

# Chapter - 3

Department of Business Administration

Managerial Accounting

## Cost Classifications & Cost Behavior

(Go through the reference books for details)

### ❖ Manufacturing Costs (Managerial Accounting, Garrison, 10th edition, p. 40)

Manufacturing costs are those costs that are used to manufacture goods directly. There are three types of manufacturing costs, which are as follows:

#### 1. Direct Material

Direct materials are those materials that become an integral part of the finished product and that can be physically and conveniently traced to the final product. It can be included directly in calculating the cost of the product, such as the steel to make automobile bodies. Generally raw materials are known as direct materials that go into the final product.

#### 2. Direct Labor

Direct labor costs are those costs that can be easily i. e., physically and conveniently traced to individual units of product. Direct labor is sometimes called touch labor, since direct labor workers typically touch the product while it is being made, e.g., labor costs of machine operators.

#### 3. Manufacturing Overhead

Manufacturing overhead is the third element of manufacturing cost that includes all costs of manufacturing except direct materials and direct labor. Manufacturing overhead includes items such as indirect materials, indirect labor. The terms indirect manufacturing costs, factory overhead and factory burden, are synonymous with manufacturing overhead.

- Direct Material + Direct Labor = Prime Cost
- Prime Cost + Manufacturing Overhead = Manufacturing Cost
- Direct Labor + Manufacturing Overhead = Conversion Cost

### ❖ Non-manufacturing Costs / Commercial Expenses (Mgt. Acct., Garrison, 10<sup>th</sup> ed, p.42)

Generally, non-manufacturing costs are sub-classified into two categories;

#### 1. Marketing Costs / Selling & Distribution Costs

Marketing expenses cover the expenses of making sales and delivering products. These costs are necessary to secure customer orders and get the finished product into the hands of the customer. These costs are called order getting and order filling costs. Examples of marketing cost include advertising, shipping, sales travel, sales commission etc.

## 2. Administrative Expenses

Administrative expenses include expenses incurred in the direction, control, and administration of the organization. These include all executive, organizational and clerical costs associated with the general management of an organization rather than with manufacturing, marketing, or selling. For example, executive compensation, general accounting expenses.

- **Marketing Costs + Administrative Expenses = Commercial Expenses**
- **Manufacturing Cost + Non-manufacturing Cost = Total Operating Cost**

### ❖ **Product Costs** (Managerial Accounting, Garrison, 10th edition, p. 43)

Product costs include all the costs that are involved in acquiring or making a product. In case of manufactured goods, these costs consist of direct materials, direct labor, and manufacturing overhead. Product costs are viewed as attaching to units of product as the goods are purchased or manufactured, and they remain attached as the goods go into inventory awaiting sale. So initially, product costs are assigned to an inventory account on the balance sheet. When the goods are sold, the costs are released from inventory as expenses (known as Cost of Goods Sold) and matched against the revenue. Product cost is also known as inventoriable cost. Product costs are not treated as expense in the period in which these are incurred. They are treated as expense in the period in which the related products are sold.

### ❖ **Period Costs** (Managerial Accounting, Garrison, 10th edition, p. 43)

Period costs are all the costs that are not included in product costs. These costs are expensed on the income statement in the period in which they are incurred using the usual rules of accrual accounting. Period costs are incurred for a specific period rather than to a specific product. They are not included as part of the cost of either purchased or manufactured goods. All selling and administrative expenses are considered to be period costs. Sales commission, office rent, executive salaries etc. are the examples of period costs.

