

COLD STORAGE

PRODUCT CODE	: 741000008 (Cold Storage) 215001001 (Ice Blocks)
QUALITY AND STANDARDS	: (a) The Directorate of Marketing and Inspection, Govt of India, Ministry of Rural and Employment, is regulating Cold Storage industry under Cold Storage Order, 1980 promulgated under Essential Commodities Act, 1955 all over India except in the States of UP, West Bengal, Punjab and Haryana. (b) For Ice Blocks BIS Specification No. IS 3957
PRODUCTION CAPACITY	: Cold Storage -4000 MT (per annum) Ice Blocks -7500 MT (per annum)
MONTH AND YEAR OF PREPARATION	: May, 2003
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INTRODUCTION

Cold Storage is a special kind of room, the temperature of, which is kept very low with the help of machines and precision instruments. India is having a unique geographical position and a wide range of soil thus producing variety of fruits and vegetables like apples, grapes, oranges, potatoes, chillies, ginger, etc. Marine products are also being produced in large quantities due to large coastal areas. The present production level of fruits and vegetables is more than 100 million MT and keeping in view the growth rate of population and demand, the production of perishable commodities is increasing every year. The cold storage

facilities are the prime infrastructural component for such perishable commodities. Besides the role of stabilizing market prices and evenly distributing both on demand basis and time basis, the cold storage industry renders other advantages and benefits to both the farmers and the consumers. The farmers get opportunity of producing cash crops to get remunerative prices. The consumers get the supply of perishable commodities with lower fluctuation of prices. Commercially apples, potatoes, oranges are stored on large scale in the cold storages. Other important costly raw materials like dry fruits, chemicals, essences and processed foods like fruit juice/pulp,

concentrate dairy products, frozen meat, fish and eggs are being stored in cold storages to regulate marketing channels of these products.

MARKET POTENTIAL

Cold storages are essential for extending the shelf life, period of marketing, avoiding glut, reducing transport bottlenecks during peak period of production and maintenance of quality of produce. The development of cold storage industry has therefore an important role to play in reducing the wastages of the perishable commodities and thus providing remunerative prices to the growers.

BASIS AND PRESUMPTIONS

- (i) The project is based on an average 90 percent capacity utilisation, three shifts working per day and 300 working days per annum.
- (ii) The project is based on renting of the chambers for the growers, traders and industry.
- (iii) The rate of interest has been taken @ 18 percent on an average.
- (iv) Labour wages have been taken as per market rates.
- (v) 25 percent margin money has been taken both for fixed investment and working capital.
- (vi) For economic viability an Ice Block Manufacturing Unit has also been included in the project.

IMPLEMENTATION SCHEDULE

The approximate time required for various activities is given below. However, it may vary from place to place

depending upon the local circumstances and on the enthusiasm of the entrepreneurs:

Selection of Site	1 month
Preparation of Project Report	1 month
Registration as SSI/Other legal formalities	15 days
Availability of Finance	3 months
Machinery procurement, erection and commissioning	2 months
Trial Run	1 month

TECHNICAL ASPECTS

Process of Manufacture

At present there are two popular refrigerants in the market. One is Freon and the other is Ammonia. Ammonia and Freon compressors are being manufactured indigenously. Ammonia refrigerant is cheaper, easily available and is of high latent heat of evaporation but it has certain disadvantages like being highly toxic in nature. It also forms explosive mixture when mixed with oil containing high percentage of carbon.

Rooms of different temperature must be separated by insulation and should be protected from moisture. Whenever possible, one coating of foam glass with vapour proof material should be used against the outside wall.

While fixing the insulation, the points to be kept in mind are:

- (a) The surface to be insulated should be completely moisture-proof and be reasonably even, free of lump or hole plaster on the walls. The ceiling must be cured before surface is insulated.
- (b) Precaution may be taken to ensure that the moisture from outside can not penetrate through the wall, ceiling or floor.

(c) The partition wall between two chambers should be insulated both sides.

Fruits and vegetables which are to be kept in cold storage, are sorted out and the bad ones removed. The sorted material is packed preferably in wooden/

plastic carton boxes and then kept in cold storage chambers. The temperature and humidity is to be maintained depending upon the commodity kept in the store. The requirements for successful storage of important fruits and vegetables are shown in Table I and II.

