# 5. COSTING TECHNIQUES

This chapter includes various costing techniques such as:

- Marginal Costing
- Standard Costing
- Variance Analysis
- Cost Volume Profit Analysis
- Break Even Chart

## Marginal Costing

Marginal cost is the change in the total cost when the quantity produced is incremented by one. That is, it is the cost of producing one more unit of a good. For example, let us suppose:

Variable cost per unit = Rs 25

Fixed cost = Rs 1,00,000

Cost of 10,000 units = 25 × 10,000 = Rs 2,50,000

Total Cost of 10,000 units = Fixed Cost + Variable Cost

= 1,00,000 + 2,50,000

= Rs 3,50,000

Total cost of 10,001 units = 1,00,000 + 2,50,025

= Rs 3,50,025

Marginal Cost = 3,50,025 – 3,50,000

= Rs 25

## Need for Marginal Costing

Let us see why marginal costing is required:

- Variable cost per unit remains constant; any increase or decrease in production changes the total cost of output.

- Total fixed cost remains unchanged up to a certain level of production and does not vary with increase or decrease in production. It means the fixed cost remains constant in terms of total cost.

- Fixed expenses exclude from the total cost in marginal costing technique and provide us the same cost per unit up to a certain level of production.

## Features of Marginal Costing

Features of marginal costing are as follows:

- Marginal costing is used to know the impact of variable cost on the volume of production or output.
- Break-even analysis is an integral and important part of marginal costing.
- Contribution of each product or department is a foundation to know the profitability of the product or department.
- Addition of variable cost and profit to contribution is equal to selling price.
- Marginal costing is the base of valuation of stock of finished product and work in progress.
- Fixed cost is recovered from contribution and variable cost is charged to production.
- Costs are classified on the basis of fixed and variable costs only. Semi-fixed prices are also converted either as fixed cost or as variable cost.

## Ascertainment of Profit under Marginal Cost

'Contribution' is a fund that is equal to the selling price of a product less marginal cost. Contribution may be described as follows:

| | | |
|---|---|---|
| Contribution | = | Selling Price – Marginal Cost |
| Contribution | = | Fixed Expenses + Profit |
| Contribution – Fixed Expenses | = | Profit |

## Income Statement under Marginal Costing

| **Income Statement<br>For the year ended 31-03-2014** | | |
|---|---|---|
| **Particulars** | **Amount** | **Total** |
| Sales | | 25,00,000 |
| Less: Variable Cost :<br>Cost of goods manufactured<br>Variable Selling Expenses<br>Variable administration Expenses | <br>12,00,000<br>3,00,000<br>50,000 | <br><br><br>15,50,000 |
| **Contribution** | | **9,50,000** |

| | | |
|---|---|---|
| Less: Fixed Cost : | | |
| Fixed Administration Expenses | 70,000 | |
| Fixed Selling Expenses | 1,30,000 | 2,00,000 |
| | | **7,50,000** |

## Advantages of Marginal Costing

The advantages of marginal costing are as follows:

- Easy to operate and simple to understand.
- Marginal costing is useful in profit planning; it is helpful to determine profitability at different level of production and sale.
- It is useful in decision making about fixation of selling price, export decision and make or buy decision.
- Break even analysis and P/V ratio are useful techniques of marginal costing.
- Evaluation of different departments is possible through marginal costing.
- By avoiding arbitrary allocation of fixed cost, it provides control over variable cost.
- Fixed overhead recovery rate is easy.
- Under marginal costing, valuation of inventory done at marginal cost. Therefore, it is not possible to carry forward illogical fixed overheads from one accounting period to the next period.
- Since fixed cost is not controllable in short period, it helps to concentrate in control over variable cost.

# Standard Costing

Planned cost is a key for effective cost control which is not provided by historical cost concepts. The standard costing system was developed to overcome the drawbacks of the historical costing system. Since historical costing deals only with the actual costs incurred, it is not an effective device of cost control.

