

BREAK EVEN ANALYSIS

Break Even Analysis is the study of **cost-volume of production profit (CVP)** relationship.

Profit mainly depends upon three factors-

- Cost of production
- Amount of input
- Sales revenue

Cost of production is sum of two costs: variable cost and fixed cost.

Fixed cost are assumed to be constant at all levels of output. e.g. Expenditure on permanent labours and overheads (Administrative cost).

Variable cost increases with the increase of output of production i.e. (material cost , inventory cost etc.)

One of the technique to study the total cost , total revenue and output relationship is known as **Break Even Analysis**.

Hence, Break Even Analysis is the study of cost, volume of production and profit relationship.

It is an analysis to study the point where neither profit nor loss is occurred. This pint is known as **Break Even Point**. This break Even Analysis can be done in two ways:

1. Algebraic method
2. Graphical method

But, usually a Break Even Analysis is done graphically.

Importance of Break Even Analysis

It helps in solving the following types of problems:

- What volume of sales will be necessary to cover a reasonable return on capital Investment
- Computing costs and revenues for all possible volumes of output.
- To find the price of an article to give the desired profit.
- To determine the variable cost per unit.

ASSUMPTIONS IN BREAK EVEN ANALYSIS

1. The total cost of production is comprised of fixed cost and variable cost.
2. Fixed cost remains constant i.e. it is independent of the quantity produced , it includes salaries , rent of buildings, depreciation of plants and equipment's etc.
3. Variable cost is directly proportional to the volume of production.
4. Selling price doesn't change with the volume of change.
5. Total sales income is $P \times Q$ where, P is selling price and Q is the quantity produced.

