

FDE 447

Cold preservation Technology

Content

- Cooling systems
- Mechanical cooling systems

Two concepts related to heat used in the cold technique:

- Frigori
- ton of refrigeration

Frigori

Ton of refrigeration (TR)

Cooling SYSTEMs



- It is a system that transfers the heat from the low temperature environment to a higher temperature environment.
- If a system is to be kept below ambient temperature, heat must be transferred from a low temperature to a high temperature, contrary to the 2nd law of thermodynamics.
- For this, it is necessary to give energy to the environment.

- A cooling system has a cold end and a hot end.
- The low temperature side (cold end) of the system is kept at a lower temperature than the temperature of the cooled environment. Thus, the heat of the cooled environment can spontaneously flow to the cold side of the cooling system according to the 2nd law of thermodynamics.
- The hot side of the cooling system is located outside the cooled environment and its temperature must be higher than the ambient temperature there so that the heat absorbed in the cooled environment can spontaneously flow to the environment.
- This heat can sometimes be used as a heat source in another heating process.

- The formation of a hot and a cold end in the cooling system can be achieved with the help of a refrigerant that circulates continuously in the system.
- The refrigerant physically behaves like any other liquid. As is known, the boiling and condensation temperature of a liquid is a function of absolute pressure.
- That is, the liquid boils at lower temperatures under low pressure.
- In the cooling systems, the refrigerant (cold end) boiling at low temperature under low pressure is charged the heat of the cooled environment as the latent heat of evaporation.
- The refrigerant evaporated in this way, when compressed to a high pressure, condenses at high temperature (hot end).
- Thus, the absorbed heat is released as a result of condensation and spreads to the environment where it is condensed.

COOLING SYSTEMS

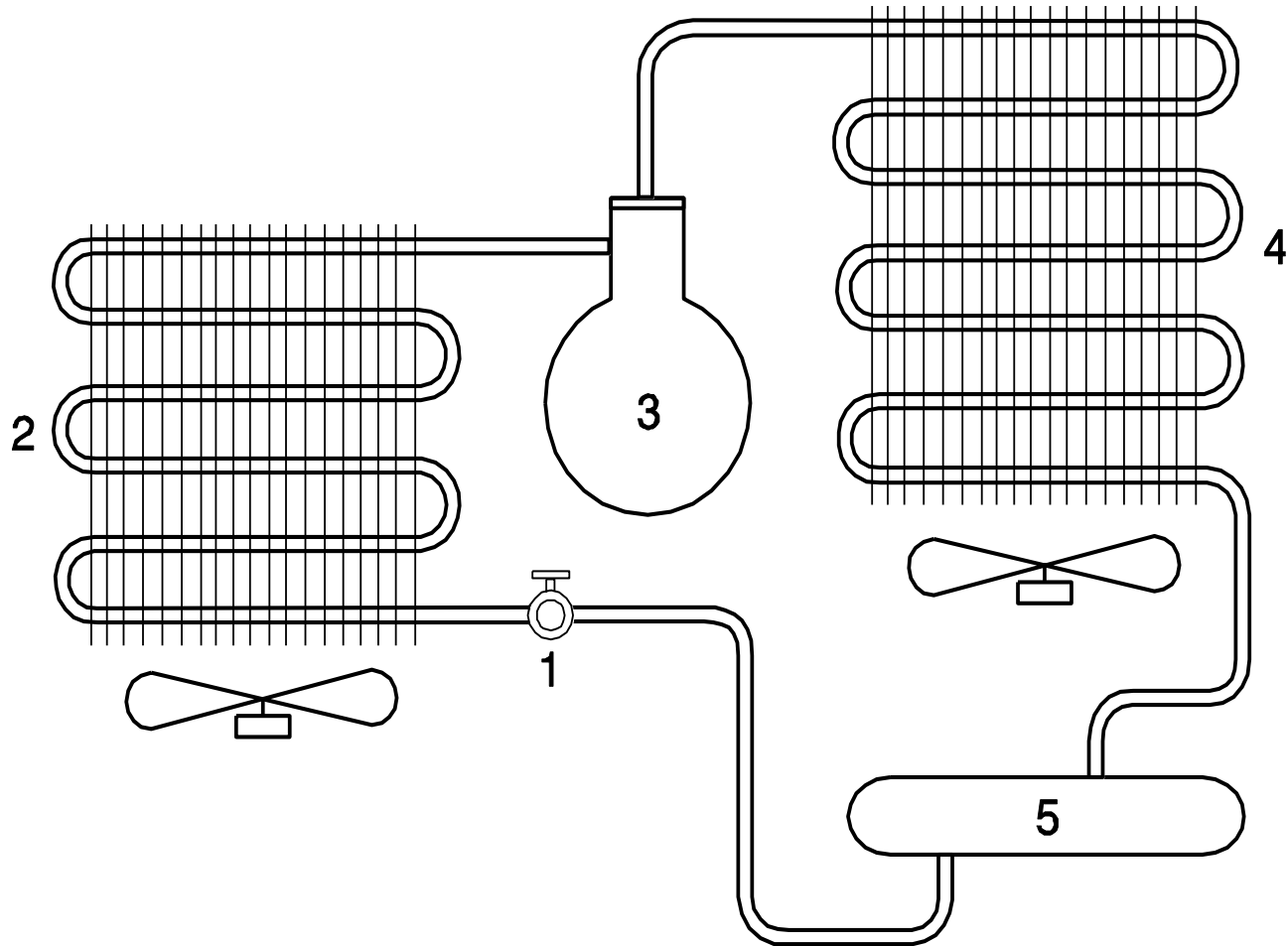
Two cooling systems is used in refrigeration

