

AWARENESS WORKSHOP/ TRAINING PROGRAM FOR COLD STORAGE OPERATORS/ TECHNICIANS UNDER THE PROGRAM ON DEMAND SIDE ENERGY EFFICIENCY IN INTEGRATED COLD CHAIN SECTOR

Organized by

POWER DEPARTMENT, GOVERNMENT OF SIKKIM
State Designated Agency, SIKKIM



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❖ Cold Chain

The Cold Chain is a term applied to -

Food handling and Distribution where the product is maintained at suitable temperature conditions all the way from harvesting, through the cooling or freezing process to the point of sale.

- Amongst the emerging markets, India is nearly last in adopting cold chain technology which is fast and reliable.
- It is well known that almost 40% of the food consumed in the western world is frozen.
- For a long time, in India, it has just been ice cream that has made a cold chain necessary. However, that is changing fast.



❖ Importance of Cold Chain

Prevents Food loss

- From the time of harvest, processing, packaging, and transporting loss of food occurs at every stage.
- Catering to the demand it saves water, labour, and other resources to compensate the lost harvest.

Employment Generation

- This field is creating millions of jobs for the country.
- Warehouse operatives, drivers, system analysis, representatives, and importers down to the delivery man in the retail shop.

- Food waste is in itself a global climate disaster.
- The world's population wastes a third of the food produced.
- Resulting in wasted carbon emission contributing largely to climate change.

- Purchasing perishables have become easier with click of buttons.
- We make an order and have it delivered. The cold chain has made many entrepreneurs open retailer shops to sell chilled perishables.

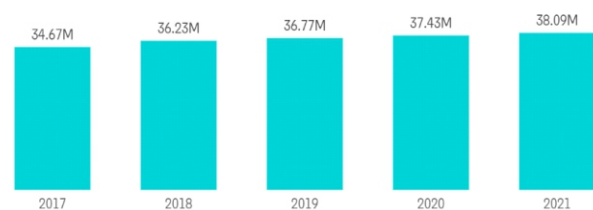
Environmental Conservation

Urbanization

❖ The Cold Chain Industry in India

- India produces over 400 million MT of perishable food each year of which 40% of the country's food gets spoilt in its supply chain which impacts our farmers' income.
- Study by the Central Institute of Post-Harvest Engineering and Technology (CIPHET) found that India wastes a whopping 16% of its fruits and vegetables yearly due to a lack of cold chain infrastructure.
- According to experts, the Indian perishable market requires 1.5 to 2 lakh reefer trucks to meet the perishables movement needs within the country.

Cold Storage Capacity, India, In Metric Tonnes, 2017-2021



Source: Ministry of Agriculture and Farmers Welfare, Government of India

❖ Indian Overview



Modern Pack Houses

Requirement: 70,080 units
Existing Capacity: 249 units
Gap: **69,831 units (99.6%)**



Reefer Trucks

Requirement: 61,826 units
Existing Capacity: 9,000 units
Gap: **52,826 units (85%)**



Ripening Chambers

Requirement: 9,131 units
Existing Capacity: 812 units
Gap: **8,319 units (91%)**



Cold Storage

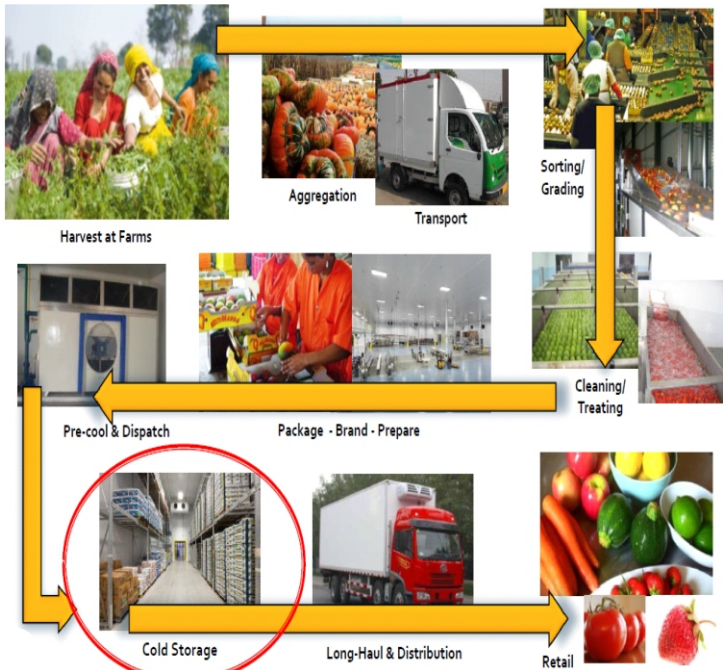
Requirement: 34.1 million tonnes
Existing Capacity: 31.8 million tonnes
Gap: **3.2 million tonnes (10%)**

The Indian cold chain market size reached INR 1,814.9 Billion in 2022

The requirement of cold storage in the country is 35 million MT, while capacity of such storage is around 32 million MT

Government annexure on the State-wise distribution of Cold Storages as on 2020, it has been noticed that NE states has lowest no. of storage units & capacity as 68% of it is used to store potatoes while 30 percent is being taken up by other multi-commodity products.

