

The Complete Book on Cold Storage, Cold Chain & Warehouse (with Controlled Atmosphere Storage & Rural Godowns) 6th Edition

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A cold storage facility preserves fruits and vegetables for a longer period of time. Entrepreneurs and MSMEs in the food and beverage industry are the most likely to choose this business. Cold Storage is a one-time investment industry with a significant initial outlay. In comparison to other small firms, however, the returns are higher and on a long-term basis.

The overall average capacity utilisation in cold storage is 75%, indicating the cold chain business in India's long-term viability. Private companies own and run 92 percent of cold storage facilities in India. A cold storage warehouse can maintain your goods at the proper temperature for long periods of time. The term "cold chain" refers to the process of controlling the temperature of perishable goods from point of origin to final consumer in order to ensure quality and safety.

The global Cold Storage Market is expected to grow at a CAGR of 14.10 percent. The global demand for processed foods, perishable foods, and medical equipment is increasing. Increased technical innovation is another influence in the cold storage sector. Cold storage is being promoted by government legislation around the world about the safety precautions for storing temperature-sensitive food and medical products.

The book covers a wide range of subjects relating to start Cold Storage Business. It also offers information on machinery suppliers, as well as photographs of the equipment and plant layout. A detailed guide to the Cold Storage industry and entrepreneurship. This book serves as a one-stop shop for everything you need to know about the Cold Storage Business, which is ripe for manufacturers, merchants, and entrepreneurs. This is the only book on the market that covers all aspects of commercial cold storage start-up. It's a veritable feast of how-to information, from concept through equipment procurement.

1. INTRODUCTION

1. History of Cold Storage

2. Efficient Cold Storage Management

1. Clean and Calibrate

2. Know Your Hot and Cold Spots

3. Pre-cool

4. Use Humidifiers

5. Avoid Air Pollution

6. Rotate Your Product

7. Inspect the Quality of Your Product on Arrival

8. Keep Score

9. Selection of Location for the Cold Storage

3. Cold Storage Chain

1. Emergence of Cold Chain Logistics

2. Providing Temperature Controlled Environments

3. Refrigerated Containers

2. TYPES OF COLD STORAGE

1. Potato Cold Storage Room

2. Onion Cold Storage Room

3. Red Meat Cold Storage Room

4. Fish and Seafood Cold Storage Room

5. Poultry Cold Storage Room

6. Bakery Cold Storage Room

7. Milk and Milk Products Cold Storage Room

8. Apple Cold Storage Room

9. Grape Cold Storage Room

10. Citrus Cold Storage Room

11. Mango Cold Storage Room

12. Pear Cold Storage Room

13. Banana Cold Storage Room

3. CONTROLLED ATMOSPHERE STORAGE

1. Importance of Controlled Atmosphere

2. Fruits and Vegetables Storage under CA

1. Indoor Storage

2. Outdoor Storage

Harvesting Apples at Optimum Maturity

Guidelines for Placing Apples into CA Storage

Temperature and Carbon Dioxide Interactions on Quality of Controlled Atmosphere-stored Apples

Pears

The Use of Cooling and Cold Storage to Stabilize and Preserve Fresh Stone Fruits

Ethylene Concentrations in Controlled Atmosphere Storage

Construction

Sealing Walls and Ceilings

Wall to Floor Joints

CA Doors

Observation Window

3.4.5 Penetrations

4. ADVANCED COLD STORAGE COOLING TECHNOLOGY

1. Cooling technology for cold storages

2. Components of Cold Storage

3. Use of Renewable Solar Energy in Cold Storage
4. Energy Conservation Options in Cold Storages
5. Challenges and Barriers to Cold Storages

5. REFRIGERATION

1. Refrigerated Rail Cars
 1. *Planning a Cold Storage*
 2. *Cold Store Capacity*
2. Refrigeration Plant Requirements
 1. *Compressors*
 2. *Power Requirements*
3. Methods of Refrigeration
4. Capacity Rating
 1. *Factors Limiting Storage Life*
 2. *Cost of Freezing*
 3. *Care and Cleanliness*
 4. *Working in Cold Rooms*
 5. *Vapour Barriers*
5. Types of Cold Stores
 1. *Prefabricated Cold Stores*
 2. *Layout of a Typical Cold Store*

-The Drying Process of Potatoes

-The Curing Process of Potatoes

Increasing the Temperature of the Potatoes After Storage

Electrical Installation

Substation

General Specifications for Refrigeration System

Refrigeration Processes

Thermal Insulation & Refrigeration System, Control and Safety Devices

Refrigeration Cycles

Types of Compressors

Piston Compressors

Rotary Compressors

Screw Compressors

Vapour Compression Cycle

Compressor

Condenser

Receiver

Evaporator

Rooms for machines, Electricals etc.