### ❖ **Cost Classifications According to Cost Behavior** (Mgt. Acct., Garrison, 10<sup>th</sup> edi, p.52)

Cost behavior refers to how a cost will react or respond to changes in the level of business activity. As the activity level rises and falls, a particular cost may rise and fall as well—or it may remain constant. From the view point of cost behavior, costs are three types:

#### 1. **Fixed Costs** (Managerial Accounting, Garrison, 10th edition, p. 53 & 196, Mondol, Mgt. Acct. p35)

A fixed cost is a cost that remains constant, in total, regardless of changes in the level of activity. Fixed costs are not affected by changes in activity. Consequently, as the activity level rises and falls, the fixed costs remain constant in total amount unless influenced by some outside force, such as a price change. Fixed costs are total fixed for a relevant range of activity level but per unit variable. For planning purposes fixed costs can be viewed as being either committed or discretionary;

- a) **Committed Fixed Cost:** Committed fixed costs relate to the investment in facilities, equipment, and the basic organizational structure of a firm. Examples of such costs include depreciation of buildings and equipment, taxes on real estate, insurance, and salaries of top management and operating personnel. They are **long term** in nature and **can not be significantly changed** for short period.

- b) **Discretionary Fixed Cost:** Discretionary fixed costs usually arise from annual decisions by management to spend in certain fixed cost areas. Examples of discretionary fixed costs include advertising, research, public relations, management development programs etc. Discretionary fixed cost is fairly **short term**, usually a single year and **can be cut for short periods** of time with minimal damage to the long-run goals of the organization.

2. **Variable Costs** (Managerial Accounting, Garrison, 10<sup>th</sup> edition, p.52 & 193, Mondol, Mgt .Acct. p32)  
A variable cost is a cost that varies, in total, in direct proportion to changes in the level of activity. The activity can be expressed in many ways, such as units produced, units sold, miles driven, lines of print, hours worked and so forth. A good example of a variable cost is direct materials. The cost of direct materials used during a period will vary, in total, in direct proportion to the number of units that are produced. Variable cost is variable in total but per unit fixed. Variable costs are two types;

- a) **True Variable Costs:** Direct material is a true or proportionately variable cost because the amount used during a period will vary in direct proportion to the level of production activity. Moreover, any amounts purchased but not used can be stored and carried forward to the next period as inventory.
- b) **Step-Variable Costs:** Those costs that increase or decrease only in response to fairly wide changes in activity is known as a step-variable cost. The behavior of a step-variable cost is that it will vary with step by step of activity level. Best example of step-variable cost is labor cost.

3. **Mixed Costs** (Managerial Accounting, Garrison, 10<sup>th</sup> edition, p. 43, Mondol, Mgt . Acct. p. 38)  
A mixed cost is one that contains both variable and fixed cost elements. Mixed costs are also known as semi-variable or semi-fixed cost. For example, in case of telephone bill, line rent is fixed cost and call charge is variable cost.

#### ❖ **Cost Classification for Assigning Costs to Cost Objects** (Mondol, Mgt. Acct. 4<sup>th</sup> ed. p27)

For purposes of assigning costs to cost objects, costs are classified into two categories;

1. **Direct Cost** (Managerial Accounting, Garrison, 10<sup>th</sup> edition, p. 55)  
A direct cost is a cost that can be easily and easily and conveniently traced to the particular cost object under consideration. Examples of direct costs are direct materials, direct labor etc.
2. **Indirect Cost** (Managerial Accounting, Garrison, 10<sup>th</sup> edition, p. 55)  
An indirect cost is a cost that cannot be easily and conveniently traced to the particular cost object under consideration, for examples, indirect materials, indirect labor etc.

#### ❖ **Cost Classification for Decision Making**

1. **Differential Cost and Revenue** (Managerial Accounting, Garrison, 10<sup>th</sup> edition, p. 55)

Decisions involve choosing between alternatives, In business decisions, each alternative will have certain costs and benefits that must be compared to the costs and benefits of the other available alternatives. A difference in costs between any two alternatives is known as a differential cost. A difference in revenues between any two alternatives is known as differential revenue. A differential cost is also known as an incremental cost, although technically and incremental cost should refer only to an increase in cost from one alternative to another; decreases in cost should be referred to as decrement costs. Differential costs refer both cost increases and cost decreases between alternatives.

