

# ECONOMIC DESIGN CRITERIA

## BASIC ECONOMIC TERMS

- Total Capital Investment,  $TCI$  or  $I$

(Total Capital Investment) = (Fixed Capital Investment) +  
(Working Capital)

$$TCI = FCI + WC$$

- Fixed Capital Investment,  $FCI$  or  $I_F$

$FCI = (\text{Direct Costs}) + (\text{Indirect Costs})$

- Working Capital,  $WC$  or  $I_W$

Cash, raw materials, stock, etc. About 10-20% of  $TCI$ .



## BASIC ECONOMIC TERMS

- Product Cost,  $C$

$$C = C_I + C_Q + C_O + C_G$$

- Fixed Charges,  $C_I$

Do not depend on production level (insurance, property taxes, depreciation, rent etc.)

- Direct Production Cost,  $C_Q$

Labor, utilities, raw materials, maintenance, supplies, royalties etc.

- Plant Overhead,  $C_O$

Recreation, employee facilities, packaging etc.

- General Expenses,  $C_G$

Administration, marketing, R&D, distribution.



## BASIC ECONOMIC TERMS

• Income from Sales,  $S$  in (\$/yr)

• Gross Earnings,  $R$  in (\$/yr)

$$R = S - C$$

• Net Earnings,  $P$  in (\$/yr)

$$P = R - eI_F - (R - dI_F)t$$

(Net Profit) = (Gross) - (Amortization) - (Taxes)

• Depreciation rate

Recovery of Investment,  $e$

Taxation purposes,  $d$

Straight line depreciation,  $e=1/n$

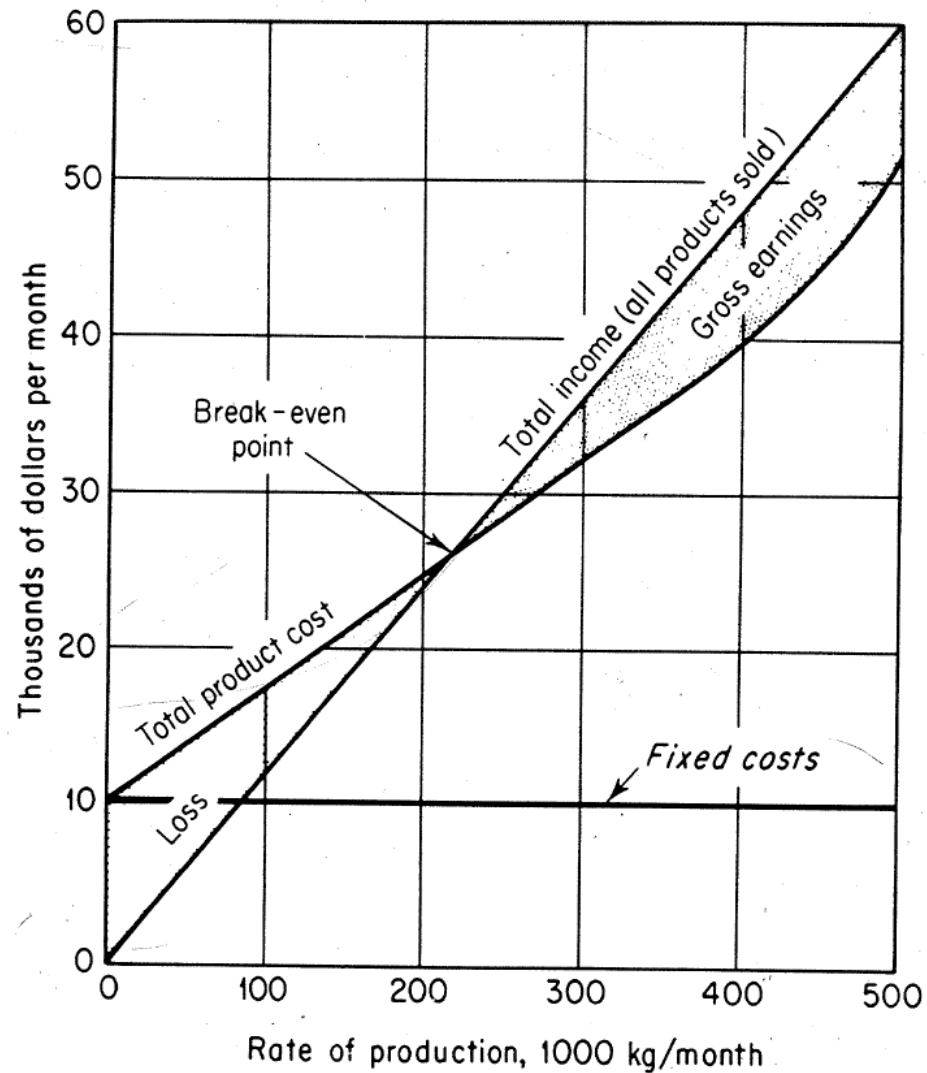
Depreciation with capital reinvestment  
(sinking fund method,  $i$  is interest)

$$e = \frac{i}{(1+i)^n - 1}$$



# BASIC ECONOMIC TERMS (break-even chart)

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**FIGURE 6-3**  
Break-even chart  
cessing plant.



## BASIC ECONOMIC TERMS

### Salvage Value

Net cash obtainable from the sale of used property (above charges for removal and sale)

Scrap value: Salvage value after dismantling a unit.

### Present Value

Book Value : (Total Capital Investment) - (All Depreciation)

Market Value : Cash obtainable from selling the unit.

