SNS COLLEGE OF TECHNOLOGY
(An Autonomous Institution)
Coimbatore – 641035.

UNIT- 4

COLD STORAGE DESIGN: TYPES OF COLD STORAGE AND TYPES OF LOADS

31.1 Introduction

The basic purpose of cold storage is to store the perishable food products at optimum temperature to enhance the self life of the products. In dairy plants, cold storages are required for storage of milk, butter, cheese, ice-cream etc. The condition of storage in these cold storages is different depending upon the nature of the product. For example, ice-cream is stored at - 25 ºC while milk is stored at 3-4 ºC. Similarly, many fruits and vegetables are also stored in cold storages.

31.2 Types of Cold Storages

Cold storages are classified in different ways as indicated below.

31.2.1 Classification based on the use of cold store

- Milk cold storage
- Cheese cold storage
- Butter cold storage
- Potato cold storage etc.

The storage conditions to be maintained as well as method of storage for these cold storages vary depending on the optimum storage conditions required for different products. For example, cheddar cheese is stored at around 10 ºC and 90 % relative humidity for ripening of cheese. Appropriate method of storage of product is very important aspect. Racks are required to keep cheese blocks in the cold storages.

31.2.2 Classification based on operating temperature of cold storage

- Cold storage maintained above 0 ºC
- Cold storage maintained below 0 ºC

Milk cold storage is maintained above ºC while ice-cream cold storage is maintained below 0 ºC. Product load is one of the factors for estimation of cold storage load. It is necessary to calculate heat to be removed from the product when a part of water gets frozen at storage temperature of the product. The design of evaporator, air circulation, expansion valve etc. will be different in these cold storages. The thickness of insulation required for low temperature cold storage will be more to reduce the wall gain load.

31.2.3 Classification based on the construction

- Constructed cold storage
- Walk in cold storage

Mostly cold storage is constructed in dairy building as per the design and layout of the dairy plant. The cold storage is generally constructed by civil work and insulated either by Thermocol sheets or PUF panels.

31.3 Types of Loads in Cold Storages

It is basic requirement to know the types of loads in the specific cold storage in order to find the capacity of the refrigeration system for the cold storage. It is necessary not only to cool the product to the storage temperature but also to meet the cooling load due to various heat infiltrations taking place in the cold storage. Broadly, the total load is divided into two categories as under.

31.3.1 Sensible heat load

► Heat flow through walls, ceilings, floor, doors (structural heat gain).

► Heat gain from infiltration of air due to door openings and movement of products through opening provided in the walls. For example, crates of milk enter in the milk cold storage through a gap provided in the wall using conveyer. This load is kept minimum by using appropriate strips of flexible plastic sheets to reduce the exchange of air.

► Heat received by workers working in cold storage. Though, it is very small as number of persons working in the cold storage is very few. This load is very important in air conditioning system as it is for providing comfort to large number of occupant.

► Heat load due to lighting and other motors used in the cold storage.

31.3.2 Latent heat load

► Latent heat load from infiltration of air.

► Latent heat load from occupancy.

► Latent heat generated from the stored products.

Based on the above heat load, the actual amount of heat flow rate is calculated in order to find total load to decide the capacity of evaporator of the refrigeration plant.