Standard costing tells us what should be the cost of the product and if the actual cost exceeds the projected cost, the standard costing system can point to the reason of deviation.

## Points Related to Standard Costing

- Standard costing includes pre-determination of costs under specific working conditions.

- In this process, the standard quantity of machine time, labor time, and material is calculated and the future market trend for price standards is analyzed.
- Standard costing helps in variance analysis.
- Along with fixation of sale price, it also provides valuation of stock and work in progress.
- Material, labor, and overheads cost are ascertained.
- Actual cost is measured.

## Standard Cost Card

**Format:**

| **Standard Cost Card** | | | |
|---|---|---|---|
| **No……..** | | | |
| **Product……** | | **Date of setting Standard……..** | |
| Element of Cost | **Quantity or Hours** | **Rate Rs.** | **Standard Cost** |
| 1. Direct Material | | | |
| Material A | 400 units | 5.00 | 2,000 |
| Material B | 100 units | 4.00 | 400 |
| | 500 units | | 2,400 |
| Less: Normal Loss 5% | 25 units | Scrap Value | 400 |
| Normal Output | 475 units | | 2,000 |
| **2.** Direct Labour | 100 hrs | 20 | 200 |
| 3. Overheads: | | | |

# Variance Analysis

When the actual cost differs from the standard cost, it is called variance. If the actual cost is less than the standard cost or the actual profit is higher than the standard profit, it is called **favorable variance**. On the contrary, if the actual cost is higher than the standard cost or profit is low, then it is called **adverse variance**.

Each element of cost and sales requires variance analysis. Variance is classified as follows:

- Direct Material Variance
- Direct Labor Variance
- Overhead Variance
- Sales Variance

## Direct Material Variance

Material variances can be of the following categories:

- Material Cost Variance
- Material Price Variance
- Material Usage Variance
- Material Mix Variance
- Material Yield Variance

| **Material Cost Variance** |
|---|
| Standard cost of materials for actual output – Actual cost of material used<br><br>Or<br><br>Material price variance + Material usage or quantity variance<br><br>Or<br><br>Material price variance + Material mix variance + Material yield variance |
| **Material Price Variance** |
| Actual usage ( Standard Quantity Price – Actual Unit Price)<br>Actual Usage = Actual Quantity of material (in units) used<br>Standard Unit Price = Standard Price of material per unit<br>Actual Unit Price = Actual price of material per unit |
| **Material Usage or Quantity Variance** |
| Material usage or Quantity variance :<br>Standard price per unit (Standard Quantity – Actual Quantity ) |
| **Material Mix Variance** |

Material mix variance arises due to the difference between the standard mixture of material and the actual mixture of Material mix.

Material Mix variance is calculated as a difference between the standard prices of standard mix and the standard price of actual mix.

**If there is no difference between the standard and the actual weight of mix, then:**

Standard unit cost (Standard Quantity – Actual Quantity )

Or

Standard Cost of Standard Mix – Standard cost of Actual Mix

Sometimes due to shortage of a particular type of material, standard is revised; then:

Standard unit cost (Revised Standard Quantity – Actual Quantity)

Or

Standard cost of revised Standard Mix – Standard Cost of Actual mix

**If the actual weight of mix differs from the standard weight of mix**, then:

$$\frac{\text{Total weight of actual mix}}{\text{Total weight of revised standard mix}} \times \text{Standard cost of revised standard mix}$$

**Material Yield Variance**

When the standard and the actual mix do not differ, then

Yield Variance = Standard Rate × (Actual Yield – Standard Yield)

$$\text{Standard Rate} = \frac{\text{Standard cost of standard mix}}{\text{Net standard output (i.e. Gross output} - \text{Standard loss)}}$$

## Direct Labor Variance

Direct labor variances are categorized as follows:

- Labor Cost Variance
- Labor Rate of Pay Variance
- Total Labor Efficiency Variance
- Labor Efficiency Variance
- Labor Idle Time Variance