## 2. Opportunity Cost (Managerial Accounting, Garrison, 10<sup>th</sup> edition, p. 57)

Opportunity cost is the potential benefit that is given up when one alternative is selected over another. Opportunity cost is not usually entered in the accounting records of an organization, but it is a cost that must be considered in making decision by management. For example, Tk. 100000 can be invested @ 10% interest in bond or deposited into bank @ 7% interest, if the amount is invested in bond then the bank interest (100000X 7%) Tk. 7000 will be the opportunity cost of bond interest.

## 3. Sunk Cost (Managerial Accounting, Garrison, 10<sup>th</sup> edition, p. 57)

A sunk cost is a cost that has already been incurred and that cannot be changed by any decision made now or in the future. Since sunk costs cannot be changed by any decision, they are not differential costs. Therefore, they can and should be ignored when making a decision. For example, a company paid Tk. 50000 before 5 years for purchase a machine.

## ❖ The Analysis of Mixed Cost (Managerial Accounting, Garrison, 10<sup>th</sup> edition, p. 201)

A mixed cost is one that contains both variable and fixed elements. The equation to express the relationship between mixed cost and the level of activity:

$$Y = a + bX \quad \text{Where,}$$

Y = The total mixed cost

a = The total fixed cost

b = The variable cost per unit

X = The level of activity

There are two methods to segregate mixed costs into variable cost and fixed costs; (a) analytical method and (b) statistical method. In the analytical method all costs are analyzed in details one by one. Analytical method is more useful for future cost segregation. Statistical methods are more scientific than analytical method. They are used to segregate the mixed cost from the past records. The statistical methods are;

## A. The High-Low Method (Managerial Acct, Garrison, 10<sup>th</sup> ed, p.207, Mondol, Mgt . Acct. p.40)

The high-low method is based on the rise-over-run formula for the slope of a straight line. If the relationship between cost and activity can be represented by a straight line, then the slope of the straight line is equal to the variable cost per unit of activity.

$$\text{Variable Cost} = \frac{\text{Cost at High Activity Level} - \text{Cost at Low Activity Level}}{\text{High Activity Level} - \text{Low Activity Level}} = \frac{\text{Change in Cost}}{\text{Change in Activity}}$$

Or

$$\text{Variable Cost (Per Unit)} = \frac{Y_2 - Y_1}{X_2 - X_1}$$

And

$$\text{Fixed cost} = \text{Total Cost} - \text{Variable Cost}$$

❖ **Example:** (Managerial Accounting, Garrison, 10<sup>th</sup> edition, p. 214)

In a hospital the admitting department's costs and the number of patients admitted during the immediately preceding eight months are given in the following:

Month	No of Patients Admitted	Admitting Department Cost
May	1800	Tk. 14,900
June	1900	Tk. 15,200
July	1700	Tk. 14,600
August	1600	Tk. 14,300
September	1500	Tk. 14,000
October	1300	Tk. 13,400
November	1100	Tk. 12,800
December	1550	Tk. 14,150

**Required:**

1. Ascertain Variable Cost per unit and total fixed cost under high-low method
2. Express the fixed and variable components of admitting costs as a cost formula in the linear equation form,  $Y = a + bX$
3. What would be the total cost of admitting department if 2000 patients are admitted?

**Solution**

**Req. 1**

Highest activity level 1900, ( $X_2$ )  
 Cost at highest activity level Tk. 15200, ( $Y_2$ )  
 Lowest activity level 1100, ( $X_1$ )  
 Cost at lowest activity level Tk. 12800 ( $Y_1$ )

$$\text{Variable Cost} = \frac{\text{Cost at High Activity Level} - \text{Cost at Low Activity Level}}{\text{High Activity Level} - \text{Low Activity Level}} = \frac{\text{Change in Cost}}{\text{Change in Activity}}$$

Or

$$\text{Variable Cost Per Unit} = \frac{Y_2 - Y_1}{X_2 - X_1} = \frac{15200 - 12800}{1900 - 1100} = \text{Tk. 3 Per patient admitted}$$

$$\begin{aligned} \text{Fixed cost} &= \text{Tk. 15200} - (\text{Tk. 3} \times 1900 \text{ patients admitted}) \\ &= \text{Tk. 15200} - \text{Tk. 5700} \\ &= \text{Tk. 9500} \end{aligned}$$

