

Parts of refrigeration systems (Evaporator)

Evaporator

The process of heat removal from the substance to be cooled or refrigerated is done in the device known as Evaporator. Evaporator is also known as Boiler, Freezing unit, Low side, cooling coil, chilling unit. It is the natural tendency of the heat that it is always from warm body to cold body. If two substances are at the same temperature, no heat transfer between them. If there is a temperature difference between them, heat flows from the warm substance to the colder one. Thus it is said that heat is transferred from high temperature to low temperature. The heat that must be transferred enters a refrigerated space in three ways.

- The heat leaks through the wall surrounding.
- As the door open, outside heat rushes into the refrigerated space.
- The heat of the food stuff material is introduced into the refrigerated space.

All this heat flows towards the evaporator and touches to the cooling coil of the evaporator. Liquid refrigerant at the cooling coil picks up this heat and absorb it so the liquid refrigerant transferred into vapour. The cooling coil, consists at good conductor at heat, permits to rapid heat transfer. The conductor which has no effect on the refrigerant is determined to use. Metal is a good conductor which is always used in evaporator. Iron or steel is used for all refrigerants generally. Brass and Copper can be used with all refrigerant except ammonia because copper is soluble in pure ammonia. The effect of heat transfer depends upon,

- The rate of heat transfer
- Controlling quantity of heat
- Air circulation
- Air velocity
- Air distribution
- Material
- Temperature difference
- Velocity of Refrigerants
- Thickness of the evaporator coil
- Contact surface area

3.2.1. Classification of evaporators

According to the type of construction

- Bare tube coil evaporator
- Finned tube evaporator
- Plate evaporator
- Shell and tube evaporator
- Shell and coil evaporator

- Tube in tube evaporator

According to the manner in which liquid refrigerant is fed

- Flood type evaporator
- Dry explosive evaporator

According to the mode of heat transfer

- Nature convection evaporator
- Forced convection evaporator

According to the operating conditions

- Frosting evaporator
- Non frosting evaporator

Bare tube evaporator

In this type of evaporator the entire surface of the coil is in contact with the refrigerant inside. This type of evaporator is also called prime-surface evaporator. The bare tube coil evaporators are extensively used in household refrigerators because they are easier to keep clean. The material used for bare tube evaporator is steel or copper.

Plate evaporator

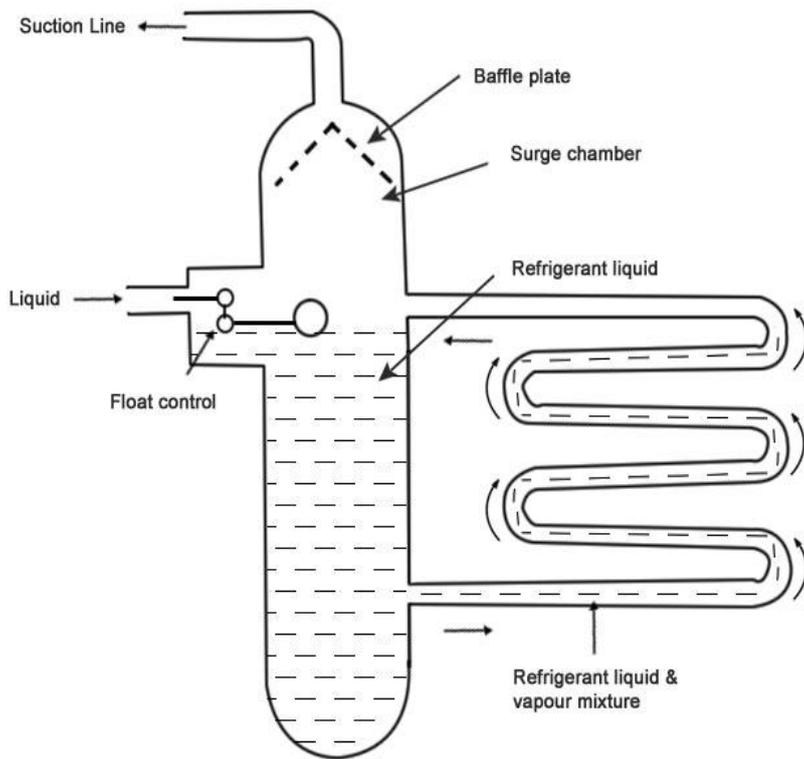
In this type of evaporator, the coils are either welded on one side of a plate or between the two plates which are welded together at the edges. The plate evaporators are generally used in house hold refrigerators, home freezers, beverage coolers, ice cream cabinets etc.

Finned Evaporators

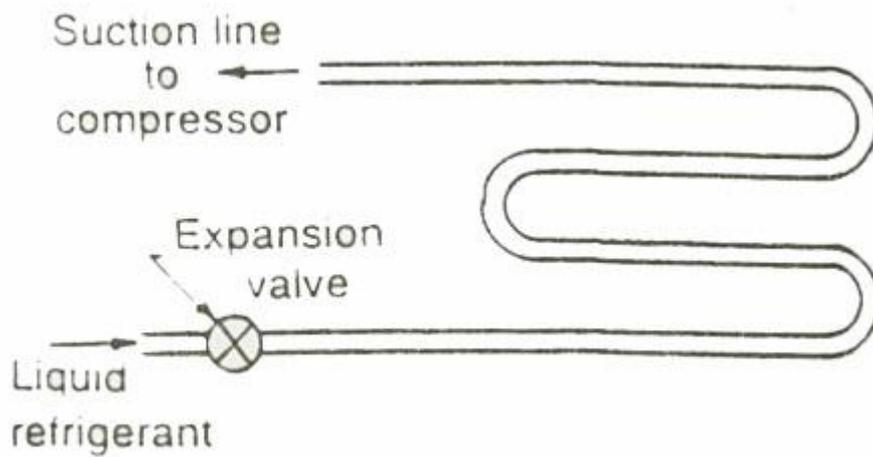
In this type of evaporator the outer surface area is surrounded by thin metallic plates called fins. Fins are thin metallic plates, usually aluminum or copper, securely attached or banded to the evaporator tubes, with bare tube evaporators. These fins increase the heat transfer efficiency of the evaporator. Finned evaporators are used in air cooling application.

3.2.1.2.Flooded type evaporators

In a flooded type evaporator a constant refrigerant liquid level is maintained. A front valve is used as a throttling device which maintains a constant liquid level in the evaporator. Due to the heat supplied by the substance to be cooled, the liquid refrigerant vaporizes and so the liquid level falls down. The float valve opens admit more liquid and thus maintains a constant liquid level. At a result the evaporator is always filled with liquid to the level determined by the float adjustment and the inside surface is wetted with liquid. Thus this type is called flooded type evaporator. The heat transfer efficiency increases because the entire surface is in contact with the liquid refrigerant and therefore the refrigerant change is relatively large as compared to the dry expansion type.



3.2.1.3. Dry expansion type evaporator



Liquid refrigerant is fed into the dry expansion evaporator by an expansion device which meters the liquid into the evaporator at a rate such that all the liquid is vaporized by the time it reaches the end of the evaporator coil.