



Air Refrigeration System

Air refrigeration cycle

- In an air refrigeration cycle, the air is used as a refrigerant.
- In olden days, air was widely used in commercial application because of its availability at free of cost.
- Since air does not change its phase i. e. remains gaseous throughout the cycle, therefore **the heat carrying capacity per kg of air is very small** as compared to vapour absorbing systems.
- The air-cycle refrigeration systems, as originally designed and installed, are now practically obsolete because of their low coefficient of performance and high power requirements.
- However, this system continues to be favoured for air refrigeration because of the low weight and volume of the equipment.

Basic elements of air refrigeration system

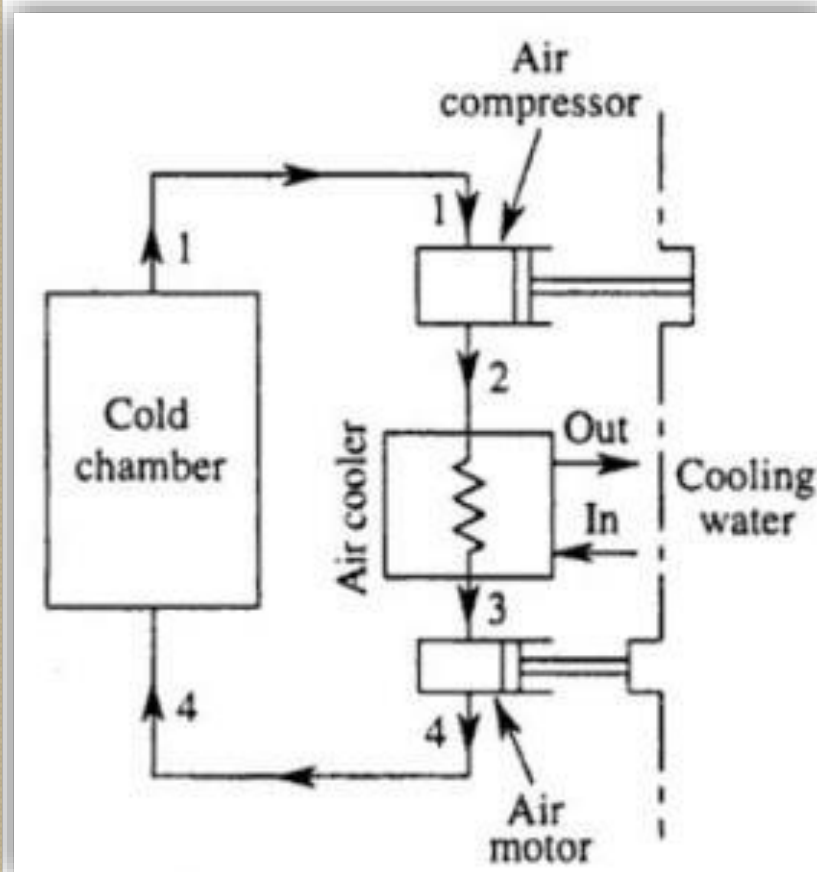
- Compressor
- Cooler or heat exchanger
- Expander
- Refrigerator

Air refrigeration cycle

- **Open air refrigeration cycle**
- **Closed air refrigeration cycle**

Open air refrigeration cycle

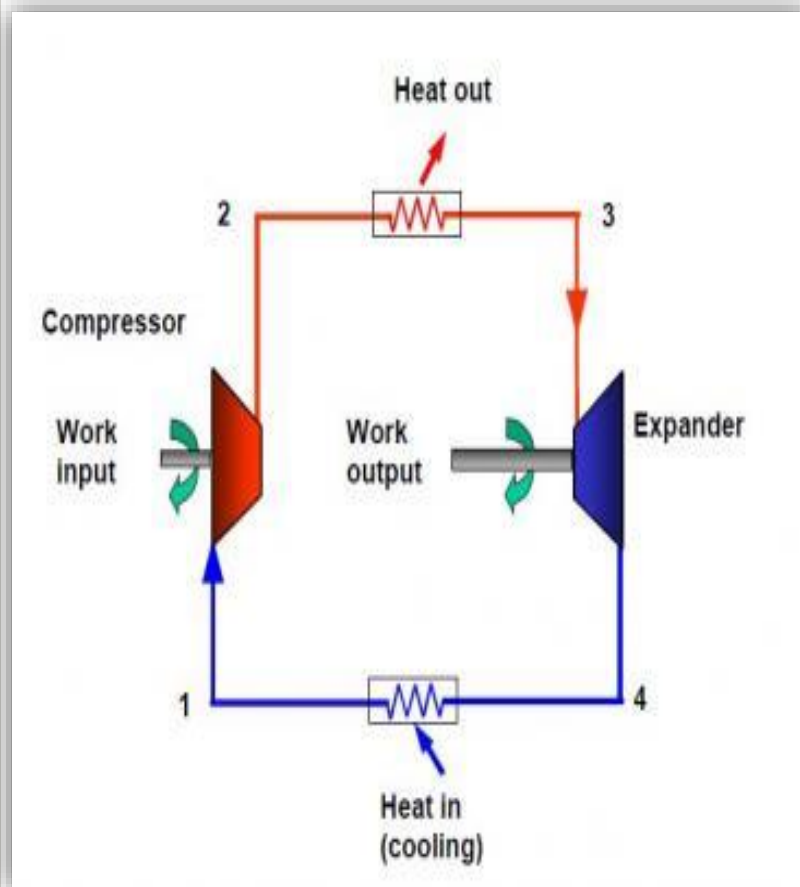
In an open air refrigeration cycle, the air is directly led to the space to be cooled, allowed to circulate through the cooler and then returned to the compressor to start another cycle.



- Since the air is supplied to the refrigerator at atmospheric pressure, therefore, **volume of air handled by the compressor and expander is large.**
- Thus the size of compressor and expander should be large.
- Another disadvantage of the open cycle system is that the **moisture is regularly carried away** by the air circulated through the cooled space.
- This leads to the formation of frost at the end of expansion process and clog the line.
- Thus in an open cycle system, a drier should be used.

Closed or dense air refrigeration cycle

In a closed or dense air refrigeration cycle, the air is passed through the pipes and component parts of the system at all times



- The air, in this system, is used for absorbing heat from the other fluid (say brine) and this cooled brine is circulated into the space to be cooled.
- The air in the closed system does not come in contact directly with the space to be cooled.

Advantages

- It can work at a suction pressure higher than that of atmospheric pressure
- Operating pressure ratio can be reduced, which results in higher coefficient of performance.

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- Isentropic compression process
- Constant pressure cooling process
- Isentropic expansion process
- Constant pressure expansion process

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