- ▶ Mechanical compression refrigeration system
- ▶ Vapor absorption refrigeration system



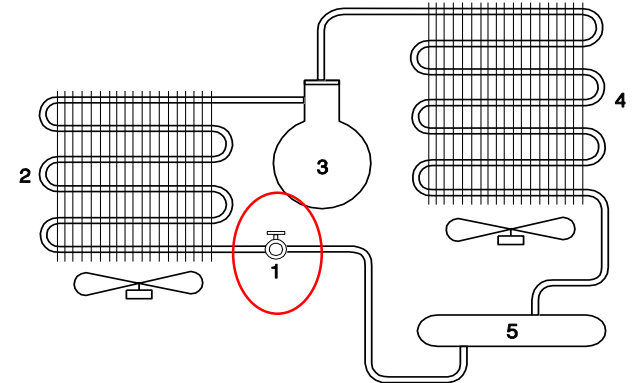
Mechanical compression refrigeration system

The main components of a mechanical refrigeration system



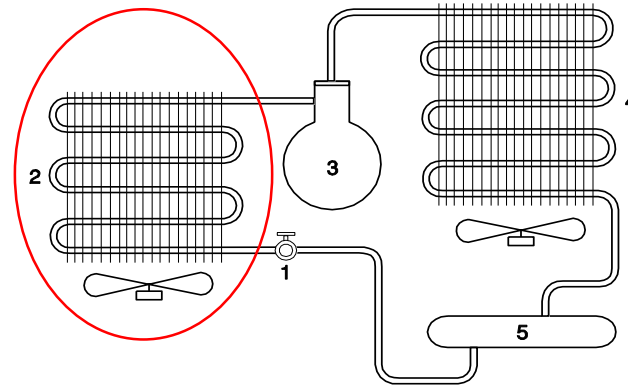
The Main components of a mechanical refrigeration system

1.Expansion valve:

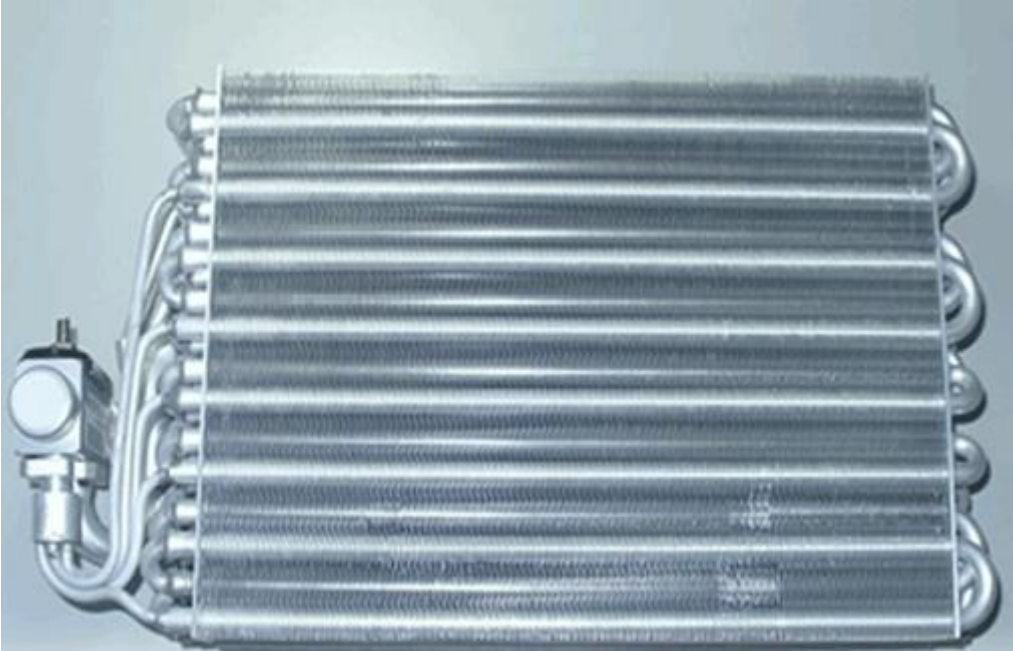


The Main components of a mechanical refrigeration system

2. Evaporator

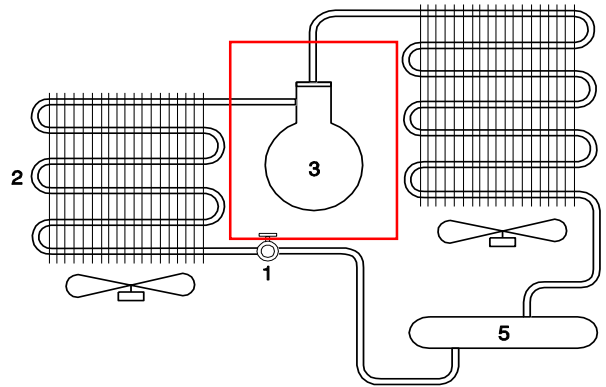


EVAPORATORS



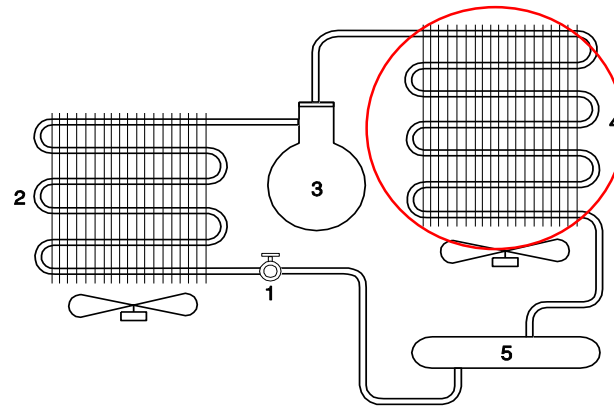
The Main components of a mechanical refrigeration system

3.Compressor:



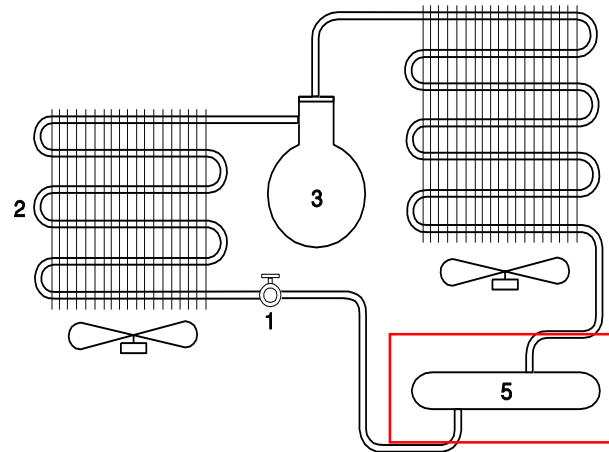
The Main components of a mechanical refrigeration system

4. Condenser:



The Main components of a mechanical refrigeration system

5. Liquid receiver



Refrigeration cycle

- ▶ The refrigerant flows from the evaporator coil through the compressor. This flow raises the pressure of the coolant.
- ▶ The vaporized refrigerant then flows to the condenser where it transforms to liquid. As the refrigerant condenses to a liquid, it gives off heat. This explains why the condenser is relatively hot when you touch it.
- ▶ From the condenser, the refrigerant flows to the expansion valve. There is a drop of pressure in the expansion valve.
- ▶ From the expansion valve, the refrigerant flows to the evaporator. The liquid refrigerant draws heat from the evaporator' environment. This heat vaporizes the liquid refrigerant.
- ▶ The vaporized refrigerant flows back to the compressor where the cycle continues.

