

COST CONCEPTS AND DESIGN ECONOMICS



COST ESTIMATING

Used to describe the process by which the present and future cost consequences of engineering designs are forecast

COST ESTIMATING USED TO

- **Provide information used in setting a selling price for quoting, bidding, or evaluating contracts**
- **Determine whether a proposed product can be made and distributed at a profit (EG: price = cost + profit)**
- **Evaluate how much capital can be justified for process changes or other improvements**
- **Establish benchmarks for productivity improvement programs**

COST ESTIMATING APPROACHES

- **Top-down Approach**
- **Bottom-up Approach**

TOP-DOWN APPROACH

- Uses historical data from similar engineering projects
- Used to estimate costs, revenues, and other parameters for current project
- Modifies original data for changes in inflation / deflation, activity level, weight, energy consumption, size, etc...
- Best use is early in estimating process

BOTTOM-UP APPROACH

- More detailed cost-estimating method
- Attempts to break down project into small, manageable units and estimate costs, etc....
- Smaller unit costs added together with other types of costs to obtain overall cost estimate
- Works best when detail concerning desired output defined and clarified

CASH COST VERSUS BOOK COST

- Cash cost is a cost that involves payment in cash and results in cash flow;
- Book cost or noncash cost is a payment that does not involve cash transaction; book costs represent the recovery of past expenditures over a fixed period of time;
- Depreciation is the most common example of book cost; depreciation is what is charged for the use of assets, such as plant and equipment; depreciation is not a cash flow;

SUNK COST AND OPPORTUNITY COST

- A sunk cost is one that has occurred in the past and has no relevance to estimates of future costs and revenues related to an alternative course of action;
- An opportunity cost is the cost of the best rejected (i.e., foregone) opportunity and is hidden or implied;

LIFE-CYCLE COST

Life-cycle cost is the summation of all costs, both recurring and nonrecurring, related to a product, structure, system, or service during its life span.

Life cycle begins with the identification of the economic need or want (the requirement) and ends with the retirement and disposal activities.

CAPITAL AND INVESTMENT

- Investment Cost or capital investment is the capital (money) required for most activities of the acquisition phase;
- Working Capital refers to the funds required for current assets needed for start-up and subsequent support of operation activities;
- Operation and Maintenance Cost includes many of the recurring annual expense items associated with the operation phase of the life cycle;
- Disposal Cost includes non-recurring costs of shutting down the operation;

FIXED, VARIABLE, AND INCREMENTAL COSTS

- Fixed costs are those unaffected by changes in activity level over a feasible range of operations for the capacity or capability available.
- Typical fixed costs include insurance and taxes on facilities, general management and administrative salaries, license fees, and interest costs on borrowed capital.
- When large changes in usage of resources occur, or when plant expansion or shutdown is involved fixed costs will be affected.

FIXED, VARIABLE AND INCREMENTAL COSTS

- Variable costs are those associated with an operation that vary in total with the quantity of output or other measures of activity level.
- Example of variable costs include : costs of material and labor used in a product or service, because they vary in total with the number of output units -- even though costs per unit remain the same.

RECURRING AND NONRECURRING COSTS

- Recurring costs are repetitive and occur when a firm produces similar goods and services on a continuing basis.
- Variable costs are recurring costs because they repeat with each unit of output .
- A fixed cost that is paid on a repeatable basis is also a recurring cost:
 - Office space rental



RECURRING AND NONRECURRING COSTS

- **Nonrecurring costs are those that are not repetitive, even though the total expenditure may be cumulative over a relatively short period of time;**
- **Typically involve developing or establishing a capability or capacity to operate;**
- **Examples are purchase cost for real estate upon which a plant will be built, and the construction costs of the plant itself;**

DIRECT, INDIRECT AND OVERHEAD COSTS

- Direct costs can be reasonably measured and allocated to a specific output or work activity -- labor and material directly allocated with a product, service or construction activity;
- Indirect costs are difficult to allocate to a specific output or activity -- costs of common tools, general supplies, and equipment maintenance ;

DIRECT, INDIRECT AND OVERHEAD COSTS

- Overhead consists of plant operating costs that are not direct labor or material costs
 - indirect costs, overhead and burden are the same;
- Prime Cost is a common method of allocating overhead costs among products, services and activities in proportion the sum of direct labor and materials cost ;

STANDARD COSTS

- Representative costs per unit of output that are established in advance of actual production and service delivery;

<u>Standard Cost Element</u>	<u>Sources of Data</u>
Direct Labor +	Process routing sheets, standard times, standard labor rates;
Direct Material +	Material quantities per unit, standard unit materials cost;
Factory Overhead Costs	Total factory overhead costs allocated based on prime costs;

SOME STANDARD COST USES

- **Estimating future manufacturing or service delivery costs;**
- **Measuring operating performance by comparing actual cost per unit with the standard unit cost;**
- **Preparing bids on products or services requested by customers;**
- **Establishing the value of work-in-process and finished inventories;**

FIXED, VARIABLE AND INCREMENTAL COSTS

- **incremental cost** is the additional cost that results from increasing the output of a system by one (or more) units.
- Incremental cost is often associated with “go / no go” decisions that involve a limited change in output or activity level.

EXAMPLE

- the incremental cost of driving an automobile might be \$0.27 / mile. This cost depends on:
 - mileage driven;
 - mileage expected to drive;
 - age of car;

CONSUMER GOODS AND PRODUCER GOODS AND SERVICES

- Consumer goods and services are those that are directly used by people to satisfy their wants;
- Producer goods and services are those used in the production of consumer goods and services: machine tools, factory buildings, buses and farm machinery are examples;