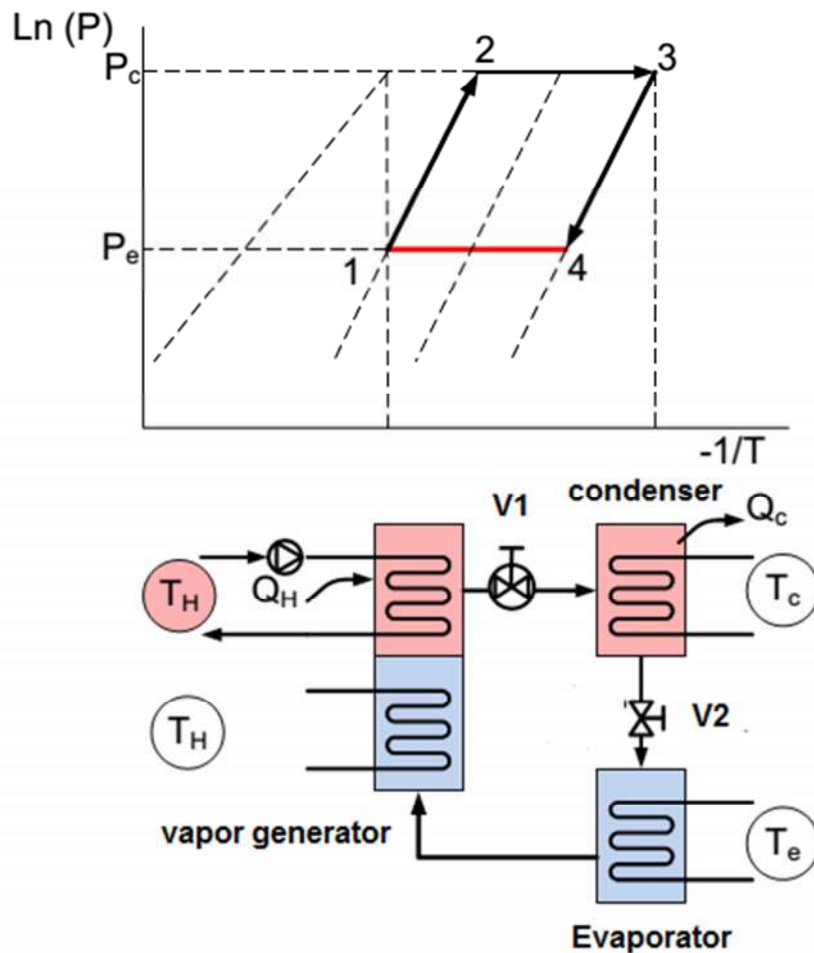


ADSORPTION
REFRIGERATION
SYSTEM

Refrigeration system

The principle works of the adsorption refrigeration system are



1- Close the valve (v1) and then heating the vapor generation by heating source(T_H) due to increase the pressure from evaporator pressure to condenser pressure as show in process (1-2) this called (heating and pressurization)

2- Open the valve (v1) due to flow the refrigerant to condenser and rejected the heat to the atmosphere as show in process (2-3) this called (desorption and condensation)

3- Close the valve (v1) and then cooling the the vapor generation by cooling source(T_L) due to decrease the pressure of vapor generation from condenser pressure to evaporator pressure, and at the same time open the valve (v2) due to flow the refrigerant through the expansion device and lead

Refrigeration system

to decrease the pressure of refrigerants as show in process (3-4) this called (cooling and depressurization)

4- The refrigerant entering to the evaporator at low pressure and temperature and absorb the heat from surrounding and the refrigerant become vapor as show in process (4-1) this called (adsorption and evaporation)

And the adsorption materials is

- 1- Silica-gel
- 2- Zeolites
- 3- Activated Carbons

Where the working pairs fluid in adsorption refrigeration system is

- 1- zeolite-water
- 2- silica gel – water
- 3- active carbon – methanol
- 4- active carbon – ammonia
- 5- active carbon – R134a

The main advantage and disadvantage of the adsorption refrigeration system are

Advantages

- 1- No risk of crystallization, no danger of damage due to temperature.
- 2- Low electricity consumption.
- 3- Little moving parts. Low maintenance cost.
- 4- Low production cost.
- 5- Friendly environmental
- 6- Operating at many heating of source such as solar energy
- 7- Quite operation

Refrigeration system

Disadvantages

- 1- High requirements to the vacuum in the condenser.
- 2- Lower COP comparable to the absorption system.
- 3- Required careful design of the external hydraulic system.
- 4- Intermittence operation.
- 5- Small refrigeration capacity

The main difference between adsorption cycle versus absorption cycle and vapor compression cycle are

Adsorption cycle	Absorption cycle	Vapor compression cycle
1- (Adsorbent and desorbed) vapor generation act as compressor 2- operated at temperature of 50°C 3- no danger of crystallization 4- Low COP 5- Intermittence operation	1- Absorber and vapor generation act as compressor 2- operated at temperature of 50°C 3- danger of crystallization 4- COP higher than adsorption but below than vapor compression 5- Continue operation	1- Compressor pressurized the refrigerant from evaporator pressure to condenser pressure 2- temperature depended on the compressor type and refrigerant 3- no danger of crystallization 4- High COP 5- Continue operation