

CLASSIFICATION OF COOLING METHODS IN REFRIGERATORS

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Refrigerators are key pieces of technology that enable the conservation of food items as well as the regulation of indoor ambient temperatures, in addition to many industrial functions. Within refrigerative systems, air conditioner systems differ from one another in their efficiency depending on the cooling methods used. In this essay, the different types of cooling methods in refrigerators, their principles, applications, and benefits will be examined.

Refrigeration systems tend to be split into several methods of cooling, all of which differ in their apparatuses and forms of application. The best-known systems are: vapor-compression refrigeration system, absorption refrigeration system, thermoelectric cooler, and evaporative cooler.

Vapor-compression refrigeration is the most popular system in usage for modern home refrigerators as well as commercial unit fridges. It utilizes a refrigerant fluid which undergoes vaporization at low pressure and condenses at high pressure. A vapor refrigerant absorbs heat from the refrigerator's interior and in turn releases heat to the exterior. Superiority of this method lies in the efficiency of its key parts, including the compressor, condenser, expansion valve, and evaporator. The refrigerant moves through an evaporator and a condenser from liquid phase to gas and then back while heat exchange takes place. This heating and cooling process is very cost-effective, transforming vapor to fluid, to construct a superior lower-cost refrigeration refrigerator.

Absorption refrigeration is a technique commonly used in industrial settings or where electricity is not available. This method relies on a heat source such as natural gas or solar energy to power the refrigeration from outside. Ammonia is typically washed out of a secondary fluid, which is usually water and later released under heat. It is better in remote locations or augmenting waste heat, but is cumulatively inefficient when compared to vapor-compression systems.

Thermoelectric cooling employs the Peltier effect, which involves passing an electric current through two dissimilar conductors to form a temperature gradient. Because it is compact, quiet, and possesses no moving parts, it is perfect for portable coolers or electronic devices. On the contrary, it is much less efficient for larger scales coolers, and unlike other methods, it consumes more electricity.

Used in drier climates, evaporative cooling is more energy efficient. This method cools air through gradual decay of water, absorbing heat from the surrounding air. Its effectiveness is less efficient in normal refrigerating units, but is ideal for cooling spaces or keeping perishable goods in optimal storage conditions. The level of efficiency heavily depends on the degree of humidity available in the environment.

Ultimately, categorizing cooling techniques employed in refrigerators reveals the breadth and adaptability of refrigeration technology to different conditions and requirements. For example, from the most popular vapor-compression systems to the more recently developed thermoelectric and evaporative methods, each system possesses its own advantages and disadvantages. Knowing these approaches makes it possible to select and design refrigeration systems for domestic and industrial refrigeration applications more effectively and sustainably. It can be anticipated that with changing technology, these systems will be improved to become more efficient and environmentally friendly, which contributes to sustainability.

Литература

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