Replacement Value : Cost of obtaining the same property.



## BASIC ECONOMIC TERMS

### Depreciation

Reduction in value due to any causes.

Example: Pump

Cost :  $C_V = \$12,000$

Scrap value :  $V_S = \$2,000$

Depreciation :  $C_V - V_S = \$10,000$

For engineers, depreciation is considered as a cost for using the equipment.



# DEPRECIATION

## Types Of Depreciation

Physical: Wear and Tear, corrosion, accidents, age deterioration.

Functional: All other causes.

Obsolescence: Due to technological advances.

Depletion: Loss due to materials consumed. Applicable to Natural Resources (timber, mineral, oil deposits)

**IRS**: "A reasonable allowance for the exhaustion, wear and tear of property used in the trade or business including a reasonable allowance for obsolescence"



## BASIC ECONOMIC TERMS

### Service Life

The IRS has determined various values  
(See Peters et al., 2003, for complete list).

Group 1: General Business Assets. (Office furniture, Land, Buildings, etc)

Group 2: Non-manufacturing activities: (Agriculture, Fishing, Mining, etc.)

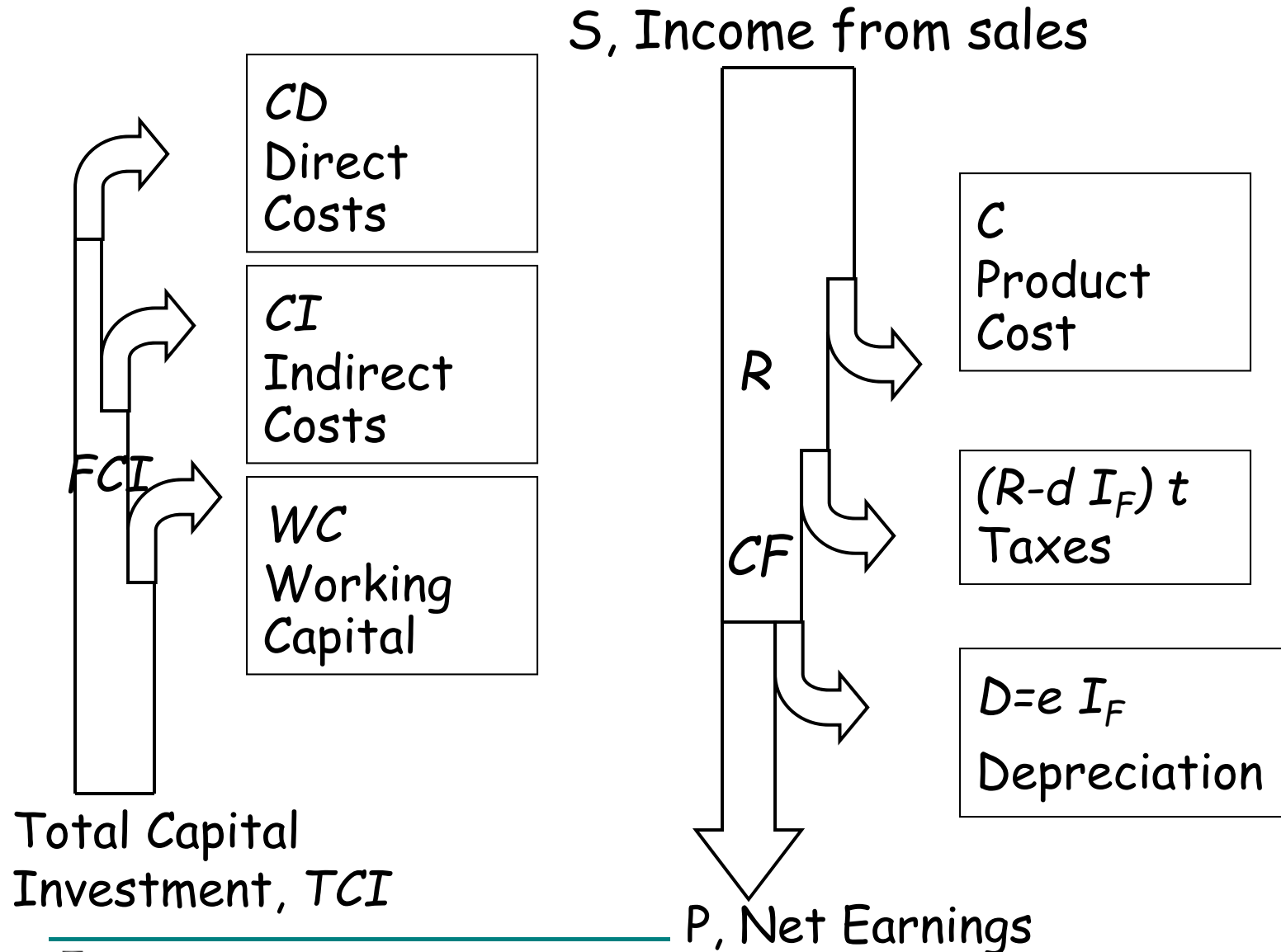
Group 3: Manufacturing, e.g. Petroleum Refining: 16 years. Chemicals 11 years.

Group 4: Transportation, Communication and Public Utilities: (Electrical, Gas, Motor transport, Radio and TV broadcasting, railroad, etc.)





# BASIC ECONOMIC TERMS



# BASIC ECONOMIC TERMS

## Cumulative Cash Position (Figs 9.12, 10.1)