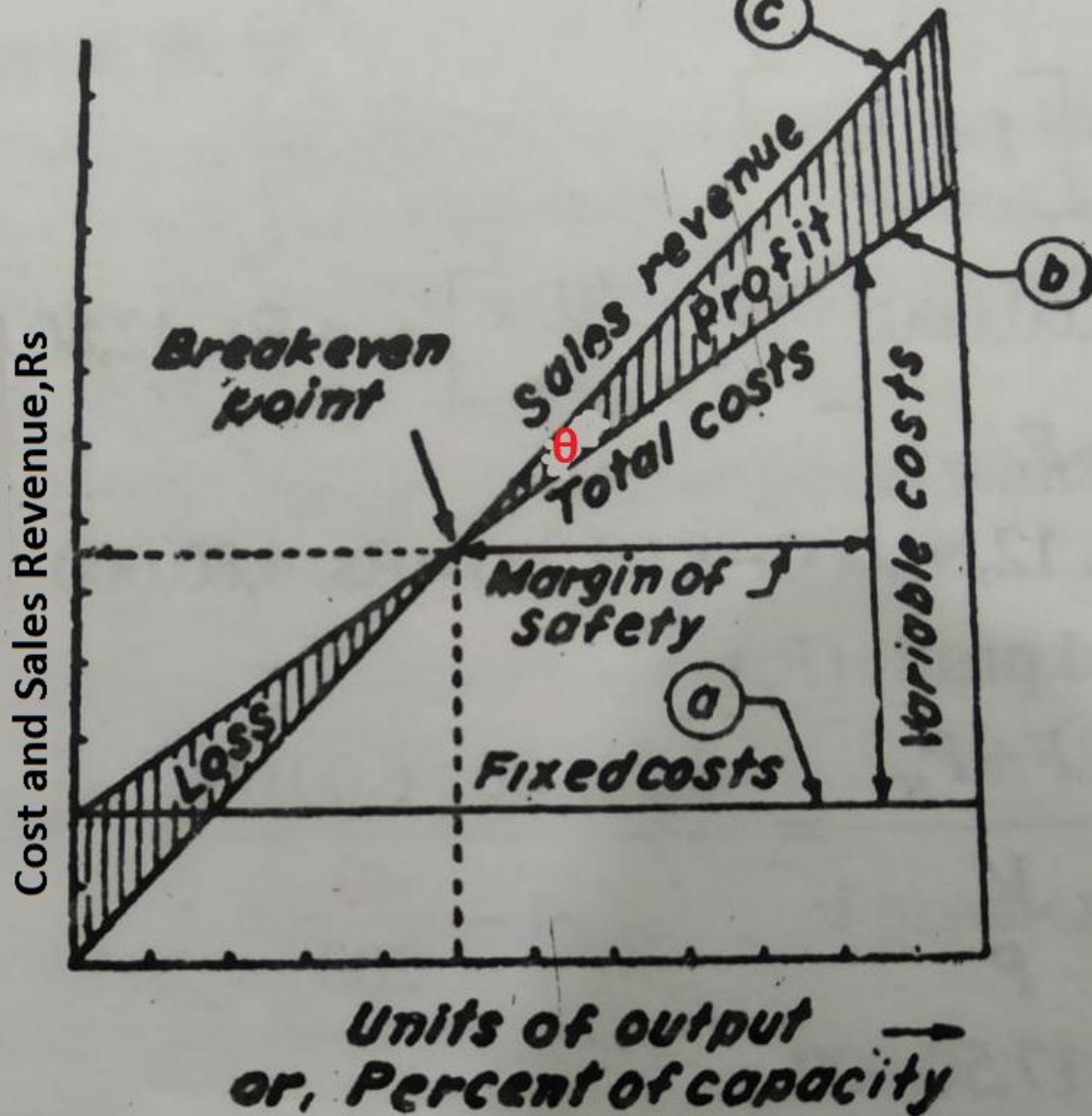
Break Even Chart

It was invented by **Walter Rautenstrauch** , an Industrial Engineer and professor of Columbia University in 1930.

It is a graphical representation of relationship between various costs and sales revenue at a given time. It determines the Break Even Point.

Functions of Break Even Chart

- It is an aid to management and it depicts a clearer view of the status of the business.
- It is a graphic representation of the economic position of the business.
- It shows the profits and losses at various output level.
- It shows the relationship between Marginal Cost and fixed Cost.
- It indicates No profit, No loss situation and margin of safety.
- It can help by making specific plans to effect profit through the control of expenses.



θ : Angle of incidence.

A Breakeven chart.

- Volume of production , number of units produced is plotted along the x-axis (Horizontal axis).
- The fixed cost is represented by straight line parallel to the horizontal axis.
- The cost and sales income (sales revenue) are plotted along y-axis(vertical axis).
- The sales income line passes through the origin.
- The point of intersection of sales income line and the total cost line represent the break even point.
- Shaded area between the total cost line and sales income/ revenue line on the left hand side of BEP indicates loss and the right hand side of the BEP indicates profit.

Margin of Safety: It is the distance between the BEP and the output being produced at a particular variable cost line. If this distance is large, the profit will be large even there is a drop in production and vice-versa.

$$\begin{aligned}\text{Margin of Safety} &= \frac{\text{Sales} - \text{Sales at BEP}}{\text{Sales}} \times 100 \\ &= \frac{\text{Profit} \times \text{sales}}{\text{Sales} - \text{variable Cost}}\end{aligned}$$