TABLE I

Name of Fruit	Storage Temp °F	Cold Storage life (in weeks)	Remarks
1. Apple	32-35	7-26	Small fruits keep better than large ones
2. Apricot	30-32	2-4	-
3. Berry Fruits	30-32	2-3	-
4. Bananas	55-60	2-3	-
5. Cherries	30-32	2-3	-
6. Guavas	47-50	3-4	-
7. Grapes	30-32	4-6	Fumigation with 1-2% sulphur dioxide before storage reduces decay and storage life can be increased to 8-12 weeks.
8. Lemon	50-55	9-13	Lemon for storage should be picked at the greenish yellow colour.
9. Lime	50-55	4-5	-
10. Mangoes	45-50	4-6	-
11. Mandarin Oranges (Nagpur) Coorg (Assam)	40-42	9-13	Mandarin oranges can be kept satisfactorily at lower temperature if to be stored for less than 4 weeks.
12. Oranges (Tight skinned)	36-39	13-17	Tight skinned oranges can also be kept at lower temperature if to be stored for less than 8 weeks.
Malta (Punjab)	36-39	13-17	
Sathgudi (Chennai)	39-42	13-17	
Mussambi (Mumbai)	42-45	13-17	
13. Pears	30-32	2-4	-
14. Peaches	30-32	2-4	-
15. Plums	30-32	2-4	If fruit is to be stored for jam making, the storage life can be extended by another two weeks.
16. Pineapple	50-55	3-4	-
17. Quinces	30-35	9-17	-

TABLE II

Optimum storage conditions for vegetables R.H. 85-90% except Beet root, Cabbage, Raddish, Turnips and Peas where R.H. is 90-95%

Name of Vegetable	Storage Temp (°F)	Cold Storage Life (in Weeks)	Remarks
1. Beans	32-35	2-3	Beans are liable to be sweet in storage. Need more ventilation, should be in crates and not in bags.
2. Beet Root	32-35	6-8	-
3. Brinjals	47-50	3-4	Big brinjals keep better than small ones
4. Carrots	32-35	13-17	-
5. Cauliflower	34-35	4-6	Only firm and compact heads should be stored as loose heads shrivel badly.
6. Cabbage	32-35	9-13	Only firm and compact heads should be stored.
7. Onions	32-35	17-26	-
8. Potatoes	37-38	26-35	In cold storage potatoes become sweet due to accumulation of sugars. This could be avoided by keeping potatoes at ordinary room temperature for 1-2 weeks before they are processed.
9. Raddish	32-35	6-8	-
10. Turnips	32-35	13-17	-
11. Tomatoes Ripe	40-45	1-1½	Tomatoes should not be stored in temperature lower than 40° F because they show tendency to break down. Green but matured tomatoes can be ripened satisfactorily with the development of attractive red colour by storing at 60-70°F
Mature (Greenish Yellow)	55-60	3-4	
12. Peas	32-35	2-3	Green peas lose part of their sugar content unless they are promptly cooled to 32° F. They also need more ventilation.

Motive Power 250 HP

Pollution Control

There are no harmful effluents in the process. However, NOC may be taken from the concerned State Pollution Control Board.

Energy Conservation

Proper insulation should be given to avoid loss of heat/temperature.

Quality Control and Standards

The Directorates of Agricultural Marketing and Inspection in State Governments and Govt., of India are

regulating cold storage industry under Cold Storage Order, 1980, promulgated under Essential Commodities Act, 1955 all over India except in the States of UP, West Bengal, Punjab and Haryana and provisionally in Bihar. State Governments are regulating the industry in their respective States under their respective Acts/Orders. The Ministry of Agriculture has now repealed the Cold Storage Order and advised the State Governments also to repeal it totally. With the repeal of this Order, the cold storage industry will now be able to enter the market free from all kinds of administrative interference.

