Basic Refrigeration System & Its component

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Heat

Heat is a form of energy that flows from high temperature to low temperature naturally.

Heat is a form of energy transferred by virtue of a difference in temperature. Heat exists everywhere to a greater or lesser degree. As a form of energy, it can be neither created nor destroyed, although other forms of energy may be converted into heat and vice versa. It is important to remember that heat energy travels in only one direction; from a warmer to a cooler object, substance, or area.

Cold

Cold is a relative term referring to the lack of heat in an object, substance, or area. Another definition describes it as the absence of heat, no process yet has been devised of achieving "absolute zero," the state in which all heat has been removed from any object, substance, or area. Theoretically, this zero point would be 459.69 degrees below zero on the Fahrenheit thermometer scale or 273.16 degrees below zero on the Celsius thermometer scale.

SOME BASIC TERMS USED IN REFRIGERATION || HEAT || COLD || REFRIGERATION || MECHANICAL REFRIGERATION || REFRIGERATION SYSTEM FUNDAMENTAL COMPONENTS

Refrigeration

Refrigeration is a science of maintaining the temperature of a system or substance below the surrounding temperature is called the Refrigeration process.

Refrigeration, or cooling process, is the removal of unwanted heat from a selected object, substance, or space and its transfer to another object, substance, or space. Removal of heat lowers the temperature and may be accomplished by the use of ice, snow, chilled water, or mechanical refrigeration.

Mechanical refrigeration

Mechanical Components used for the refrigeration process are called mechanical refrigeration.

Mechanical refrigeration is the utilization of mechanical components arranged in a "***refrigeration system***" for the purpose of transferring heat.

Refrigerants

Refrigerants are those chemical compounds used for transferring heat from one place to another place in the refrigeration system.

Refrigerants are chemical compounds that are alternately compressed and condensed into a liquid and then permitted to expand into a vapor or gas as they are pumped through the mechanical refrigeration system to cycle.

The refrigeration cycle is based on the long-known physical principle that a liquid expanding into a gas extracts heat from the surrounding substance or area. (You can test this principle by simply wetting your finger and holding it up. It immediately begins to feel cooler than the others, particularly if exposed to some air movement. That's because the liquid in which you dipped it is evaporating, and as it does, it extracts heat from the skin of the finger and air around it).

Refrigerants evaporate or "boil" at much lower temperatures than water, which permits them to extract heat at a more rapid rate than the water on your finger.

Refrigeration system fundamental components

The job of the refrigeration cycle is to remove unwanted heat from one place and discharge it into another. To accomplish this, the refrigerant is pumped through a closed refrigeration system. If the system was not closed, it would be using up the refrigerant by dissipating it into the surrounding media; because it is closed, the same refrigerant is used over and over again, as it passes through the cycle removing some heat and discharging it. The closed cycle serves other purposes as well; it keeps the refrigerant from becoming contaminated and controls its flow, for it is a liquid in some parts of the cycle and a gas or vapor in other phases.

Let's look at what happens in a simple refrigeration cycle, and at the major components involved. Two different pressures exist in the cycle - the evaporating or low pressure in the "low side," and the condensing, or high pressure, in the "high side." These pressure areas are separated by two dividing points: one is the metering device where the refrigerant flow is controlled, and the other is at the compressor, where vapor is compressed.

The metering device is a point where we will start the trip through the cycle. This may be a thermal expansion valve, a capillary tube, or any other device to control the flow of refrigerant into the evaporator, or cooling coil, as a low-pressure, low-temperature refrigerant. The expanding refrigerant evaporates (changes state) as it goes through the evaporator, where it removes the heat from the substance or space in which the evaporator is located.

Heat will travel from the warmer substance to the evaporator cooled by the evaporation of the refrigerant within the system, causing the refrigerant to "boil" and evaporate, changing it to a vapor. This is similar to the change that occurs when a pail of water is boiled on the stove and the water changes to steam, except that the refrigerant boils at a much lower temperature.

Now, this low-pressure, low-temperature vapor is drawn to the compressor where it is compressed into a high-temperature, high-pressure vapor. The compressor discharges it to the condenser so that it can give up the heat that is picked up in the evaporator. The refrigerant vapor is at a higher temperature than the air passing across the condenser (air-cooled type), or water passing through the condenser (water-cooled type); therefore that is transferred from the warmer refrigerant vapor to the cooler air or water.

In this process, as heat is removed from the vapor, a change of state takes place and the vapor is condensed back into a liquid, at high pressure and high temperature.

The liquid refrigerant travels now to the metering device where it passes through a small opening or orifice where a drop in pressure and temperature occurs, and then it enters into the evaporator or cooling coil. As the refrigerant makes its way into the large opening of the evaporator tubing or coil, it vaporizes, ready to start another cycle through the system.