Typical Specifications of Refrigeration System

Vapour Absorption System

Ammonia Refrigeration System

Physical Properties

Chemical Properties

Cold Storage for Fruits and Vegetables

Storage Conditions

Temperature

Incompatibility

Cold Storage B.I.S Specification

Working in Cold Rooms

Examples of Food Processing by Refrigeration and Storage

Meat Products

Fishery Products

Dairy Products

Freezing System

Indirect Contact Systems

Plate Freezers

Freezers for Liquid Foods

Direct-Contact Systems

Immersion

6. REFRIGERATED WAREHOUSE SYSTEMS AND COLD STORAGE TRENDS

1. Automation/Robotics in Chilled Warehouses
2. Taller Warehouses Requiring Temperature Control
3. Energy Efficiency Initiatives throughout the Cold Supply Chain
4. Keeping Pace with Market Demands

7. COLD STORAGE ERP SOFTWARE BENEFITS

1. How ERP is helping cold storage industry to achieve better performance?

What is ERP?

Why Is ERP Important for Businesses?

How Does an ERP Work?

How Does an ERP System Function?

ERP fundamentals

The business value of ERP

What Are The Benefits of an ERP System?

8. FOOD STORAGE GUIDELINES FOR CONSUMERS

1. Dairy Products
2. Recommended Food Storage Chart

9. BANANAS COLD STORAGE

1. Conditions of Harvesting and Putting into Store Harvesting
 1. *Criteria of Ripeness*
2. Qualify Characteristics for Storage and Transport
3. Method of Storage

10. COLD STORAGE PLANT – AUTOMATION

11. ABSORPTION REFRIGERATOR

1. a. Transport Handling
2. b. Installation of Refrigerators and Freezers
3. c. Maintenance

4. d. Choice of Refrigeration Equipment
5. Failures Related to Absorption Refrigerators
 1. *a. Leaks*
 2. *b. Repair of Leaks on Cooling Units*
 3. *c. Fuel Consumption*
6. Comparison between Vapor Compression and Absorption System
 1. *Compressor*
 2. *Condenser*
 3. *Receiver*
 4. *Expansion Valve*
7. Difference Between Refrigeration and Heat Pump System
8. Water-Lithium Bromide Vapor Absorption Refrigeration System
9. Special Features of Water-Lithium Bromide Solution

12. COLD CHAIN

1. Importance of Maintaining the Cold Chain
2. The Effective Cold Chain
3. National Centre for Cold-Chain Development
4. Cold Chain Development in India-Modernization of the Infrastructure of Cold Storage of Perishables

Growth of Cold Storage Industry

Verification and Validation

Components of Cold Chain

13. COLD CHAIN AND REFRIGERATION

1. Health Facilities in Developing Countries
2. Domestic (Kitchen) and Bar Refrigerators
3. Types of Cold Chain Refrigerators
4. Cold-Chain Maintenance, Repair and Replacement Maintenance of Equipment
 1. *Distribution and Transport*
 2. *Estimation of Transportation*
5. Cold Chain and Logistics Management
 1. *Costs of Cold Chain and Logistics Management*
6. Importance of Cold Chain and Vaccine Logistics Management
7. Electrical Cold Chain Equipments
 1. *Walk-in-Freezers (WIF)*
 2. *Walk-in-Coolers (WIC)*
 3. *Deep Freezer*
 4. *Cold Chain Management*
8. Maintenance of the Vaccine Refrigerator
 1. *Cold Box*
 2. *Ice Manufacture*
 3. *Applications of Refrigeration in Different Food Products*
 4. *Frozen Food Properties*
 5. *Refrigerator Thermometers*
 6. *Monitoring of the Refrigerator Temperature*
 7. *Fridge Failure or Disruption of the Cold Chain*

14. SHIPPING CONTAINERS

1. Refrigerated Container
2. Shipping Container Features
3. Comparison of Passive and Active System
4. Transport Operations
 1. *The Role of the Transport Operator*