FINANCIAL ASPECTS

A. Fixed Capital

i) Land and Building		Rate (In Rs.)	Total (In Rs.)
Land 5000 sq.mtr.@ Rs. 280 per sq. mtr.			14,00,000
(a) Cold Storage Chamber (35×25×15)	13125 Cu Mt.	225/Cu Mt.	29,53,000
(b) Sorting Verandah (25×9×5)	225 Sq.Mt.	15000/Sq.Mt.	3,37,500
(b1) Sorting Verandah on 1st and 2nd floor	450 Sq.Mt.	1500/Sq.Mt.	6,75,000
(c) Ice Tank Room	81 Sq.Mt.	3000/Sq Mt.	2,43,000
(d) Packing and insulation on Walls, Ceiling Floor such as Wood Racking and insulation with fibre glass wool bitumen Jalli	40000 Qtls.	52/Qtls.	20,80,000
(e) Machine Room 12m × 10m × 4m	120 Sq. mt.	2500/Sq. Mt.	3,00,000
(f) D.G. Room 8m × 4m × 4m	32 Sq. mt.	2500/Sq. Mt.	80,000
(g) Bore Well	L.S.		30,000
(h) Administration 10m × 4m × 3m	40 Sq.mt.	3000/Sq. Mt.	1,20,000
(i) Stair Case	L.S.	-	1,50,000
(j) Condenser cooling pad and Sanitation, etc.	L. S.	-	1,50,000
	Total		71.18 lakhs
	Total Land & Building		85.18 lakhs

(ii) Machinery and Equipment

Sl. Particulars No.	Qty.	Amount (In Rs.)
i) Super freeze Refri-compressor Model SRA-4000	1 No.	
ii) 100 HP screen protected induction Motor	1 No.	
iii) Suitable hand operated oil immersed starter/ motor starter	1 No.	
iv) Ammonia oil separator Size 18" × 48"	1 No.	
v) Atmospheric Type Ammonia condenser	12 No.	
vi) Valves and fittings for the condenser	1 lot	
vii) Ammonia Air Cooling units	16 No.	
viii) Ammonia Receiver size 16"×24" without standard Ammonia Fittings	1 No.	

Sl. No.	Particulars	Qty.	Amount (In Rs.)
ix)	Valve and fittings for the above Receiver	1 lot	
x)	Instrument comprising of dry and wet thermometers	6 No.	
xi)	Ammonia valves and fittings	1 lot	
xii)	5 HP mono block centrifugal pump set for condensers water circulation	2 No.	
xiv)	Insulated cold storage door made of wooden frame with GI Sheets Metal Cladding. Hinger Latches, Push Bar Size 28" × 36" × 4" thick	4 No.	27.01 Lakhs
xv)	Slide rail for compressor motor	2 No.	
xvi)	Ammonia pipe to interconnect high and low side equipment of refrigeration machine	1 lot	
xvii)	Water pipe lines and fitting	1 lot	

Sl. No.	Particulars	Qty.	Amount (In Rs.)
1	Super freeze refrigeration compressor	1 No.	
2	75 HP screen protected induction motor	1 No.	
3	Suitable hand operated oil immersed starter/ motor starter	1 No.	
4	Super freeze refri-compressor	1 No.	
5	50 HP screen protected delivery induction motor	1 No.	
6	Suitable hand operated oil immersed starter	1 No.	
7	Ammonia oil separator (Size 16"×48")	12 No.	
8	Atmospheric type Ammonia condensers	15 No.	
9	Valves and fitting for the condenser	1 lot	
10	Cooling oil trunk type duly tested by hydraulic pressure	1 No.	
11	Ammonia receiver size 18" × 24"	1 No.	
12	Valves fitting for above receiver	1 No.	
13	Hand hoist and trolley wheel fitted both sides	1 No.	
14	Mono block agitator fitted with suitable electric motor	1 No.	
15	Condump with stand	1 No.	27.69 Lakhs
16	Ice can size 11"×22" ×48" from G.I. Sheet 16 gauges	540 Nos.	
17	Ammonia valves and fitting	1 lot	
18	Ammonia gas charging pipe	1 No.	
19	5 HP Mono block centrifugal pump set for condenser water circulation	2 No.	
20	Material of freezing bring tank	1 lot	
21	Ammonia pipe for inter-connection	1 lot	
22	Water pipe lines fittings	1 lot	

