

COST ESTIMATION AND ECONOMICS

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

C_1 = Fixed capital cost of a plant of Capacity Q_1

C_2 = Fixed capital cost of a plant of Capacity Q_2

$n = 0.6$.

For the year 1999.

Utilizing 8000 operating hours / year.

$$Q_1 = 50000 \text{ tons/year}$$

$$Q_2 = 66666.67 \text{ tons / year.}$$

$$C_1 = \$ 24000000.$$

$$\begin{aligned} C_2 &= 24000000 \times (66666.67 / 50000)^{0.6} \\ &= \$ 28.5 \times 10^6 \end{aligned}$$

Cost of the plant in 2002:

(Cost of plant in 2002 / Cost of plant in 1999) = (Cost index in 2002 / Cost index in 1999)

$$\begin{aligned} \text{Cost of plant in 2002} &= 28.5 \times 10^6 \times (402 / 389.9) \\ &= \$ 29.4 \times 10^6 \end{aligned}$$

Fixed Capital Investment (FCI) required = \$ 29.4 x 10⁶.
= Rs.1411.2 x 10⁶

I Direct cost:

(70 - 85 % of FCI)

A. 1. Purchased Equipment (PEC) (15 - 40% of FCI)

$$25\% \text{ of FCI} = \text{Rs } 352.8 \times 10^6$$

2. Installation including insulation and painting (25 - 55% of PEC)

$$30\% \text{ of PEC} = \text{Rs } 105.84 \times 10^6$$

3. Instrumentation and Controls , Installed (6 - 30 % of PEC)

$$25\% \text{ of PEC} = \text{Rs } 88.2 \times 10^6$$

- 4. Piping, Installed (10 - 80 % of PEC)
30% of PEC = Rs . 105.84 x 10⁶
- 5. Electrical ,Installed (10 - 40% of PEC)
25% of PEC = Rs. 88.2 x 10⁶
- B. Building, process and auxiliary (10 - 70% of PEC)
40% of PEC = Rs.141.12 x 10⁶
- C. Service Facilities and Yard Improvements (40 - 100% of PEC)
60% of PEC = Rs.211.68 x 10⁶
- D. Land (1- 2% of FCI or 4- 8% of PEC)
5% of PEC = Rs. 17.64 x 10⁶

Total Direct Cost = Rs.1111.32 x 10⁶

II Indirect Costs

(15 - 30 % of FCI)

- A. Engineering and Supervision (5 - 30 % of Direct Cost)
10% of Direct cost = Rs. 111.132 x 10⁶
- B. Construction Expense and Contractors Fee (6 - 30% of Direct cost)
10% of Direct costs = Rs. 111.132 x 10⁶
- C. Contingency (5- 15% of FCI)
5.5% of FCI = Rs. 77.616 x 10⁶

Total Indirect Cost = Rs 299.88 x 10⁶

III Working Capital

(10 - 20% of TCI)

15% of TCI = **Rs. 249.035 x 10⁶**

IV Total Capital Investment (TCI)

TCI = FCI + Working Capital

TCI = Rs. 1660.23 x 10⁶

ESTIMATION OF TOTAL PRODUCT COST (TPC):

I Manufacturing Cost

A. Fixed Charges (10 - 20% of TPC)

- 1. Depreciation (10% of FCI + 2 - 3% of building value for building)
10% of FCI + 2.5% of Building value = Rs. 144.648 x 10⁶
- 2. Local Taxes (1-4% of FCI)

- 4% of FCI = Rs 56.448 x 10⁶
3. Insurance (0.4 - 1% of FCI)
0.7% of FCI = Rs. 9.878 x 10⁶

Total Fixed Charges = Rs. 210.97 x 10⁶

Total Product Cost

$$\begin{aligned} \text{TPC} &= \text{Fixed Charges} / 0.15 \\ &= \text{Rs. 1406.467 x 10}^6 \end{aligned}$$

B. Direct Production Costs (about 60 % of TPC)

1. Raw Materials (10 - 50 % of TPC)
10% of TPC = Rs . 140. 64
2. Operating Labor (10 - 20 % of TPC)
15% of TPC = Rs.210.97
3. Direct Supervisory and Clerical Labor (10 - 25 % of Operating labor)
15% of Operating Labor = Rs. 31.64
4. Utilities (10 - 20% of TPC)
10 % of TPC = Rs 140. 64
5. Maintenance and Repairs (2- 10% of FCI)
5% of FCI = Rs. 70.56
6. Operating supplies (10 - 20% of cost for maintenance and repairs)
15% of cost for maintenance and repairs = Rs. 10.584
7. Laboratory Charges (10 - 20% of Operating Labor)
15% of Operating Charges = Rs 31.645
8. Patents and Royalties (0 - 6% of TPC)
2% of TPC = Rs 28.13

Total Direct Production Cost = Rs 664.808x 10⁶

C. Plant Overhead Cost (5 - 10% of TPC)

$$7\% \text{ of TPC} = \text{Rs } 98.453$$

Total Manufacturing Cost = Rs . 974.231

II General Expenses

- A. Administrative Costs (2- 6% of TPC)
5% of TPC = Rs. 70.323
- B. Distribution and Selling Costs (2 - 20% of TPC)
18% of TPC = Rs. 253.164
- C. Research and development cost (5% of TPC)
5% of TPC = Rs. 70.32

D. Financing (0- 10 % of TCI)
= Rs. 38.432

Total General Expenses = Rs. 432.24

SELLING PRICE:

Acrylic acid produced = 200 TPD

Selling price of Acrylic acid = \$1.92 /kg

Acetic acid produced = 21.67 TPD

Selling price of Acetic acid = \$ 0.794 /kg

$$\begin{aligned}\text{Total income} &= \text{selling price} \times \text{qty of product produced} \\ &= 128 \times 10^6 + 7.22 \times 10^6 = \$ 135.22 \times 10^6 = \text{Rs. } 6558.17 \times 10^6\end{aligned}$$

$$\begin{aligned}\text{Gross Earning} &= \text{Total income} - \text{Total product cost} \\ &= 6558.17 \times 10^6 - 1406.467 \times 10^6 \\ &= \text{Rs } 5151.703 \times 10^6\end{aligned}$$

Tax on gross earning = 40% of gross earning.

$$\begin{aligned}\text{Net Profit} &= \text{Gross earning} [1 - \text{tax rate}] \\ &= \text{Rs. } 3091.0218 \times 10^6\end{aligned}$$

$$\begin{aligned}\text{Rate of return} &= \text{Net profit} / \text{Total capital investment} \\ &= 3091.0218 \times 10^6 / 1660.23 \times 10^6 \\ &= 1.86\end{aligned}$$