**Req. 2**

The cost formula expressed in the linear equation form is,  $Y = a + bX$  or  $Y = \text{Tk. 9500} + \text{Tk. 3}X$

**Req. 3**

The total cost of admitting department for 2000 patients,  $Y = \text{Tk. 9500} + \text{Tk. 3} \times 2000 = \text{Tk. 15500}$

Or

Month	No of Patients Admitted	Admitting Department Cost
High Activity Level (June)	1900	Tk. 15200
Low Activity Level (November)	1100	Tk. 12800
Change	800	Tk. 2400

## B. The Least-Squares Method

The least-squares method is a method of separating a mixed cost into its fixed and variable components that uses all of the data. A straight line of the form is used for this purpose:

$$Y = a + bX \quad \text{Where,}$$

Y = Total Mixed Cost

a = Fixed Cost

b = Variable Cost Per Unit

X = Activity Level

$$\text{Variable Cost Per Unit (b)} = \frac{dXdY}{dX^2}$$

## C. Scatter Graph Method

**Example:** (Management Accounting, M.A.Mondal, 4<sup>th</sup> edition, p. 42)

In an organization, production costs and the number of units produced during the immediately preceding six months are given in the following:

Month	No of Unit Produced	Production Cost
January	600	Tk. 2700
February	900	Tk. 3300
March	700	Tk. 2900
April	1000	Tk. 3500
May	1100	Tk. 3700
June	500	Tk. 2500

**Required:**

- Ascertain Variable Cost per unit and total fixed cost under least-square method
- Express the fixed and variable components of production costs as a cost formula in the linear equation form,  $Y = a + bX$
- What would be the total cost of production if 800 units were produced?

**Solution**

**Req. 1**

Month	No of Unit Produced (X)	dX = X - 700	dX <sup>2</sup>	Production Cost (Y)	dY = Y - 2900	dXdY
January	600	-100	10000	Tk. 2700	-200	20000
February	900	200	40000	Tk. 3300	400	80000
March	700	0	0	Tk. 2900	0	0
April	1000	300	90000	Tk. 3500	600	180000
May	1100	400	160000	Tk. 3700	800	320000
June	500	-200	40000	Tk. 2500	-400	80000
<b>Total</b>			<b>340000</b>			<b>680000</b>

$$\text{Variable Cost Per Unit (b)} = \frac{dXdY}{dX^2} = \frac{680000}{340000} = \text{Tk. 2}$$

According to the equation,

$$Y = a + bX$$

$$2700 = a + 2 \times 600$$

$$a = 2700 - 1200$$

$$a = 1500$$

**Fixed Cost = Tk. 1500**

**Req. 2**

The expression of fixed and variable cost in the straight line equation form

$$Y = 1500 + 2X$$

**Req. 3**

If 800 units are produced then the total cost of production will be

$$Y = 1500 + 2 \times 800$$

$$= \text{Tk. 3100}$$

### Problem 1

Information relating to sales and carriage outwards for six months in Navana Ltd. is given below:

Month	Sales (Units)	Carriage Outwards Taka
January		15790
February	3400	15210
March	3200	16370
April	3600	17530
May	4000	15500
June	3300	16080

#### Required

1. Ascertain Variable Cost per unit and Total Fixed Cost under High-Low method
2. Ascertain Variable Cost per unit and Total Fixed Cost under Least-square method
3. Ascertain Variable Cost per unit and Total Fixed Cost under Scatter Graph Method
4. Express the fixed and variable components of production costs as a cost formula in the linear equation form,  $Y = a + bX$
5. What would be the total cost of carriage outwards if 3800 units were sold?

