

Carbon Dioxide Refrigerant (CO₂)

Although carbon dioxide is known as a major greenhouse gas, it is a promising refrigerant as one of alternatives to fluorocarbons since its Global Warming Potential (GWP) is significantly lower (GWP=1) than fluorocarbons and it is non-toxic and non-flammable.

When carbon dioxide is used as a refrigerant, it must operate at high pressure and this made it difficult to commercialize in compact appliances. Today more efficient and compact appliances have been developed by using a two-stage compression method.



Drinks showcase

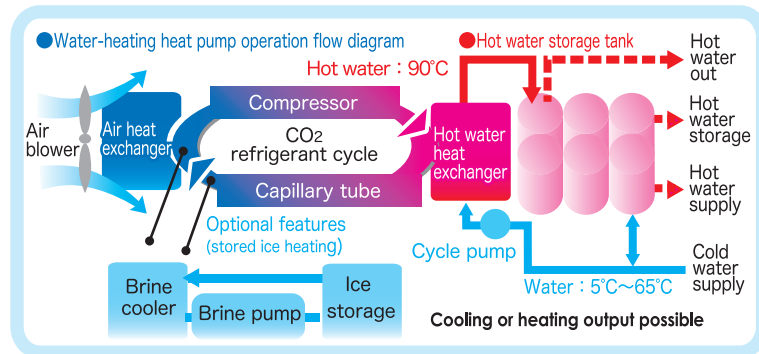
When used as a refrigerant in freezers, carbon dioxide has comparatively low efficiency, but it is suitable for heating equipment that transfers heat from outdoors to make hot water. For this application, carbon dioxide has become the most suitable and popular refrigerant in recent years.

For example, it is used in "Eco-cute" water heaters, which make use of cheaper nighttime electricity to heat water for use in our daily life.

Example of system using CO₂ refrigerant



Eco-Cute



<Features of carbon dioxide refrigerant>

- non toxic, odorless
- non-flammable

- High COP for water-heating compared to fluorocarbon refrigerants

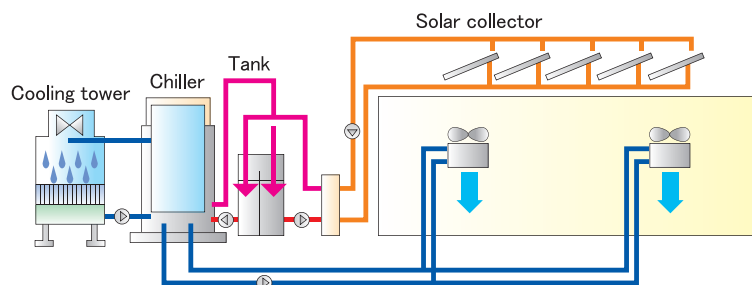
<Usage Example> water-heating in domestic houses, hospitals, hotels, and spas.
Cooling in vending machines and drinks showcases.

Water Refrigerant (H₂O)

Water is a safe refrigerant with no toxicity and flammability. It can be used as a refrigerant by combining with other substances. Absorbent cooling systems combined with a solid absorbent (Silica gel) and absorption freezers and refrigerators combined with lithium bromide etc. have been commercialized. These types of equipment are not relatively energy-efficient, but water is non-toxic and non-flammable and can make use of solar heat and waste heat from factories. In these cases, these systems are very energy-efficient.



Absorbent chiller



Example of water chiller system using solar heat

<Features of water refrigerant>

- non-toxic, odorless
- Main drive mechanism is a pump: compressor is not required
- non-flammable
- Solar heat or waste heat can be used to produce chilled water

<Usage Example> Cooling equipment using waste heat
from Industrial reactors or engines, or natural energy etc.