❖ Cold Chain Need; From **FARM** To **FORK**

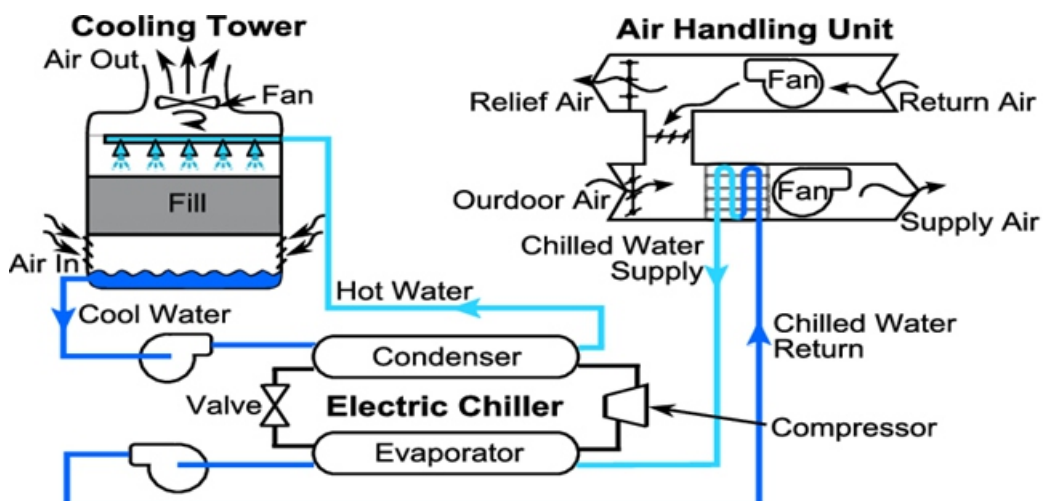


NEED OF THE HOUR

- ❖ Cold Chain Initiators- Modern Pack Houses
- ❖ Cold Chain Transport- Reefer Transport Units
- ❖ Distribution Hubs- Transitory Cold Stores
- ❖ Source Point Cold Stores
- ❖ Ripening Facilities
- ❖ Energy Efficient Technology
- ❖ Standardized Handling-Packaging Unit loads
- ❖ Multi modal Direct Access Movement



❖ Cold Storage: Cooling System Components

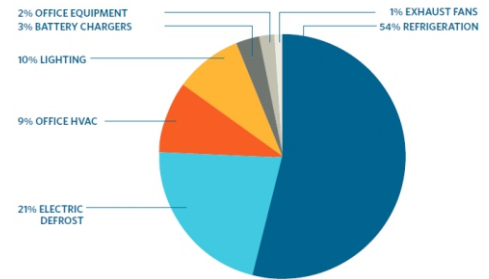


❖ Opportunities to Implement ENCON Measures in Cold Storage

Energy cost constitutes a major part of the running cost of a cold store. Apart from the problems of the availability of electrical energy, the ever increasing rate of electrical energy seriously affects the economic viability of cold store units. Following are some of the measures adopted to achieve energy efficient operation.

- ◆ **Cold Store Building Design:** Proper orientation, compact arrangement of chambers, shading of exposed walls, adequate insulation etc. are some of the important factors.
- ◆ **Refrigeration System:** The system must be designed for optimum operating conditions like evaporating and condensing temperatures, as these conditions have a direct bearing on energy consumption.
 - Add VFDs to motors operating at variable rpm.
- ◆ **Chilling System:** Increase the chilled water temperature set point if possible.
 - Use the lowest temperature condenser water available that the chiller can handle. (Reducing condensing temperature by 5.5 deg C, results in a 20 – 25 per cent decrease in compressor power consumption)
- ◆ **Compressor capacity control system:** The system helps in energy savings during partial load operation.
- ◆ **Control System:** The proper control systems for refrigerant level, room temperature, compressor capacity etc., are required to further optimize energy consumption.
- ◆ **Air Curtain or Strip Curtain:** The use of air curtains and strip curtains is a common feature in present day cold stores as they help reduce air infiltration due to frequent and sometimes long door openings.
- ◆ **Heat Recovery System:** In processing plant cold stores, a heat reclaim system can be installed to recover a part of the heat rejected by the refrigeration system. This can be gainfully utilised in generating hot water free of cost.
- ◆ **Pumping System:** Replace old pumps by energy efficient BEE star rated pumps.
 - In the case of over designed pump, provide variable speed drive, or downsize / replace impeller or replace with correct sized pump for efficient operation.
 - Reduce system resistance by pressure drop assessment and pipe size optimization.
- ◆ **Cooling Tower:** Optimise cooling tower fan blade angle on a seasonal and/or load basis.
 - Isolate cooling towers for sensitive applications like A/C plants, with other loads if any. A 10C cooling water temperature increase may increase A/C compressor kW by 2.7%. A 10 C drop in cooling water temperature can give a heat rate savings of 5 kcal/kWh in a thermal power plant.
 - Replace old blade by energy efficient FRP blade for fan energy savings.

ENERGY USE PROFILE FOR A TYPICAL COLD STORAGE FACILITY



❖ Maintenance of Solar Based Cold Storage

Processes involved in the maintenance of solar power systems:

Most solar panel operation and maintenance (O&M) processes require periodic checks for ensuring optimal performance and security;

- ★ The timely and regular cleaning of solar cells and PV panels
- ★ Regular maintenance of all thermal-based components
- ★ Servicing of HT side equipment on an annual basis
- ★ Diagnosis and tests pertaining to low solar power production
- ★ Testing and upkeep of circuits
- ★ Tracing of IV curves and thermal imaging
- ★ Measure of earth value

