



Ministry of Higher Education and Scientific Research

Al-Mustaqbal University College

Chemical Engineering and Petroleum Industries Department

# Chemical Engineering Economics

## Fourth Stage

### Lecture No.1

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**Course Syllabus**

- 1- Outline and basic relationships for accounting costs , Revenues and Profits .**
- 2- Estimation of Capital Costs .**  
Rapid estimation , Factorial method , Cost index , Computer tools for cost estimation , Location and design factors .
- 3- Estimation of Purchased Cost for Common Chemical Processes Equipment .**
- 4- Estimation of Production Costs and Revenues**  
Utilities , Consumable materials , Waste – Disposal and Labour costs , By –

**References:**

- Peters M X, Timmerhaus K.D.2003, PLANT DESIGN AND ECONOMICS FOR CHEMICAL ENGINEERS, 5th Ed. McGraw-Hill, Inc.
- Panneerselvam R. 2012, Engineering Economics, PHI Learning Private Limited, New Delhi.
- Couper J.R, 2003, PROCESS ENGINEERING ECONOMICS, Marcel Dekker, Inc. USA.

**Economics**

Economics is the science that deals with the production and consumption of goods and services and the distribution and rendering of these for human welfare.

The following are the economic goals:

- A high level of employment
- Price stability
- Efficiency
- An equitable distribution of income
- Growth

Some of the above goals are interdependent. The economic goals are not always complementary; in many cases they are in conflict. For example, any move to have a significant reduction in unemployment will lead to an increase in inflation.

**Economic Efficiency**

Economic efficiency is the ratio of output to input of a business system.

$$\text{Economic efficiency (\%)} = \frac{\text{Output}}{\text{Input}} \times 100 = \frac{\text{Worth}}{\text{Cost}} \times 100$$

‘Worth’ is the annual revenue generated by way of operating the business and ‘cost’ is the total annual expenses incurred in carrying out the business. For the survival and growth of any business, the economic efficiency should be more than 100%.

Economic efficiency is also called ‘productivity’. There are several ways of improving productivity, such as increased output for the same input or decreased input for the same output.

**Cost Accounting**

Cost accounting is an accounting process that measures all of the costs associated with production, including both fixed and variable costs. The purpose of cost accounting is to assist management in decision-making processes that optimize operations based on efficient cost management.

**Direct vs. Indirect Costs**

Direct costs are fairly straightforward in determining their cost object. For example, Ford Motor Company (F) manufactures automobiles and trucks.

The steel and bolts needed for the production of a car or truck would be classified as direct costs. However, an indirect cost would be the electricity

for the manufacturing plant. Although the electricity expense can be tied to the facility, it can't be directly tied to a specific unit and is, therefore, classified as indirect.

### **Fixed vs. Variable Costs**

Direct costs do not need to be fixed in nature, as their unit cost may change over time or depending on the quantity being utilized. An example is the salary of a supervisor that worked on a single project. This cost may be directly attributed to the project and relates to a fixed dollar amount. Materials that were used to build the product, such as wood or gasoline, might be directly traced but do not contain a fixed dollar amount. This is because the quantity of the supervisor's salary is known, while the unit production levels are variable based upon sales.

### **Revenue**

Revenue is the total amount of income generated by the sale of goods or services related to the company's primary operations. Revenue, also known as gross sales, is often referred to as the "top line" because it sits at the top of the income statement. Income, or net income, is a company's total earnings or profit. When investors and analysts speak of a company's income, they're actually referring to net income or the profit for the company.

### **Profit**

The term "bottom line" is commonly used in reference to any actions that may increase or decrease net earnings or a company's overall profit. A company that is growing its earnings or reducing its costs is said to be improving its bottom line. Most companies aim to improve their bottom lines through two simultaneous methods: increasing revenues (i.e., generate top-line growth) and improving efficiency (or cutting costs).

**Profit = Sales – (Fixed cost + Variable costs)**

**Gross profit** is revenue minus the cost of goods sold (COGS), which are the direct costs attributable to the production of the goods sold in a company. This amount includes the cost of the materials used in creating the good along with the direct labor costs used to produce the good.

**Gross Profit = Revenue – Production Cost or (COGS)**

$$g_j = s_j - C_{o_j}$$

**Net profit** refers to the amount of money left after all the expenses have been subtracted from revenues.

Net profit is commonly referred to as the “bottom line” because it appears at the bottom portion of an income statement. It may also be called net income or net earnings.

**Net Profit = Gross Profit – Taxes**

$$Np_j = G_j (1 - \Phi)$$

$$\text{Income taxes} = G_j \Phi$$

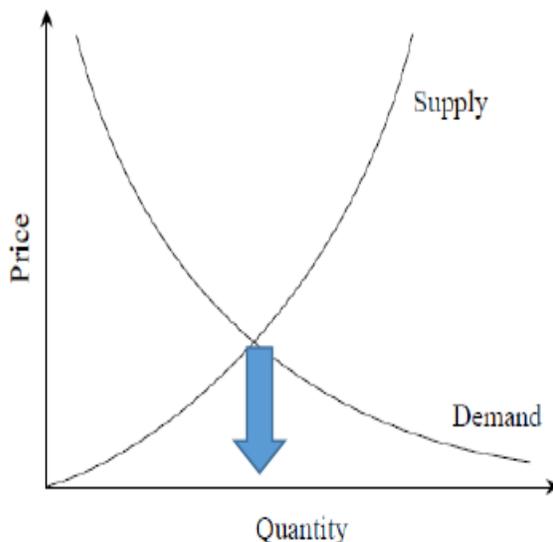
**Operating profit** is gross profit minus all other fixed and variable expenses associated with operating the business, such as rent, utilities, and payroll.

**Operating Profit = Gross Profit - Operating Expenses - Depreciation – Amortization**

**Cost of goods sold (COGS)** refers to the direct costs of producing the goods sold by a company. This amount includes the cost of the materials and labor directly used to create the good. It excludes indirect expenses, such as distribution costs and sales force costs.

**Capital costs** are one-time expenditures on the construction, enhancement, or acquisition of assets such as equipment and land that will benefit the project for more than one financial year.

**Capital cost = Fixed capital cost + Working capital cost + Land cost**



**A demand curve** is almost always downward-sloping, reflecting the willingness of consumers to purchase more of the commodity (goods) at lower price levels.

**A supply curve** is usually upward-sloping, reflecting the willingness of producers to sell more of the commodity they produce in a market with higher prices.

In equilibrium the quantity of a good supplied by producers equals the quantity demanded by consumers.