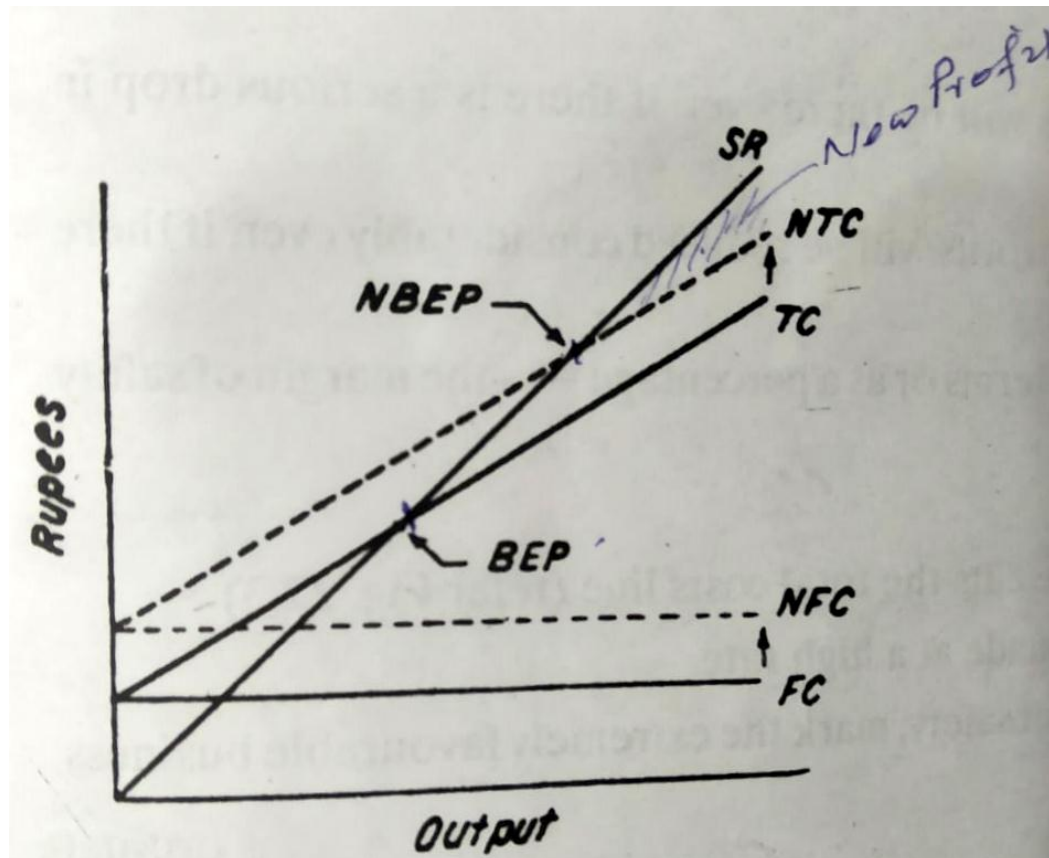
Angle of Incidence (θ): This is the angle at which sales revenue cuts the total cost line. A larger θ indicates more profit at a higher rate. A larger angle of Incidence at a high margin of safety marks the extremely favorable business position.

Profit Volume Ratio(P/V): It measure the profitability in relation to sales. It determines the BEP. Can be increased by increasing the sales price and reducing the variable cost.

$$\begin{aligned} \text{P/V Ratio} &= \frac{\textit{Contribution}}{\textit{Sales}} \times 100 = \frac{\textit{Increase in Profit}}{\textit{Increase in Sales}} \times 100 \\ &= \frac{\textit{Total Sales} - \textit{Total Variable Cost}}{\textit{Total Sales}} \times 100 = \frac{\textit{S} - \textit{V}}{\textit{S}} \times 100 \\ &= \frac{\textit{Fixed Costs} + \textit{Profit}}{\textit{Sales}} \times 100 \\ &= \frac{\textit{Price per Unit} - \textit{Cost per Unit}}{\textit{Price per Unit}} \times 100 \end{aligned}$$

