

Manufacturing cost concepts and behavior

Learning objectives of the topic

- Introduce the concept of cost
- Explain the process of cost allocation
- Present how material, labor, and overhead costs are added to a product at each stage of the production process
- Define the basic cost behaviors; fixed, variable, semi-variable, and step costs
- Identify the components of costs of a product

Cost

- When a company buys a machine, the purchase of the machine consumes some of the money the company has.
- By buying the machine, the company has decided to give up some of the money (resource) for the acquisition of the machine.
- Cost is a sacrifice of resources.
- The price of the machine measures the sacrifice the company must make to acquire it.

Cost types in manufacturing

- In a typical manufacturing process, there are many costs that need estimation.
- For easy collection and clear presentation, costs are classified into types.
- The types of costs in a typical manufacturing process are:
 - Manufacturing costs
 - Nonmanufacturing costs
 - Prime costs
 - Conversion costs

Manufacturing costs

- Manufacturing costs are costs that are assigned to units of production.
- The manufacturing costs are either direct or indirect costs.
- Direct manufacturing costs are product costs that can be easily identified with units of production.
- Any other product costs are called indirect manufacturing costs.

Direct cost	Indirect cost
Raw material	Machines
Machine operators	Utilities

- There are three categories of manufacturing costs:
 1. Direct material: easily identified with the product.
 2. Direct labor: easily identified with the product.
 3. Manufacturing overhead: all other costs.

Direct material	Direct labor	Overhead
Wires in PC manufacturing	Machine operators and assembly workers	Repair workers, electricity

Prime and conversion costs

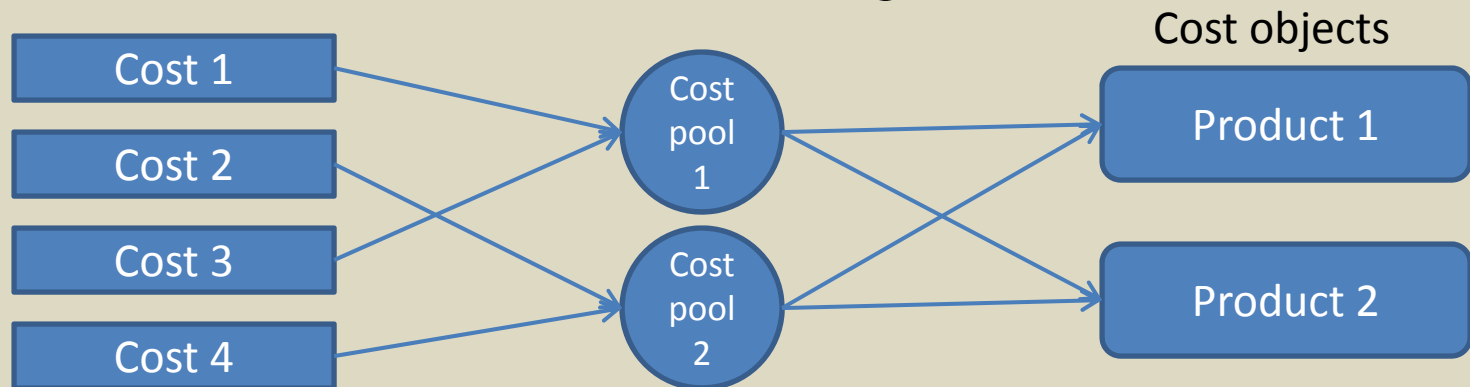
- It is useful in specific cases to classify costs as either primal or conversion costs.
- Primal costs are the direct materials and labor costs.
- Conversion costs are the direct labor and overhead costs.

Nonmanufacturing costs

- Nonmanufacturing costs are the costs associated with administrative and non-administrative functions that are required to provide necessary support to manufacturing, such as processing customer orders, delivery, managers, building, etc.

Cost allocation

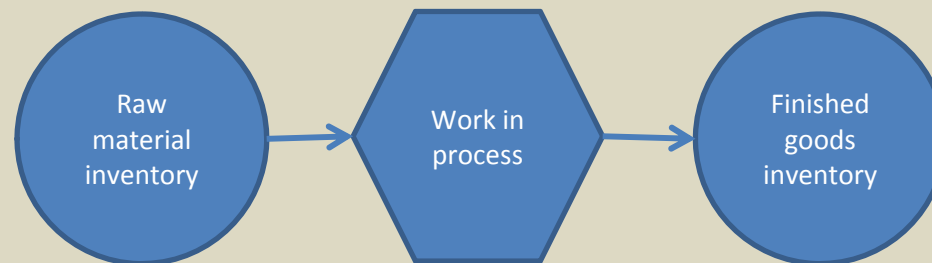
- Cost allocation is the assignment of the manufacturing costs to products.
- Important definitions are in turn:
 - Cost object is any product to which a cost is assigned.
 - The collection of all costs that will be assigned is called the cost pool.
 - Cost driver is a factor causing costs.



