

8.COST ESTIMATION

Fixed capital investment = \$ 3228500 (year 1979)

Capacity at that year, $Q_1 = 6.795 \times 10^3$ tons / yr.

$$C_2 = C_1(Q_2/Q_1)^n$$

$$n = 0.6$$

Considering 300 days,

Given capacity, $Q_2 = 75000$ tons/yr

$$C_2 = 3228500(75000/6795)^{0.6}$$

$$= 13.64 \times 10^6 \$$$

$$= 654.6 \times 10^6 \text{Rs}$$

Cost index in the year 1979 = 230

Cost index in the year 2002 = 402

n – fixed capital investment

$$n_2 = n_1(C_2/C_1)$$

$$= 654.6 \times 10^6 (402/230)$$

$$= 1144 \times 10^6 \text{Rs.}$$

Fixed capital investment for 75000 tons / yr capacity

$$= 1144 \times 10^6 \text{Rs}$$

Estimation of total capital investment :

I.Direct cost:

A. Equipment, installation, piping etc.

1. Purchased equipment (30% of fixed capital investment)

$$= 0.3 \times 1144 \times 10^6$$

$$= 343.2 \times 10^6 \text{Rs.}$$

2. Installation, including insulation and painting

(30% of purchased equipment)

$$= 0.3 \times 343.2 \times 10^6$$

$$= 102.96 \times 10^6 \text{ Rs.,}$$

3. Instrumentation and controls, installed (10% of purchased equipment)

$$= 0.1 \times 343.2 \times 10^6$$

$$= 34.32 \times 10^6 \text{ Rs.}$$

4.Piping, installed (20% of purchased equipment)

$$= 0.2 \times 343.2 \times 10^6$$

$$= 68.64 \times 10^6 \text{ Rs.}$$

5.Electrical, installed (15% of purchased equipment)

$$= 0.15 \times 343.2 \times 10^6$$

$$= 51.48 \times 10^6 \text{ Rs.}$$

B. Buildings (20% of purchased equipment cost)

$$= 0.2 \times 343.2 \times 10^6$$

$$= 68.64 \times 10^6 \text{ Rs.}$$

C. Service facilities and yard improvements:

(60% of purchased equipment)

$$= 0.6 \times 343.2 \times 10^6$$

$$= 205.92 \times 10^6 \text{ Rs.}$$

D. Land (5% of purchased equipment)

$$= 17.1 \times 10^6 \text{ Rs.}$$

Direct cost = 893.32×10^6 Rs.

II. Indirect cost :-

1. Engineering and supervision (10% of direct cost)

$$= 89.23 \times 10^6 \text{ Rs.}$$

2. Construction expense and contractor's fee

(11% of direct cost)

$$= 93.85 \times 10^6 \text{ Rs.}$$

3. Contingency (6% of fixed capital investment)

$$= 0.06 \times 1144 \times 10^6$$

$$= 68.64 \times 10^6 \text{ Rs}$$

Indirect cost = 251.7×10^6 Rs.

Total capital investment = fixed capital investment + working capital

Let working capital = 15% of total capital investment

Fixed capital investment = 1144×10^6 Rs.

Total capital investment = 1345×10^6 Rs.

Estimation of total product cost:

I. Manufacturing cost

A. Fixed charges:

1. Depreciation (10% of fixed capital investment + 2% of building)

$$= 114.4 \times 10^6 + 1.37 \times 10^6$$

$$= 116 \times 10^6 \text{ Rs.}$$

2. Local taxes (3% of fixed capital investment)

$$= 34.32 \times 10^6 \text{ Rs}$$

.

3. Insurance (0.8% of fixed capital investment)

$$= 9.15 \times 10^6 \text{ Rs.}$$

$$\text{Fixed charges} = 159.5 \times 10^6 \text{ Rs.}$$

Let fixed charge be 15% of total product cost

$$\begin{aligned} \text{Total product cost} &= 159.5 \times 10^6 / 0.15 \\ &= 1063.14 \times 10^6 \text{ Rs} \end{aligned}$$

B.Direct production cost:

1.Raw materials (15% of total product cost)

$$= 159.45 \times 10^6 \text{ Rs.}$$

2.Operating labor (11% of total product cost)

$$= 116.93 \times 10^6 \text{ Rs.}$$

3.Direct supervisory and clerical labor (15% of operating labor)

$$= 17.53 \times 10^6 \text{ Rs.}$$

4.Utilities (15% of total product cost)

$$= 159.45 \times 10^6 \text{ Rs.}$$

5 .Maintenance and repairs (5% of fixed capital investment)

$$= 57.2 \times 10^6 \text{ Rs.}$$

6.Operating supplies [15% of maintenance and repairs)

$$= 8.58 \times 10^6 \text{ Rs}$$

7.Laboratory charges (15% of operating labor)

$$= 17.53 \times 10^6 \text{ Rs.}$$

8.Patents and royalties (3% of total product cost)

$$= 31.89 \times 10^6 \text{ Rs.}$$

C. Plant overhead costs (5% of total product cost)

$$= 53.16 \times 10^6 \text{ Rs.}$$

I. Manufacturing cost = Fixed charges + direct production cost + plant
overhead cost

$$= 780.3 \times 10^6 \text{ Rs.}$$

II. General Expenses:

A. Administrative costs (5% of total product cost)

$$= 53.15 \times 10^6 \text{ Rs.}$$

B. Distribution and selling costs (14% of total product cost)

$$= 148.82 \times 10^6 \text{ Rs.}$$

C. Research and development costs (5% of total product cost)

$$= 53.15 \times 10^6 \text{ Rs.}$$

D. Financing (2% of total capital investment)

$$= 26.9 \times 10^6 \text{ Rs.}$$

General expenses = $282.7 \times 10^6 \text{ Rs.}$

Total product cost = manufacturing cost + general expenses

$$= 1063 \times 10^6 \text{ Rs.}$$

Cost of the product = $(1063 \times 10^6) / (75000 \times 10^6)$

$$= 14 \text{ Rs/Kg}$$

With a profit margin of 20% = 1.2×14

$$= 17 \text{ Rs/Kg}$$

Gross annual earning = $17 \times 75000 \times 10^3$

$$\text{(GAE)} = 225 \times 10^6 \text{ Rs.}$$

Net annual earnings = GAE – Income tax

Income tax = 40% of GAE

Net annual earnings = 135×10^6 Rs

Payback period = (total capital investment) / (net annual earnings)

$$= \frac{1345 \times 10^6}{135 \times 10^6}$$

= 10 years

Rate of return = (net annual earnings) / (fixed capital investment)

$$= \frac{135 \times 210^6 \times 100}{1144 \times 10^6}$$

= 11.8%