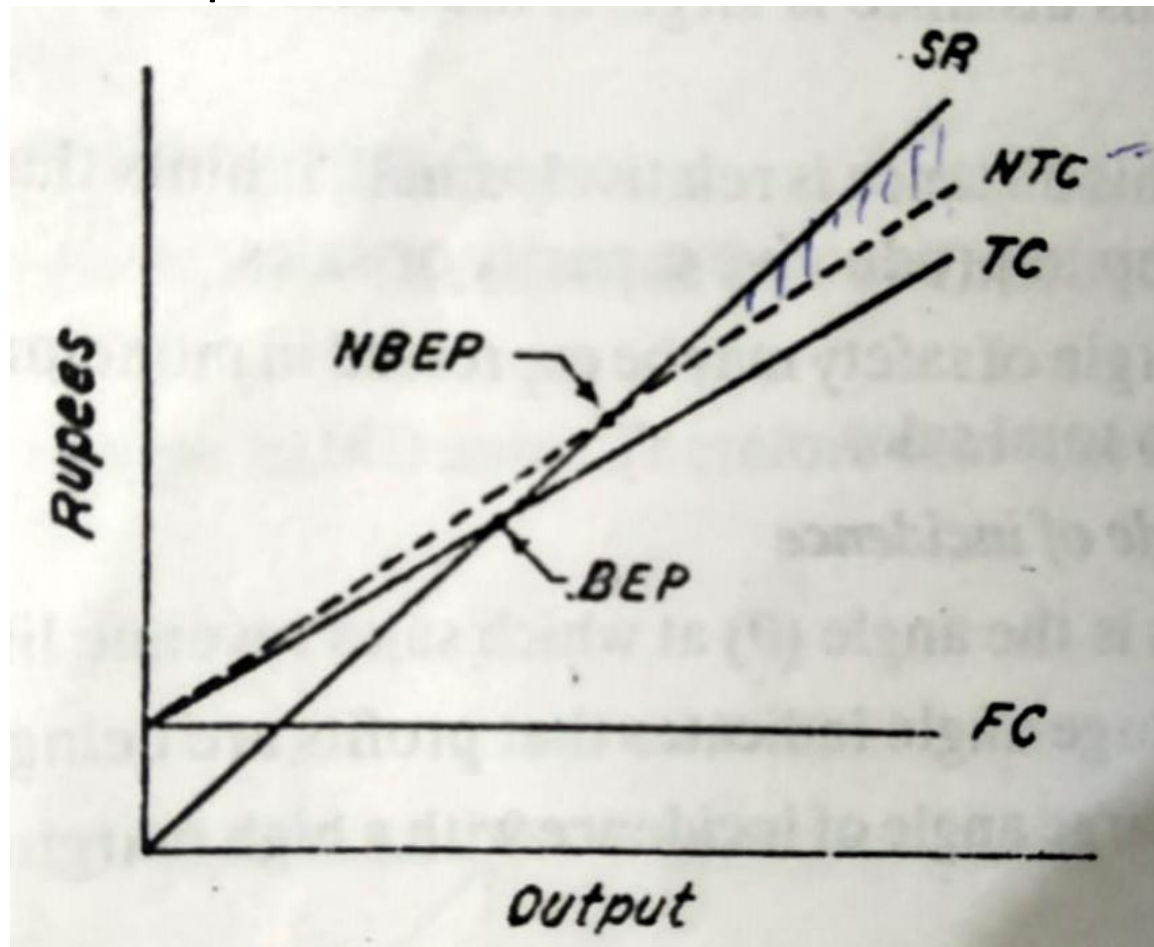
Effect of an increase in fixed costs

An increase in fixed cost possibly due to the purchase of new machines increases the total costs and thus shifts BEP towards Right Hand Side(RHS). This causes the decrease in profit for the same output and vice-versa.