- The costs in the cost pool are assigned according to a specific allocation rule.
- The decision about the allocation rule may not be that straight foreword.

Manufacturing costs

- Knowing the manufacturing process is essential in estimating the manufacturing costs.
- In typical manufacturing, production begins with the transportation of the raw material to the manufacturing area, where it will be transformed into work-in process, and ends with the transportation of the finished goods to inventory.



Cost flows through the statements

- Product costs are recorded in inventory when cost is incurred.
- The inventory accounts are three:
 - Raw materials inventory: materials purchased to make a product.
 - Work-in-process inventory: products currently in the production process, but not yet completed.
 - Finished goods inventory: completed products that have not yet been sold.
- The work-in-process inventory accounts for all costs a work-in-process item has incurred up to a specific point in the manufacturing process, such as direct materials, direct labor, and overhead.

- Take this balance sheet of cost of goods manufactured and sold as an example:

Beginning work in process Inventory, January 1		SR	270,000
Manufacturing Cost During the Year:			
Direct Materials:			
Beginning Raw Materials Inventory, Jan. 1	SR	95,000	
Purchases	SR	5,627,000	
Direct Materials Available	SR	5,722,000	
Ending raw material Inventory, Dec. 31	SR	72,000	
Direct Materials put into Production		SR	5,650,000
Direct Labor		SR	1,220,000
Manufacturing Overhead		SR	6,780,000
Total Manufacturing Costs Incurred		SR	13,650,000
Total Work-in-Process During the Year		SR	13,920,000
Ending Work-in-Process Inventory, Dec. 31		SR	310,000
Cost of Goods Manufactured		SR	13,610,000
Beginning Finished Goods Inventory, Jan. 1	SR	420,000	
Finished Goods Available for Sale	SR	14,030,000	
Ending Finished Goods Inventory, Dec. 31	SR	930,000	
Cost of Goods Sold	SR	13,100,000	

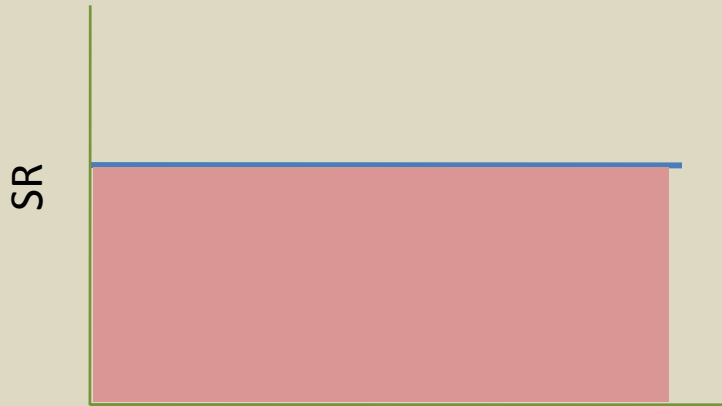
- The cost of raw materials is
 - Cost of beginning inventory = SR 95,000
 - Purchased material in the year = SR 5,627,000
 - Ending inventory = SR 72,000
 - The cost of direct materials put into production during the year = $95 + 5,627 - 72 = \text{SR } 5,650,000$
- The manufacturing cost is
 - Cost of direct materials is SR 5,650,000
 - Cost of direct labor is SR 1,220,000
 - Costs of manufacturing overhead is SR 6,780,000
 - Therefore, the cost of manufacturing incurred during the year = $5,650 + 1,220 + 6,780 = \text{SR } 13,650,000$

- The cost of work in process is
 - Cost of beginning work in process inventory is SR 270,000.
 - The costs of manufacturing is SR 13,650,000.
 - Therefore, the costs of total work in process during the year = $270 + 13,650 = \text{SR } 13,920,000$
- The cost of goods manufactured is
 - The cost of the ending work in process inventory is SR 310,000.
 - The cost of total work in process inventory is SR 13,920,000.
 - Therefore, the cost of goods manufactured = $13,920 - 310 = \text{SR } 13,610,000$.