-Distribution Vehicles

-Air Circulation

-Dispatching Product

-Air Flow

-The Essential Data Logger

15. THE COLD-CHAIN MONITOR

1. How to Use the Cold-Chain Monitor in Routine Forwarding of Vaccine Shipments

The Vaccine Vial Monitor

Proportion of Regional Vaccines Carrying VVMs

Recommendations on Improving Availability and Use of VVMs

Availability

Use

Cold Storage Temperature Legislation

Why Set -18°C for Thermal Stabilisation? Vaccine Damage

Heat Damage

Solar Refrigerators

Components of Solar Refrigerator

16. COLD STORAGE FOR FISH AND MEAT

1. Introduction

2. Uses of Ice

3. Cold Storage Life of Frozen Fish

1. Cold Storage for Meat

2. Chilled Storage

4. Parameters Considered for the Design

1. Site Selection

2. Storage Temperature

3. Rate of Freezing

4. Relative Humidity

5. Calculation of Refrigeration Loads

5. Material Selection

1. Insulating Material

6. Meat Supply Cold Chain Management

1. Cold Chain in Slaughterhouse

2. Air Chilling

3. Immersion Chilling

4. Spray Chilling

5. Vacuum Chilling

17. WAREHOUSE

1. Cold Storage Warehouse Construction

17.2 Warehouse cum Cold Storage

Central Location

Value—Adding Operation

Need for Warehousing

Types of Warehouses

Advantages

Disadvantages

Functions

Advantages of Public Warehousing

Disadvantages of Public Warehousing

Advantages of Private Warehousing
Disadvantages of Private Warehousing
Sequence of Warehousing Decisions

Determination of Storage Capacity
Fixation of Storage Charges
Storage Systems
Basic Warehouse Equipment

18. NABARD WAREHOUSING SCHEME

1. GOI Approved Nabard Warehousing Scheme
 1. *Mode of Financial Support*
 2. *Eligible Institutions/Entities*
 3. *Purpose/Activities*
 4. *Priority Segments*
 5. *Rate of Interest, Quantum of Support and Repayment Period*
 6. *Accreditation by WDRA*
 7. *Implementation Period*
2. Department of Storage and Marketing Initiatives
 1. *Direct Lending to State Owned Entities*
 2. *Accreditation/Registration of Warehouse*

19. RURAL GODOWNS

1. Subsidy
2. Size
3. Institutional Lending
 1. *Eligible Financing Institutions*
 2. *Term Loan*
4. Pattern of Assistance
5. Monitoring

20. SOLAR POWERED COLD STORAGE

1. Solar PV Powered Cold Storage System
 1. *Advantages of Solar PV Powered Cold Storage System*
 2. *Cost-Economics of the Solar PV Powered Cold Storage System*
2. Requirement of Cooling System
 1. *Solar Cold Storage System Schematic*
 2. *Solar Powered Movable Cold Storage Structure for Perishables*

Use of Solar Panel & Refrigeration in Cold Storage Through Alternate Technology
Benefits
Subsidy available
Off Grid Solar System
On Grid Solar System

21. BIS SPECIFICATIONS

22. ADDRESSES OF PLANT AND MACHINERY SUPPLIERS

23. PLANT LAYOUT DESCRIPTION OF A COLD STORAGE FACILITY

24. PLANT LAYOUT & PROCESS FLOW CHART

25. PHOTOGRAPHS OF MACHINERY WITH SUPPLIER'S CONTACT DETAILS

- Compressor
- Condensor
- Water Cooled Condenser
- Rotary Compressor
- Screw Compressor
- Evaporator
- Refrigerator
- Cold Box
- Temperature Monitor
- Walk In Freezers
- Walk In Coolers
- Deep Freezer
- Refrigeration Thermometer
- Data Logger
- Time Temperature Indicator
- Solar Freeze
- Cold Storage Plant
- Refrigerating Chambers
- Horticulture Cold Room
- Cold Storage Room
- Cold Rooms for Hospitals
- Cold Rooms for Dairy
- Compressor Piston Assembly
- Potato Cold Storage
- Vaccine Refrigerators
- Ipa4 - Ice Pack
- Air Chiller
- Vegetables Cold Storage
- Controlled Atmosphere Cold Storage
- Electric Control Box
- Cold Water Pump

- Screw Water Chillers
- Banana Ripening Chamber
- Blast Freezer
- Kitchen Cold Room
- Banana Ripening Damper
- Refrigerated Container

- Cold Storage
- Chilling Plant
- IQF Buffer

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