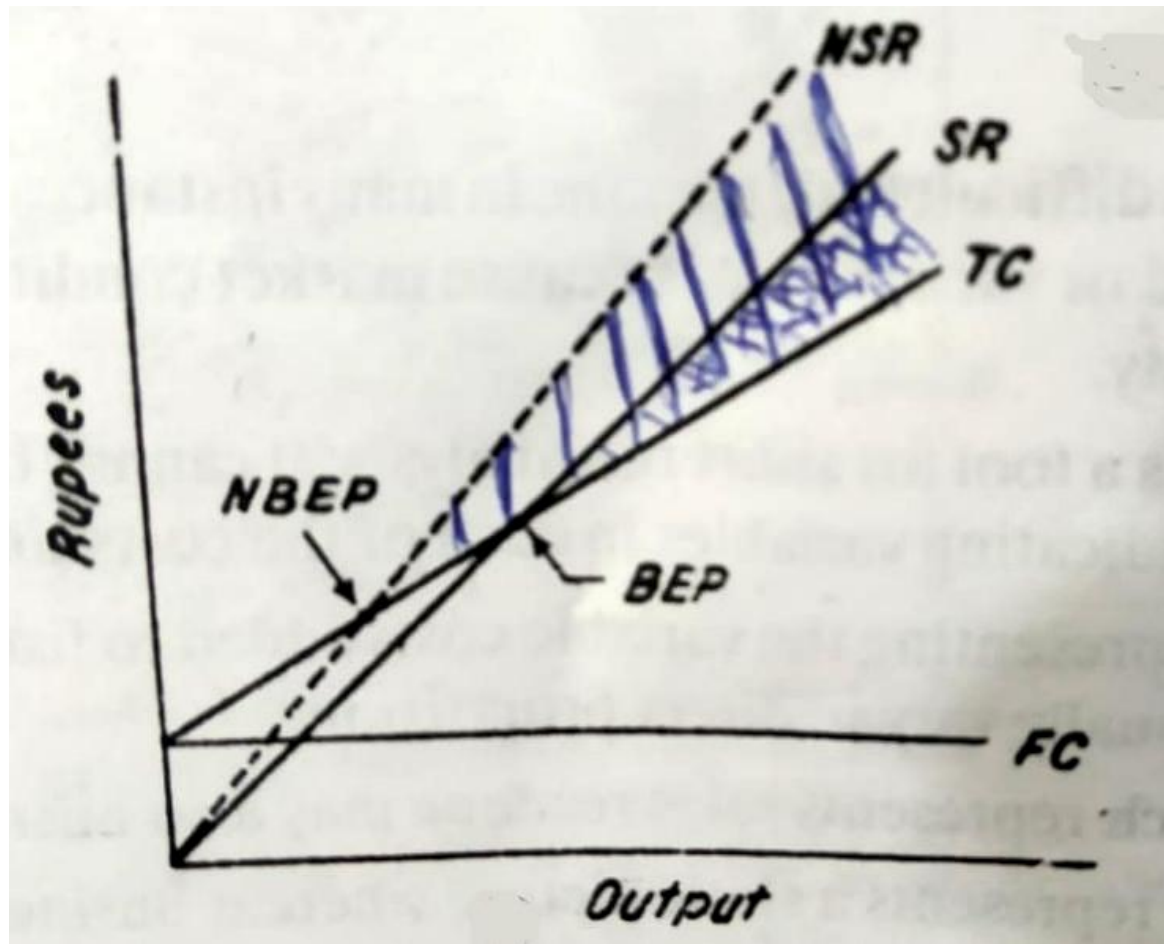
Effect of an increase in variable costs

An increase in variable cost and therefore in the total cost possibly due to increase in labour cost would shift the BEP towards Right Hand Side(RHS). This causes the decrease in profit for the same output and vice-versa.



Effect of an increase in Sales revenue

If the price of an item (goods) increase a new sales revenue will be drawn with a greater slopes .This will shift the BEP towards Left Hand Side(LHS). This causes the increase in profit for the same output and vice-versa.



Example: The fixed cost for the year 2019 are Rs. 80000. The estimated sales for the period are valued at Rs. 200000. The variable cost per unit for the single product made is Rs. 4. if each unit sales at Rs. 20 and the number of units involved coincides with the expected volume of output , construct the Break Even Chart.

1. Determine the Break Even Point
2. Above how many units the company should produce in order to seek profit.
3. Determine the profit earned at a turn of Rs. 160000
4. Find the Margin of Safety.
5. Measure the angle of Incidence.

Answer:

Given: Fixed Cost(F) = Rs. 80000

Variable Cost per Unit(V)=Rs. 4

Selling price of each item(P)=Rs. 20

Estimated Sales(S)=Rs. 200000

Hence, No. of units sold = $\frac{S=\text{Rs. } 200000}{P=\text{Rs. } 20} = 10000$

Purchase/Selling price for Total unit(P)=Rs.20 X 10000

For BEP, $\text{BEP} = \frac{F}{1 - \frac{V}{P}} = \frac{80000}{1 - \frac{40000}{20 \times 10000}} = 100,000$

