

Ice Plant, Quality of Ice

Expected Learning Outcome

- Quality of water for Ice manufacturing
- Types of Ice and their manufacturing methods
- Ice – can, Ice-tank, brine tank
- Ice – harvesting

6.1. Ice plant

Ice is an ideal cooling medium. It has a very large cooling capacity for a given weight or volume, it is harmless, comparatively cheap and can cool the fish quickly through immediate contact with the fish. For effective chilling, the ice must be allowed to melt and furthermore, the melting ice also keeps the fish moist and glossy. The general rule in ordering ice point is that the buyer should supply as much information as possible. The more facts the buyer supplies, the easier it will be for ice plant manufacturer to submit competitive tenders which can be compared on a common basis. At this stage of planning, some decisions should have been made and specific instructions given on certain things such as type of ice required, site location, building layout and services available. The following is a check list of the information the buyer should provide when ordering an ice plant.

- Main purpose for which ice is intended
- Type of ice required (block ice, flake ice, tube ice etc.)
- Ice production capacity (tons ice/24hour)
- Local maximum ambient temperature and humidity
- Exact location of plant
- Information on water (purity hygienic temperature ranges etc.)
- Information on electricity supply (Reliability, voltage frequency, phase etc)
- Details of separate power source if required
- Refrigerant preferred
- Ice storage capacity
- Method of discharging ice, rate of discharge required
- Details of local skill available for installing and servicing the plant
- Spare parts and refrigerant supply requirement
- Ice weighing equipment-preferred
- Technical installations, specification drawing etc for installation and minuteness required and in what language

There are two types of ice one is natural ice and other one is artificial ice, the artificial ice have two types one is called raw ice and other one is transparent ice. The raw ice is white and gives as a milky appearance but it is harmful for health. It is extensively used to pre-chill the cold drinks by placing the bottles in ice boxes. The good quality ice is a transparent and smooth. The raw ice freezer in short time and air CO₂ is entrapped in ice during freezing operation. For making good quality ice the water is to agitate in order to eliminate air and impurities.

6.2. Quality of water

The water used for ice making should be quite clean but it contains many impurities such as suspended impurities and dissolved inorganic impurities. The suspended impurities include

clay silt- causes turbidity, Bacteria-causes disease, Algae, protozoan* causes odor, colour and turbidity. The dissolved inorganic impurities include calcium and magnesium –causes alkalinity and hardness sodium-causes alkalinity and softening, Metals and oxide causes taste corrosiveness lead poisoning, gases-causes corrosion, acidity etc. so the water used for ice plant should be given preliminary chemical treatment and filtered before using. Natural water from rivers, canals etc. do not confirm to all the required specifications for ice manufacturing. So water from such sources is given specific treatments to get potable water. The actual treatment method depends directly on the impurities present in the raw water. For removing various types of impurities, the following treatment processes are employed.

Impurity	Process used for removal
Floating matter such as leaves, wood pieces dead animals etc.	Screening
Suspended impurities such as silt, clay, sand etc.	Sedimentation
Fine suspended matter	Sedimentation with co-agulation
Micro – organism and colloidal matters	Filtration
Pathogenic bacteria	Disinfection

6.3.Essential components of an ice plant

6.3.1.Ice-can

The maximum artificial ice can be made by using ice can. Ice freezes in such a container is called ice can. The ice can is made of galvanized iron. The size of ice can depends upon the weight of ice. The ice cans are filled with clean water to the proper height. These cans are placed in brine tank, where cold brine is circulated by an agitator with the help of a pump. To remove the ice the cans are lifted out of the brine and sprayed or dipped in warm water. So the ice loosens from the can and slide down to store room.

6.3.2.Ice tank

The tank in which the ice cans are placed is called freezing tank or ice tank. These ice tanks are made of wood, steel or concrete. Wooden tanks have a relatively short life and are subjected to leak. Tanks made of reinforced concrete are also recommended as being superior to those made of wood. Mostly freezing tanks are made of steel. These are well insulated and well coated with suitable frame for supporting ice cans. It is equipped with an agitator or propeller for keeping the brine in motion. The freezing tank contains evaporator coils, equally distributed throughout the tank and submerged in brine. The suitable hard wood frame is provided for supporting the ice cans in the freezing tank. The brine in the brine tank acts as a medium of transferring heat from the ice cans to the evaporator. The refrigerant evaporating in the freezing coils extract heat from the brine which again absorbs the heat from the water in the cans there by freeze it.

6.3.3.Brine

Brine is a secondary refrigerant and is generally used where temperature is required to be maintained below the freezing point of water (0°C). In case the temperature involved is above the freezing point of water, then water is commonly used as a secondary refrigerant.

Brine is a solution of salt and water. It may be noted that when a salt is mixed with water, then the freezing temperature of the solution becomes lower, because when the salt is dissolving in water it takes off its latent heat from the solution and cools it below the freezing point of water.

The brine commonly used are calcium chloride (CaCl₂) and sodium chloride (Na Cl) the CaCl₂ has the eutectic temperature of -55°C at salt concentration of 30% by mass. This type of

brine is primarily used where temperature below -18°C is required. It is generally used in industrial process cooling and product freezing.

The sodium chloride brine has the eutectic temperature of -21.1°C at salt concentration of 23% by mass.

Brine tank: Brine tank is an apparatus in which refrigerant is evaporated to cool another heat transmitting fluid.