Sl. No.	Particulars	Qty.	Amount (In Rs.)
23	M.S. slide rail for compressor motor	4 No.	
24	Water hose pipe	1 lot	
25	Instrument Brine thermometer and hydrometer	1 No.	
	Excise duty and CST		9.14 Lakhs
	DG set of 125 KVA		3.70 Lakhs
	Transformer and other electrical expenses		3.00 Lakhs
			70.54 Lakhs
	Electrification and Installation charges @ 10% of cost of Machinery		07.05 Lakhs
	Total Cost of Plant and Machinery		77.59 Lakhs
	Office Furniture and Equipment		01.00 Lakhs
	Total		78.59 Lakhs
iii.	Pre-operative Expenses		Rs. 2.00 Lakhs
	Total Fixed Cost (i+ii+iii)		Rs. 165.77 Lakhs

B. Working Capital (per month)

i) Personnel

Designation	Number	Salary/ month (In Rs.)	Total (In Rs.)
1. Manager	1	6,000	6,000
2. Maintenance Supervisor	1	5,000	5,000
3. Storekeeper	1	4,000	4,000
4. Accountant	1	5,000	5,000
5. Skilled Workers	4	2,000	8,000
6. Unskilled Workers	15	1,600	24,000
7. Watchman	2	1,600	3,200
	Total		55,200
	Perquisites @ 15 percent		08,280
	Total		63,480
	or Say		0.63 Lakh

ii) Raw Material

	Total (In Rs.)
1. Water 9000 KL @ Rs. 10/KL	90,000
2. Add back of Salt and Ammonia	10,000
Total	1,00,000
or Say	1.0 Lakh

iii) Utilities	Amount (In Rs.)
Power 250 HP 80% of 200×24×30 KWH @ Rs 2.66 unit	2,88,000
Fuel	12,000
Total	3.00 Lakhs

iii) Other Contingent Expenses	Amount (In Rs.)
1. Postage and stationery	2,000
2. Telephone	3,000
3. Consumable stores	15,000
4. Repair and maintenance	15,000
5. Transport	20,000
6. Insurance	30,000
7. Miscellaneous	15,000
Total	1,00,000
or Say	1.0 Lakh
iv) Working Capital (per month)	5.63 Lakhs
v) Working Capital for 2 months	11.26 Lakhs

C. Total Capital Investment

	Amount (Rs. In Lakhs)
1. Fixed Cost	165.77
2. Working Capital for 2 Months	11.26
Total	177.03

FINANCIAL ANALYSIS

(1) Cost of Production (per annum) (Rs. In Lakhs)	
1. Total recurring cost	67.56
2. Depreciation on building @ 8 percent/annum	05.61
3. Depreciation on machinery @ 10 percent/annum	07.75
4. Depreciation on Furniture @ 20 percent/annum	00.20
5. Interest on total investment @ 18 percent/annum	31.87
Total	112.99

(2) Turnover (per annum)	Total (In Rs.)
1. 3600 M.T. Vegetables, fruits and chemicals @ Rs 2500 M.T.	90.00
2. Ice Blocks 6750 M.T. @ Rs 1000/M.T.	67.50
Total Turnover	157.50

(3) Net Profit (per annum) Rs. 44.51 Lakhs

$$(4) \text{ Net Profit Ratio} = \frac{44.51 \times 100}{157.50} = 28\%$$

$$(5) \text{ Rate of Return} = \frac{44.51 \times 100}{177.03} = 25\%$$

(6) Break-even Point

Fixed Cost (per annum) Amount (Rs. In Lakhs)	
Depreciation on Machinery	07.75
Depreciation on Furniture	00.20
Interest on Total investment	31.87
40% of Salary and Wages	03.00
40% of other expenses	04.80
Total	47.62

$$\begin{aligned} \text{B.E.P} &= \frac{\text{F.C.} \times 100}{\text{F.C.} + \text{Profit}} \\ &= \frac{47.62 \times 100}{47.62 + 44.51} \\ &= \frac{47.62 \times 100}{92.13} \\ &= 52\% \end{aligned}$$

Addresses of Machinery Suppliers

1. M/s. Bombay Ammonia Refrigeration Company
G-32, Kirti Nagar,
New Delhi-110015.
2. M/s. Sunder Singh and Sons
1/6 Roop Nagar,
Delhi-110006.
3. M/s. Guru Nanak Refrigeration Corporation
18/30 Street No. 5,
New Rohtak Road,
New Delhi.

Addresses of Raw Material Suppliers
Locally available.