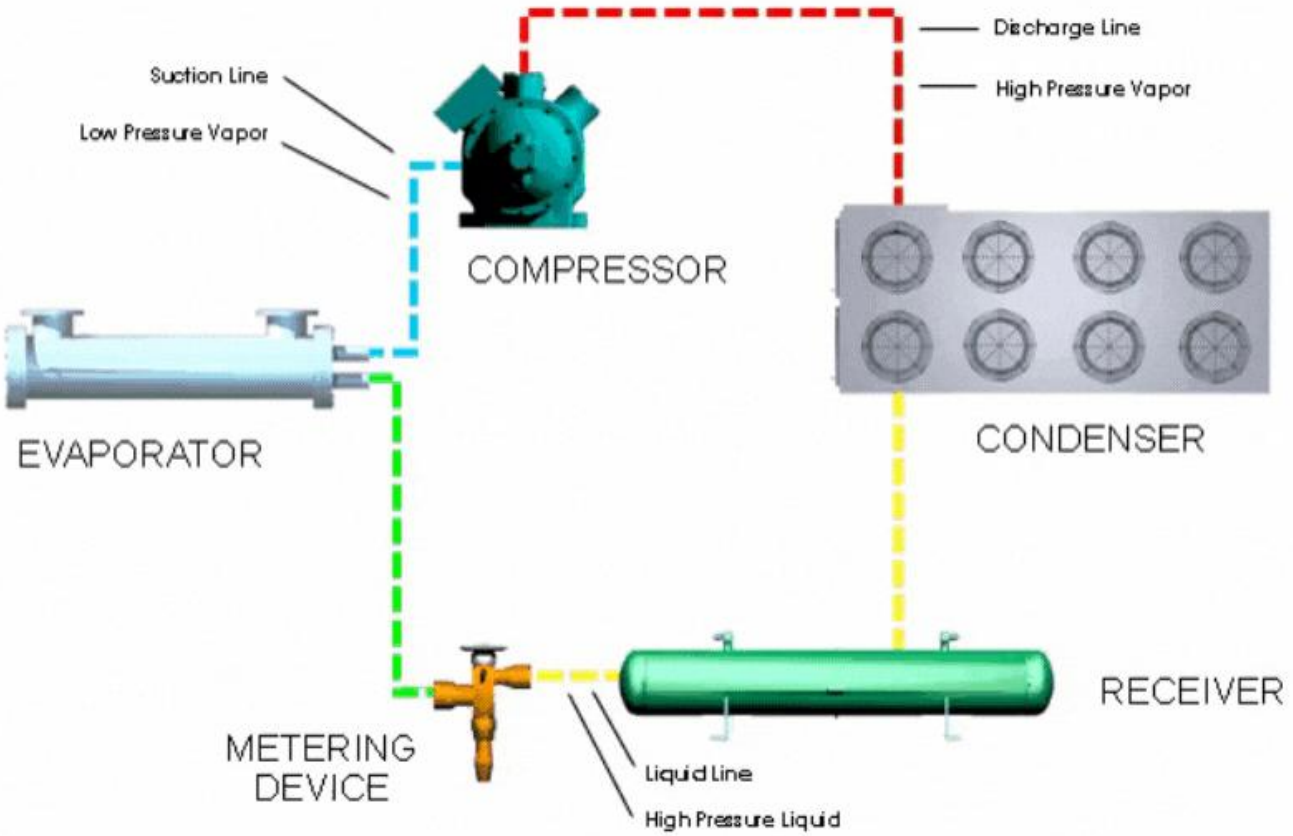
The refrigeration system requires some means of connecting the basic major components - evaporator, compressor, condenser, and metering device - just as roads connect communities. Tubing or "lines" make the system completely so that the refrigerant will not leak out into the atmosphere. The suction line connects the evaporator or cooling coil to the compressor, the hot gas or discharge line connects the compressor to the condenser, and the liquid line is the connecting tubing between the condenser and the metering device (Thermal expansion valve). Some systems will have a receiver immediately after the condenser and before the metering device, where the refrigerant is stored until it is needed for heat removal in the evaporator.

There are many different kinds and variations of refrigeration cycle components. For example, there are at least a half dozen different types of compressor, from the reciprocating, piston through a screw, scroll, and centrifugal impeller design, but the function is the same in all cases - that of compressing the heat laden vapor into a high-temperature vapor.

The same can be said of the condenser and evaporator surfaces. They can be bare pipes, or they can be finned condensers and evaporators with electrically driven fans to pass the air through them, or with a condenser, pump to pump the water through a water-cooled condenser.

There are a number of different types of metering devices to regulate the liquid refrigerant into the evaporator, depending on the size of equipment, the refrigerant used, and its application.

The mechanical refrigeration system described above is essentially the same whether the system is a domestic refrigerator, a low-temperature freezer, comfort air conditioning system, industrial chiller, or commercial cooling equipment. Refrigerants will be different and the size of the equipment will vary greatly, but the principle of operation and the refrigeration cycle remains the same. Thus, once you understand the simple actions that are taking place within the refrigeration mechanical cycle you should have a good understanding of how a refrigeration system works.



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