- The cost of finished goods available for sale is
 - The cost of beginning finished goods is SR 420,000.
 - The cost of goods manufactured is SR 13,610,000.
 - Therefore, the cost of finished goods available for sale = $420 + 13,610 = \text{SR } 14,030,000$.
- The cost of goods sold during the year is
 - The cost of ending finished goods is SR 930,000.
 - The cost of finished goods available for sale is SR 14,030,000.
 - Therefore, the cost of goods sold = $14,030 - 930 = \text{SR } 13,100,000$.

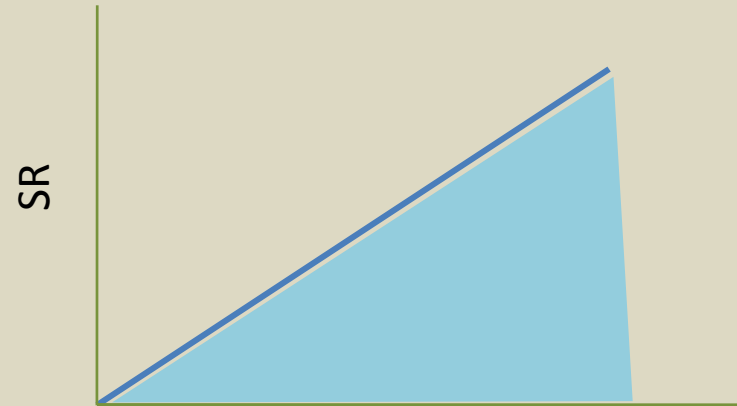
Cost behavior

- Cost behavior is the way costs respond to changes in activity levels.
- The industrial engineer should know how costs behave to make decisions about production and to plan and evaluate performance.
- Costs are of two types:
 - Fixed costs are unchanged as production volume changes.
 - Variable costs change in direct proportional with a change in production volume.



Volume

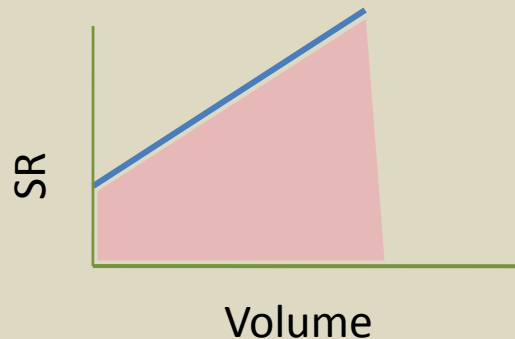
Fixed cost



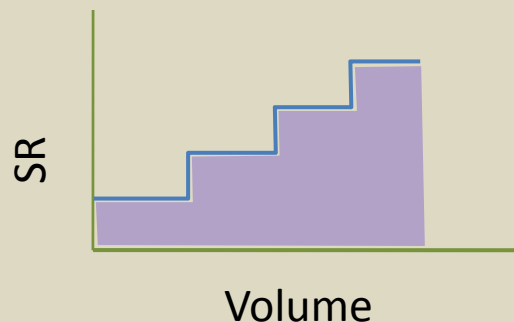
Volume

Variable cost

- Costs are identified as either fixed or variable only over a certain range of activity, called the relevant range.
- Costs in general can fall into both types of costs:
 - Semi-variable cost



- Step cost



- Examples of cost types in East Cement Factory:

Cost type	Activity	Cost
Variable cost		
Fixed cost		
Semi-variable cost		
Step cost		

Components of product costs

- Saudi Fan Industries specializes in the manufacture of ventilation fans.
- Take the following costs associated with the manufacture of a fan:

Direct material	SR 8
Direct labor	SR 7
Variable manufacture overhead	SR 8
Fixed manufacture overhead	SR 6
Variable nonmanufacture cost	SR 4
Fixed nonmanufacture cost	SR 7

- The variable manufacturing cost is the sum of costs of direct materials, direct labor, and variable manufacture overhead:

variable manufacture cost of a fan = SR 23

- The variable cost is the sum of variable manufacture cost and variable nonmanufacture cost:

variable cost of a fan = SR 27

- The total cost to manufacture one fan is called the full cost:

full cost of a fan = SR 40

- The sum of variable and fixed manufacturing costs is called the full absorption cost:

full absorption cost of a fan = SR 29