

Refrigeration Application

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ME 415: Refrigeration & Building Mechanical Systems



Comfort vs. Industrial Air-conditioning

- Comfort air-conditioning is for human comfort. It involves control of space temperature, humidity, air-motion and cleaning/filtering of air.
- Industrial air-conditioning does not have the primary function of conditioning air for human comfort.
- Functions of industrial air-conditioning include:
 - control of moisture of hygroscopic materials.
 - govern the chemical/bio-chemical reaction rates.
 - limit the variation of size of precision manufacturing items because of thermal expansion and contraction.
 - provide clean, filtered air for production of quality products.
 - ensure space temperature/humidity/air-motion for production requirement.



Classification of Refrigeration Application

- ① Domestic refrigeration
- ② Commercial refrigeration
- ③ Industrial refrigeration
- ④ Marine & transportation refrigeration
- ⑤ Comfort air-conditioning
- ⑥ Industrial air-conditioning



Food Preservation by Refrigeration

- Preservation of perishables by refrigeration involves the use of low temperature as a means of eliminating or retarding the activity of spoilage agents.
- For storage, the product is chilled and stored at some temperature above its freezing point. Frozen storage requires freezing of the product and storage at some temperature between -12° to -23° C.
- Factors affecting the quality of frozen product:
 - Nature and composition of product to be frozen
 - Care in selecting, handling & preparing the product for freezing
 - Freezing method
 - Storage condition



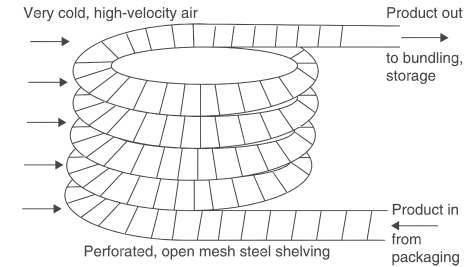
Freezing Method

- **Sharp (Slow) Freezing:** accomplished by placing the product in a low temperature room and allowing it to freeze slowly, usually in still air
- **Quick Freezing:**
 - ① Air Blast Freezing
 - ② Indirect Contact Freezing
 - ③ Immersion Freezing
 - Smaller ice crystals are formed & less damage to the cells.
 - Freezing period is small, less time is allowed for diffusion of salts & separation of water.
 - Temperature is quickly reduced, hence bacteria/yeast growth rates are retarded, thus preventing decomposition during freezing.

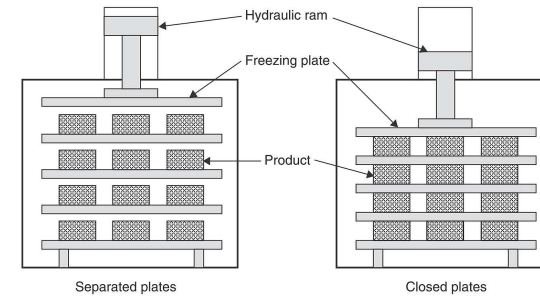


Some Commercial/Industrial Applications

- Ice rinks
- Low temperature liquid storage/transportation
- De-waxing of oil
- Separation and condensation of gases
- Solidification and separation of solid
- Low temperature testing
- Removal of heat of reaction
- etc.



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Self Study

- Chapter 9 of *Dossat*
- Chapter 1 of *Stoecker & Jones*
- Chapter 14, 15 & 16 of *Hundy, Trott & Welch*

