,000
Direct labor: 30 percent complete	1,060
Factory overhead: 40 percent complete	1,620
Beginning work-in-process inventory	<u>\$12,680</u>
Units started during June	40,000 units
Units completed during June and transferred out of the molding department	44,000 units
Work-in-process inventory, June 30	6,000 units
Direct materials: 100 percent complete	
Direct labor: 50 percent complete	
Factory overhead: 60 percent complete	
Costs added during June	
Direct materials	\$ 44,000
Direct labor	22,440
Factory overhead	43,600
Total costs added during June	<u>\$110,040</u>



## Step 1: Analyze the Physical Flow of Production Units

<b>Input</b>	<b>Physical Units</b>
Work-in-process inventory, June 1	10,000
Units started during June	<u>40,000</u>
Total units to account for	<u><u>50,000</u></u>

<b>Output</b>	
Units completed and transferred out during June	44,000
Work-in-process inventory, June 30	<u>6,000</u>
Total units accounted for	<u><u>50,000</u></u>

## Step 2: Calculate Equivalent Units for Each Manufacturing Cost Element

	Physical Units	EQUIVALENT UNITS			
		Completion Percentage	Direct Materials	Direct Labor	Factory Overhead
Work-in-process, June 1	10,000				
Direct materials		100%			
Direct labor		30			
Factory overhead		40			
Units started	<u>40,000</u>				
Units to account for	<u>50,000</u>				
Units completed	44,000	100%	44,000	44,000	44,000
Work-in-process, June 30	<u>6,000</u>				
Direct materials		100	6,000		
Direct labor		50		3,000	
Factory overhead		60			3,600
Units accounted for	<u>50,000</u>				
Total equivalent units			<u>50,000</u>	<u>47,000</u>	<u>47,600</u>

## Step 3: Determine Total Costs for Each Manufacturing Cost Element

Beginning work-in-process inventory		
Direct materials	\$10,000	
Direct labor	1,060	
Factory overhead	<u>1,620</u>	
Total		\$ 12,680
Costs added during June		
Direct materials	\$44,000	
Direct labor	22,440	
Factory overhead	<u>43,600</u>	
Total costs added		<u>110,040</u>
Total costs to account for		<u><u>\$122,720</u></u>

## Step 4: Compute Cost per Equivalent Unit

	<b>Direct Materials</b>		<b>Direct Labor</b>		<b>Factory Overhead</b>		<b>Total</b>
Costs (from Exhibit 6.7)							
Work-in-process, June 1	\$10,000		\$ 1,060		\$ 1,620		\$ 12,680
Costs added during June	<u>44,000</u>		<u>22,440</u>		<u>43,600</u>		<u>110,040</u>
Total costs to account for	<u>\$54,000</u>		<u>\$23,500</u>		<u>\$45,220</u>		<u>\$122,720</u>
Divide by equivalent units (from Exhibit 6.6)							
	<u>50,000</u>		<u>47,000</u>		<u>47,600</u>		
Equivalent unit costs	<u>\$ 1.08</u>	+	<u>\$ 0.50</u>	+	<u>\$ 0.95</u>	=	<u>\$ 2.53</u>

## Step 5: Assign Total Manufacturing Costs to Units Completed and Ending WIP

	Completed and Transferred out	Ending Work-in-Process	Total
Goods completed and transferred out (44,000 × \$2.53)	\$111,320		\$111,320
Ending work-in-process:			
Direct materials (6,000 × \$1.08)		\$ 6,480	6,480
Direct labor (3,000 × \$0.50)		1,500	1,500
Factory overhead (3,600 × \$0.95)		3,420	3,420
Total costs accounted for	<u>\$111,320</u>	<u>\$11,400</u>	<u>\$122,720</u>

## Cost Reconciliation: Production Cost Report

Production Quantity Information					
	Step 1: Analyze Flow of Physical Units		Step 2: Calculate Equivalent Units		
	Physical Units	Completion Percentage	Direct Materials	Direct Labor	Factory Overhead
<b>Input</b>					
Work-in-process, June 1	10,000				
Direct materials		100%			
Direct labor		30			
Factory overhead		40			
Units started	<u>40,000</u>				
Units to account for	<u><u>50,000</u></u>				
<b>Output</b>					
Units completed	44,000	100%	44,000	44,000	44,000
Work-in-process, June 30	<u>6,000</u>				
Direct materials		100	6,000		
Direct labor		50		3,000	
Factory overhead		60			3,600
Units accounted for	<u><u>50,000</u></u>				
Total equivalent units			<u><u>50,000</u></u>	<u><u>47,000</u></u>	<u><u>47,600</u></u>

Unit Cost Determination				
<b>Step 3: Determine Total Costs</b>	<b>Direct Materials</b>	<b>Direct Labor</b>	<b>Factory Overhead</b>	<b>Total</b>
Work-in-process, June 1	\$10,000	\$ 1,060	\$ 1,620	\$ 12,680
Costs added during June	<u>44,000</u>	<u>22,440</u>	<u>43,600</u>	<u>110,040</u>
Total costs to account for	<u>\$54,000</u>	<u>\$23,500</u>	<u>\$45,220</u>	<u>\$122,720</u>
<b>Step 4: Compute Cost per Equivalent Unit</b>				
Divide by equivalent units	<u>50,000</u>	<u>47,000</u>	<u>47,600</u>	
Equivalent unit costs	<u>\$ 1.08</u>	<u>\$ 0.50</u>	<u>\$ 0.95</u>	<u>\$ 2.53</u>
<b>Cost Assignment</b>				
<b>Step 5: Assign Total Manufacturing Costs</b>	<b>Completed and Transferred out</b>	<b>Ending Work-in-Process</b>	<b>Total</b>	
Goods completed and transferred out (44,000 × \$2.53)	\$111,320		\$111,320	
Ending work-in-process				
Direct materials (6,000 × \$1.08)		\$ 6,480	6,480	
Direct labor (3,000 × \$0.50)		1,500	1,500	
Factory overhead (3,600 × \$0.95)		<u>3,420</u>	<u>3,420</u>	
Total costs accounted for	<u>\$111,320</u>	<u>\$11,400</u>	<u>\$122,720</u>	