Engineering economics
&
law

GNE 502

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Course Content

- Module 1: Introduction to Engineering Economics
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Course Content

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MODULE 2

Costing in Production systems

Module 2: Costing in Production Systems

Module Learning Outcomes

At the end of this module students are expected to be able to;

- **Understand and explain the relevance of costing in production systems**
- **Identify and explain various elements of cost/cost terminologies.**
- **Solve basic cost problems using defined equations.**

MODULE 2

BASIC ELEMENTS OF COSTS

Cost can be broadly classified into *variable cost* and *overhead cost*.

Variable cost varies with the volume of production while overhead cost is fixed, irrespective of the production volume.

Direct material costs are those costs of materials that are used to produce the product.

Overhead cost is the aggregate of indirect material costs, indirect labour costs and indirect expenses.

OTHER COSTS/REVENUES

The following are the costs/revenues other than the costs which are presented in the previous section:

- Marginal cost
- Marginal revenue
- Sunk cost
- Opportunity cost

Marginal Cost

- Marginal cost of a product is the cost of producing an additional unit of that product. Let the cost of producing 20 units of a product be ₦ 10,000, and the cost of producing 21 units of the same product be ₦10,045. Then the marginal cost of producing the 21st unit is ₦ 45.

Marginal Revenue

- Marginal revenue of a product is the incremental revenue of selling an additional unit of that product. Let, the revenue of selling 20 units of a product be ₦15,000 and the revenue of selling 21 units of the same product be ₦15,085. Then, the marginal revenue of selling the 21st unit is ₦85.

Sunk Cost

- This is known as the past cost of an equipment/asset. Let us assume that an equipment has been purchased for ₦100,000 about three years back. If it is considered for replacement, then its present value is not ₦100,000. Instead, its present market value should be taken as the present value of the equipment for further analysis. So, the purchase value of the equipment in the past is known as its sunk cost. The sunk cost should not be considered for any analysis done from now onwards.

Opportunity Cost

- In practice, if an alternative (*X*) is selected from a set of competing alternatives (*X*,*Y*), then the corresponding investment in the selected alternative is not available for any other purpose. If the same money is invested in some other alternative (*Y*), it may fetch some return. Since the money is invested in the selected alternative (*X*), one has to forego the return from the other alternative (*Y*). The amount that is foregone by not investing in the other alternative (*Y*) is known as the opportunity cost of the selected alternative (*X*).

BREAK-EVEN ANALYSIS

The main objective of break-even analysis is to find the cut-off production volume from where a firm will make profit.

Let

s = selling price per unit

v = variable cost per unit

FC = fixed cost per period

Q = volume of production

The total sales revenue (S) of the firm is given by the following formula:

$$S = s \quad + Q$$

The total cost of the firm for a given production volume is given as

TC = Total variable cost + Fixed cost

$$= v \;\; Q + FC$$

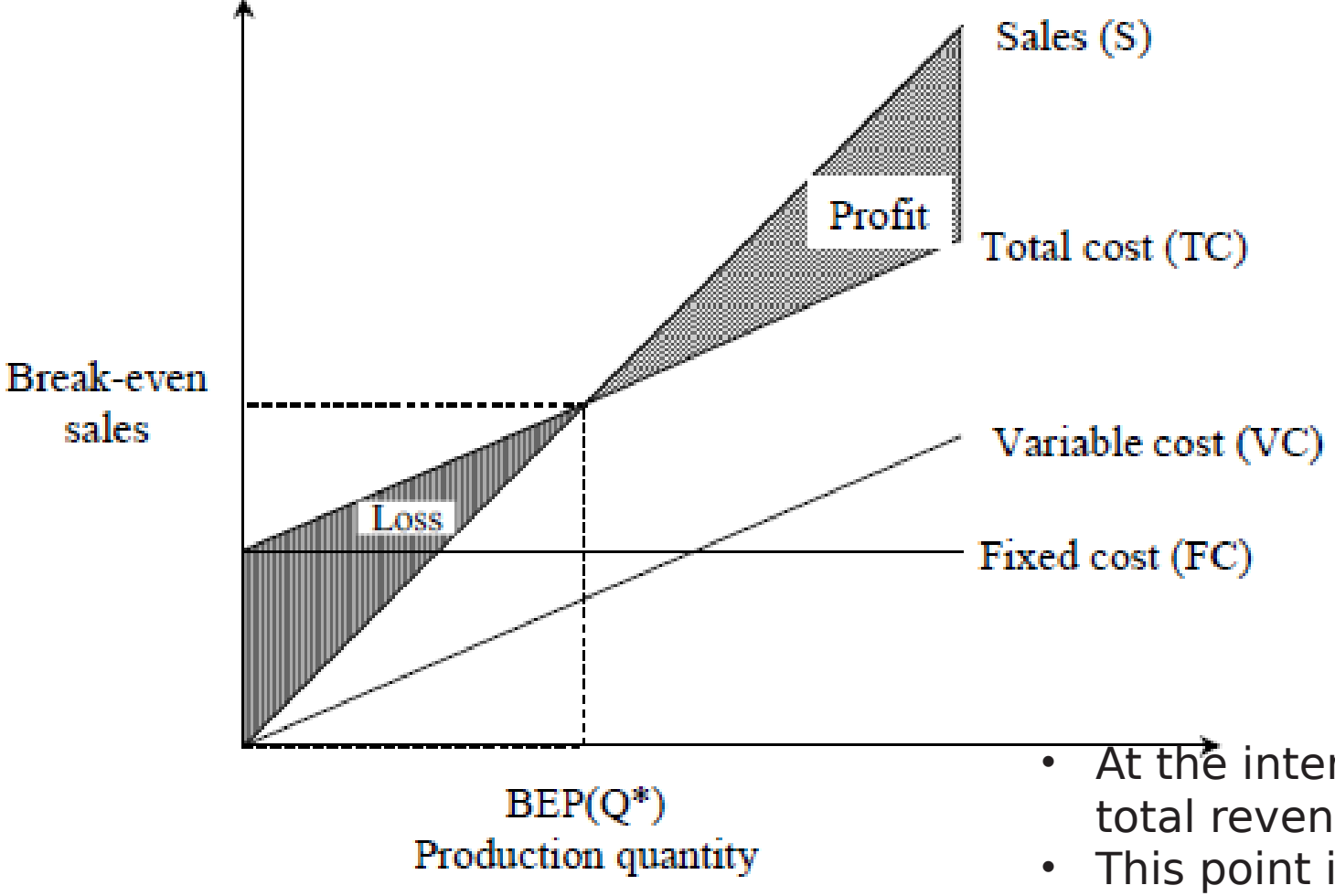

Fig. 1.3 Break-even chart.

- At the intersection point, the total cost is equal to the total revenue.
- This point is also called the no-loss or no-gain situation.
- For any production quantity which is less than the break-even quantity, the total cost is more than the total revenue.
  Hence, the firm will be making loss.
- For any production quantity which is more than the break-even quantity, the total revenue will be more than the total cost. Hence, the firm will be making

Profit = Sales – (Fixed cost + Variable costs)

= (*s)* – (*FC* + *v*) .....(1)

= (*s* x *Q)* – (*FC* + *v* x*Q*) .....(2)

The formulae to find the break-even quantity and break-even sales quantity

Break-even quantity = ...(3)

= (in units)

Break-even sales = x Selling price/unit

= x (₦)

Contribution and Margin of Safety

The contribution is the difference between the sales and the variable costs. The margin of safety (M.S.) is the sales over and above the break-even sales. The formulae to compute these values are;

Contribution = Sales – Variable costs

Contribution/unit = Selling price/unit – Variable cost/unit

M.S. = Actual sales – Break-even sales

=

EXAMPLE

Alpha Associates has the following details:

Fixed cost = ₦ 2,000,000

Variable cost per unit = ₦100

Selling price per unit = ₦ 200

Find

(a) The break-even sales quantity,

(b) The break-even sales

(c) If the actual production quantity is 60,000,

find (i) contribution; and

(ii) margin of safety.

Solution

- Fixed cost (FC) = ₦ 2,000,000
- Variable cost per unit (v) = ₦100
- Selling price per unit (s) = ₦ 200

(a) Break-even quantity = = = 20,000 units

(b) Break-even sales = x s = x 200 = ₦ 4,000,000

(c) (i) Contribution = Sales – Variable cost

= $(s \ x \ Q) - (v \ x \ Q)$

= 200 x 60,000 – 100 x 60,000

= 12,000,000 – 6,000,000

= ₦ 6,000,000

(ii) Margin of Safety = Actual sales – Break-even sales

= (60,000 x 200) – 4,000,000

= 12,000,000 – 4,000,000

= 8,000,000

PROFIT/VOLUME RATIO (*P/V* RATIO)

P/V ratio is a valid ratio which is useful for further analysis. The different formulae for the *P/V* ratio are as follows:

P/V ratio = $\frac{\text{Contribution}}{\text{Sales}}$ =

Also,

BEP =

And

M.S =

Practice Questions

1. Consider the following data of a company for the year 1997:

   Sales = ₦ 120,000, Fixed cost = ₦ 25,000, Variable cost = ₦ 45,000

   Find the following:

   (a) Contribution (b) Profit

   (c) BEP (d) M.S.

2. Consider the following data of a company for the year 1998:

   Sales = Rs. 80,000, Fixed cost = Rs. 15,000, Variable cost = 35,000

   Find the following:

   (a) Contribution (b) Profit

   (c) BEP (d) M.S.

References

1. **Engineering Economics by R. Panneerselvam (2001).** PHI Learning Private Limited, New Delhi.
2. **Contemporary Engineering Economics by** Chan S. Park (2007) (4th Ed.) Pearson Education, Inc.

Module 2b: Costing in Production Systems

Module Learning Outcomes

At the end of this module students are expected to be able to;

- **Understand and explain the relevance of costing in production systems**
- **Identify and explain various elements of cost/cost terminologies.**
- **Solve basic cost problems using defined equations.**
- **Understand the place of cost control**
- **List the various cost control techniques**

COST PLANNING AND CONTROL

- Cost control is the practice of identifying and reducing business expenses to increase profits, and it starts with the budgeting process.
- A business owner compares actual results to the budget expectations, and if actual costs are higher than planned, management takes action.
- As an example, a company can obtain bids from other vendors that provide the same product or service, which can lower costs.

Key Organs of Cost Control

- Identify and define what real costs should be.
- It is most often not the same with what they actually are in real time.

Cost Control Techniques

- Careful and realistic budgeting.
- Budget Control/monitoring.
- Careful management of workforce.
  - Layoff
  - Recruit
  - Outsourcing (e.g Marketing)

Cost Control Techniques (cont’d)

- Manage inventory to minimize waste
- Monitor Purchasing

Practice Questions

1. What is Cost Control?
2. Identify 2 objectives of cost control
3. List and explain 3 techniques of cost control you know

References

1. **Engineering Economics by R. Panneerselvam (2001).** PHI Learning Private Limited, New Delhi.
2. **Contemporary Engineering Economics by** Chan S. Park (2007) (4th Ed.) Pearson Education, Inc.
3. Video sourced from Investopedia.com