- Labor Mix Variance or Gang Composition Variance
- Labor Yield Variance or Labor Efficiency Sub Variance
- Substitution Variance

| **Labor Cost Variance** |
|---|
| Standard Cost of Labor – Actual Cost of Labor |
| **Labor Rate of pay Variance** |
| Actual Time taken × (Standard Rate – Actual Rate) |
| **Total Labor Efficiency Variance** |
| Standard rate × (Standard time – Actual time) |
| **Labor Efficiency Variance** |
| Standard Rate (Standard time for actual output – Actual time worked) |
| **Labor Idle Time Variance** |
| Idle Time Variance = Abnormal Idle Time x Standard Rate<br>Total Labor Cost Variance = Labor rate of Pay variance + Total labor Efficiency Variance<br>Total Labor Efficiency Variance = Labor Efficiency Variance + Labor Idle Time Variance |
| **Labor Mix Variance or Gang Composition Variance** |
| If actual composition of labor is equal to standard:<br><br>LMV = Standard Cost of Standard Composition (for Actual time taken)<br>– Standard Cost of Actual Composition (for Actual time worked)<br><br>If standard composition of labor revised due to shortage of any specific type of labor but the total actual time is equal to the total standard time:<br><br>LMV = Standard Cost of Revised Standard Composition (for Actual Time Taken)<br>– Standard Cost of Actual Composition (for Actual Time Worked)<br><br>If actual and standard time of labor differs:<br><br>$= \frac{\text{Total time of actual labor composition}}{\text{Total time of standard labor composition}} \times \text{Std. cost of std. composition} - \text{Std. cost of actual composition}$<br><br>In case the Standard is revised and there is a difference in the total Actual and the Standard time: |

| |
|---|
| $= \frac{\text{Total time of actual labor composition}}{\text{Total time of revised std. labor composition}} \times \text{Std. cost of (revised std. composition} - \text{actual composition)}$ |
| **Labor Yield Variance** |
| Std. Labor Cost per unit × (Actual Yield In units – Std. Yield in units expected from Actual time worked on production) |
| **Substitution Variance** |
| (Actual hrs x Std. Rate of Std. Worker) – (Actual hrs x Std.Rate actual worker) |

# Cost-Volume-Profit Analysis

Cost-Volume-Profit (CVP) Analysis is also known as Break–Even Analysis. Every business organization works to maximize its profits. With the help of CVP analysis, the management studies the co-relation of profit and the level of production.

CVP analysis is concerned with the level of activity where total sales equals the total cost and it is called as the break-even point. In other words, we study the sales value, cost and profit at different levels of production. CVP analysis highlights the relationship between the cost, the sales value, and the profit.

## Assumptions

Let us go through the assumptions for CVP analysis:

- Variable costs remain variable and fixed costs remain static at every level of production.
- Sales volume does not affect the selling price of the product. We can assume the selling price as constant.
- At all level of sales, the volume, material, and labor costs remain constant.
- Efficiency and productivity remains unchanged at all the levels of sales volume.
- The sales-mix at all level of sales remains constant in a multi-product situation.
- The relevant factor which affects the cost and revenue is volume only.
- The volume of sales is equal to the volume of production.

## Marginal Cost Equation

Equations for elements of cost are as follows:

Sales = Variable costs + Fixed Expenses ± Profit /Loss

Or

Sales – Variable Cost = Fixed Expenses ± Profit /Loss

Or

Sales – Variable Cost = Contribution

It is necessary to understand the following four concepts, their calculations, and applications to know the mathematical relation between cost, volume, and profit:

- Contribution
- Profit Volume Ratio (P/V Ratio or Contribution/Sales (C/S))
- Break-Even Point
- Margin of Safety

## Contribution

Contribution = Sales – Marginal Cost

We have already discussed contribution in Marginal Costing topic above.