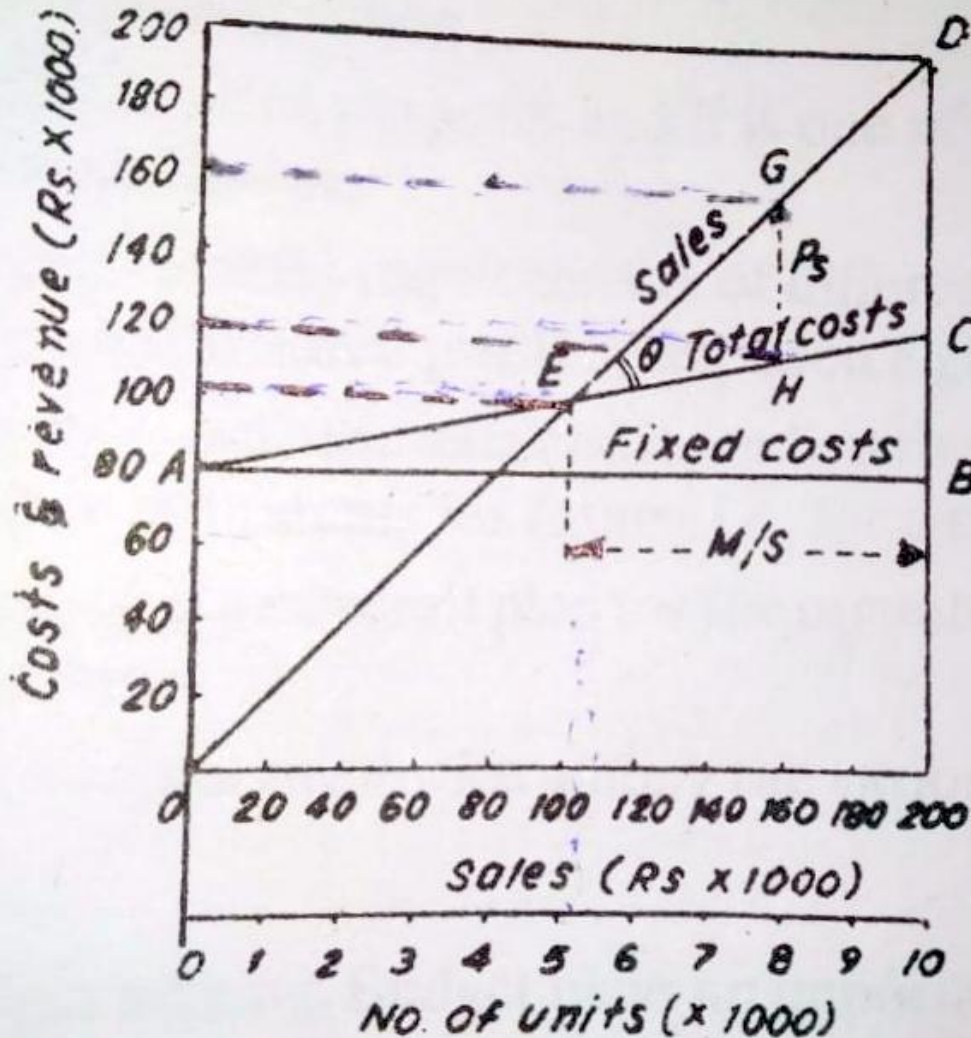
Variable Cost= No. of units X variable cost per unit

$$V = 10000 \times 4 = \text{Rs. } 40000$$

Procedure to draw Break Even Chart:

- Draw the fixed cost line(AB) at Rs. 80000 on the graph paper.
- Variable Cost varies from 0 at 0 unit to Rs. 40000 at 10000 units.
- Draw variable cost line (AC) above the fixed cost line. The variable cost when added to fixed cost gives the total cost.

- Sales revenue is zero at 0 units and it is 200000 at 10000units. Therefore draw the sales revenue line OD.



$$P_s = (160 - 120) \times 10000 = 40000$$

- I. In the break even chart, point E represents the break even point. It is at 5000 units or Rs. 100000, i.e., where production when sold will return Rs. 100000 in reverse to the company.
- II. The company should produce and sell more than 5000 to seek profit.
- III. The profit earned at a turnover of Rs. 160000 is marked by Ps in Fig. and it is equal to Rs. 40000.
- IV. The margin of safety at 10000 units has been marked by M/S and it is = Total Sales – Sales figure at B.E.P.
= Rs. 200000 – 100000 = **Rs.100000**

Also, margin of safety when represented as a percentage is

$$\begin{aligned} &= \frac{\textit{Margin of safety}}{\textit{Total sales}} \times 100 \\ &= \frac{100000}{200000} \times 100 = 50\% \end{aligned}$$

The angle of incidence θ has been marked and is 34.3° .