Answer: VC= 2.9, FC = 5930, For 3800 units = 16950

### Problem 2

The following information for six months is obtained from a company:

Month	Production (Units)	Mixed Cost (Taka)
July	5000	45600
August	6500	53850
September	5900	50550
October	4200	41200
November	7100	57150
December	5800	50000

#### Required

1. Ascertain Variable Cost per unit and Total Fixed Cost under High-Low method
2. Ascertain Variable Cost per unit and Total Fixed Cost under Least-square method
3. Ascertain Variable Cost per unit and Total Fixed Cost under Scatter Graph Method
4. Express the fixed and variable components of production costs as a cost formula in the linear equation form,  $Y = a + bX$
5. What would be the total cost of production if 7000 units were produced?

Answer: VC= 5.5, FC = 18100, For 7000 units = 56600



### Problem 3

Zerbel Company, a wholesaler of large custom-build air conditioning units for commercial buildings, has noticed considerable fluctuation in its shipping expense from month to month, as shown below:

Month	Units Shipped	Total Shipping Exp. (Taka)
January	4	2200
February	7	3250
March	5	2550
April	2	1500
May	3	1850
June	6	2900
July	8	3600

#### Required

1. Ascertain Variable Cost per unit and Total Fixed Cost under High-Low method
2. Ascertain Variable Cost per unit and Total Fixed Cost under Least-square method
3. Ascertain Variable Cost per unit and Total Fixed Cost under Scatter Graph Method
4. Express the fixed and variable components of production costs as a cost formula in the linear equation form,  $Y = a + bX$
5. What will be the total shipping cost if 9 units are shipped?

**Answer: VC = 350, FC = 800, For 9 units = 3950**

### Problem 4

The number of X-rays taken and X-ray costs over the last nine months in Beverly Hospital are given below:

Month	X-ray taken	X-ray Cost (Taka)
January	625	2675
February	700	2900
March	500	2300
April	425	2075
May	450	2150
June	300	1700
July	375	1925
August	550	2450
September	575	2525

#### Required

1. Ascertain Variable Cost per unit and Total Fixed Cost under High-Low method
2. Ascertain Variable Cost per unit and Total Fixed Cost under Least-square method
3. Ascertain Variable Cost per unit and Total Fixed Cost under Scatter Graph Method
4. Express the fixed and variable components of production costs as a cost formula in the linear equation form,  $Y = a + bX$
5. What will be the total X-ray taken cost if 600 X-ray are taken?

**Answer: VC = 3, FC = 800, For 600 units = 2600**

### Problem 5

The data below have been taken from the cost records of the Atlanta Processing Company. The data relate to the cost of operating one of the company's processing facilities at various levels of activity:

Month	Units Processed	Total Cost (Taka)
January	800	1400
February	450	875
March	700	1250
April	900	1550
May	370	755
June	600	1100
July	300	650
August	500	950

#### Required

1. Ascertain Variable Cost per unit and Total Fixed Cost under High-Low method
2. Ascertain Variable Cost per unit and Total Fixed Cost under Least-square method
3. Ascertain Variable Cost per unit and Total Fixed Cost under Scatter Graph Method
4. Express the fixed and variable components of production costs as a cost formula in the linear equation form,  $Y = a + bX$
5. What will be the total processing cost if 850 units are processed?

**Answer: VC = 1.5, FC = 200, For 850 units = 1475**

### Problem 6

One of Baric Company's products goes through a glazing process. The company has observed glazing costs as follows over the last six weeks:

Week	Units Produced	Total Cost (Taka)
1	8	270
2	5	210
3	10	310
4	4	190
5	6	230
6	9	290

#### Required

1. Ascertain Variable Cost per unit and Total Fixed Cost under High-Low method
2. Ascertain Variable Cost per unit and Total Fixed Cost under Least-square method
3. Ascertain Variable Cost per unit and Total Fixed Cost under Scatter Graph Method
4. Express the fixed and variable components of production costs as a cost formula in the linear equation form,  $Y = a + bX$
5. What will be the total glazing cost if 7 units are processed?

**Answer: VC = 20, FC = 110, For 7 units = 250**