## Profit-Volume Ratio

Profit / Volume (P/V) ratio is calculated while studying the profitability of operations of a business and to establish a relation between Sales and Contribution. It is one of the most important ratios, calculated as under:

$$\frac{P}{V}\text{Ratio} = \frac{\text{Contribution}}{\text{Sales}}$$

$$= \frac{\text{Fixed Expenses} + \text{Profit}}{\text{Sales}}$$

$$= \frac{\text{Sales} - \text{Variable Cost}}{\text{Sales}}$$

$$= \frac{\text{Change in profits of Contributions}}{\text{Change in Sales}}$$

The P/V Ratio shares a direct relation with profits. Higher the P/V ratio, more the profit and vice-a-versa.

## Break-Even Point

When the total cost of executing business equals to the total sales, it is called break-even point. Contribution equals to the fixed cost at this point. Here is a formula to calculate break-even point:

$$\text{B. E. P (in units)} = \frac{\text{Total Fixed Expenses}}{\text{Selling Price per Unit} - \text{Marginal Cost per Unit}}$$

$$= \frac{\text{Total Fixed Expenses}}{\text{Contribution per Unit}}$$

Break-even point based on total sales:

$$= \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$$

Calculation of output or sales value at which a desired profit is earned:

$$= \frac{\text{Fixed Expenses} + \text{Desired Profit}}{\text{Selling Price per Unit} - \text{Marginal Cost per Unit}}$$

$$= \frac{\text{Fixed Expenses+Desired Profit}}{\text{Contribution per Unit}}$$

## Composite Break Even Point

A company may have different production units, where they may produce the same product. In this case, the combined fixed cost of each productions unit and the combined total sales are taken into consideration to find out BEP.

- **Constant Product Mix Approach** In this approach, the ratio is constant for the products of all production units.
- **Variable Product Mix Approach** In this approach, the preference of products is based on bigger ratio.

## Margin of Safety

Excess of sale at BEP is known as margin of safety. Therefore,

Margin of safety = Actual Sales – Sales at BEP

Margin of safety may be calculated with the help of the following formula:

$$\text{Margin of Safety} = \frac{\text{Profit}}{\text{P/V Ratio}}$$

$$= \frac{\text{Profit}}{\text{Contribution per Unit}}$$

# Break-Even Chart

Break-Even Chart is the most useful graphical representation of marginal costing. It converts accounting data to a useful readable report. Estimated profits, losses, and costs can be determined at different levels of production. Let us take an example.

### Example

Calculate break-even point and draw the break-even chart from the following data:

Fixed Cost = Rs 2,50,000

Variable Cost = Rs 15 per unit

Selling Price = Rs 25 per unit

Production level in units 12,000, 15,000, 20,000, 25,000, 30,000, and 40,000.

**Solution**:

$$\mathbf{B.E.P.} = \frac{\textbf{Fixed Cost}}{\textbf{Contribution per Unit}} = \frac{\textbf{Rs } 2,50,000}{\textbf{Rs } 10 \times (\textbf{Rs } 25 - \textbf{Rs } 15)} = \mathbf{25,000 \text{ units}}$$

At production level of 25,000 units, the total cost will be Rs 6,25,000.

(Calculated as (25000 x 14) + 2,50000)

| Statement showing Profit & Margin of safety at different level of production<br>Break Even Sale = Rs 6,25,000 (25,000 x 25) | | | | |
|---|---|---|---|---|
| **Production (In Units)** | **Total Sale (In Rs)** | **Total cost (Rs)** | **Profit (Sales – Cost) (In Rs)** | **Margin of safety (Profit / Contribution per unit) (In Units)** |
| 12000 | 3,00,000 | 4,30,000 | -1,30,000 | |
| 15000 | 3,75,000 | 4,75,000 | -1,00,000 | |
| 20000 | 5,00,000 | 5,50,000 | -50,000 | |
| 25000 | 6,25000 | 6,25,000 | (B.E.P) | (B.E.P) |
| 30000 | 7,50,000 | 7,00,000 | 50,000 | 5,000 |
| 40000 | 10,00,000 | 8,50,000 | 1,50,000 | 15,000 |

The corresponding chart plotted as production against amount appears as follows: