# UNIT IV

# VAPOUR COMPRESSION SYSTEM

## Basic Civil and Mechanical Engineering

KARTHICK B

ASSISTANT PROFESSOR / MECHANICAL ENGG

# REFRIGERATION

- **Refrigeration** : The term refrigeration may be defined as the process of removing heat from a substance under controlled conditions.
- It also includes the process of reducing heat & maintaining the temp. of a body below the general temp. of its surroundings.

# VAPOUR COMPRESSION SYSTEM

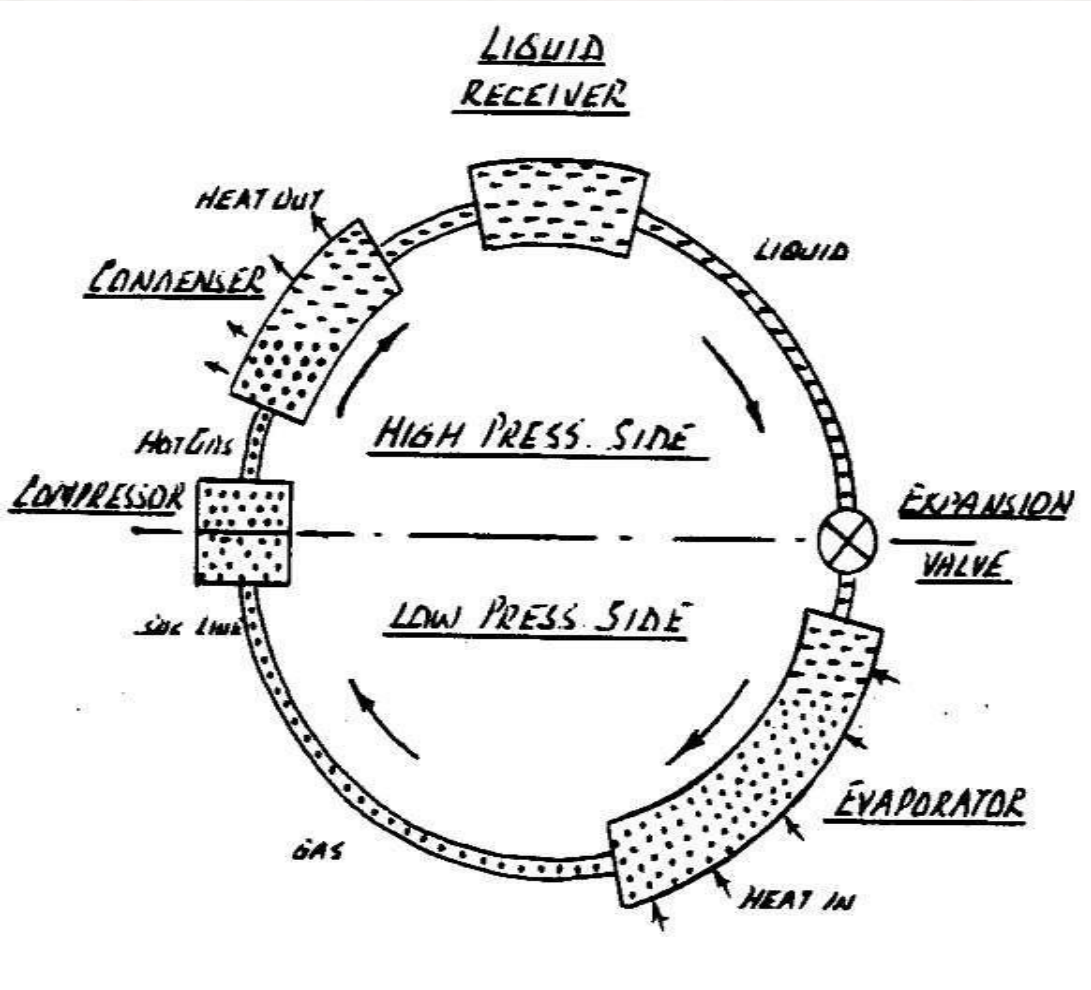
4 numbers principle components :

(1)Evaporator

(2)Compressor

(3)Condenser

(4)Expansion Valve



# VAPOUR COMPRESSION REFRIGERATION

Highly compressed fluids tend to get colder when allowed to expand

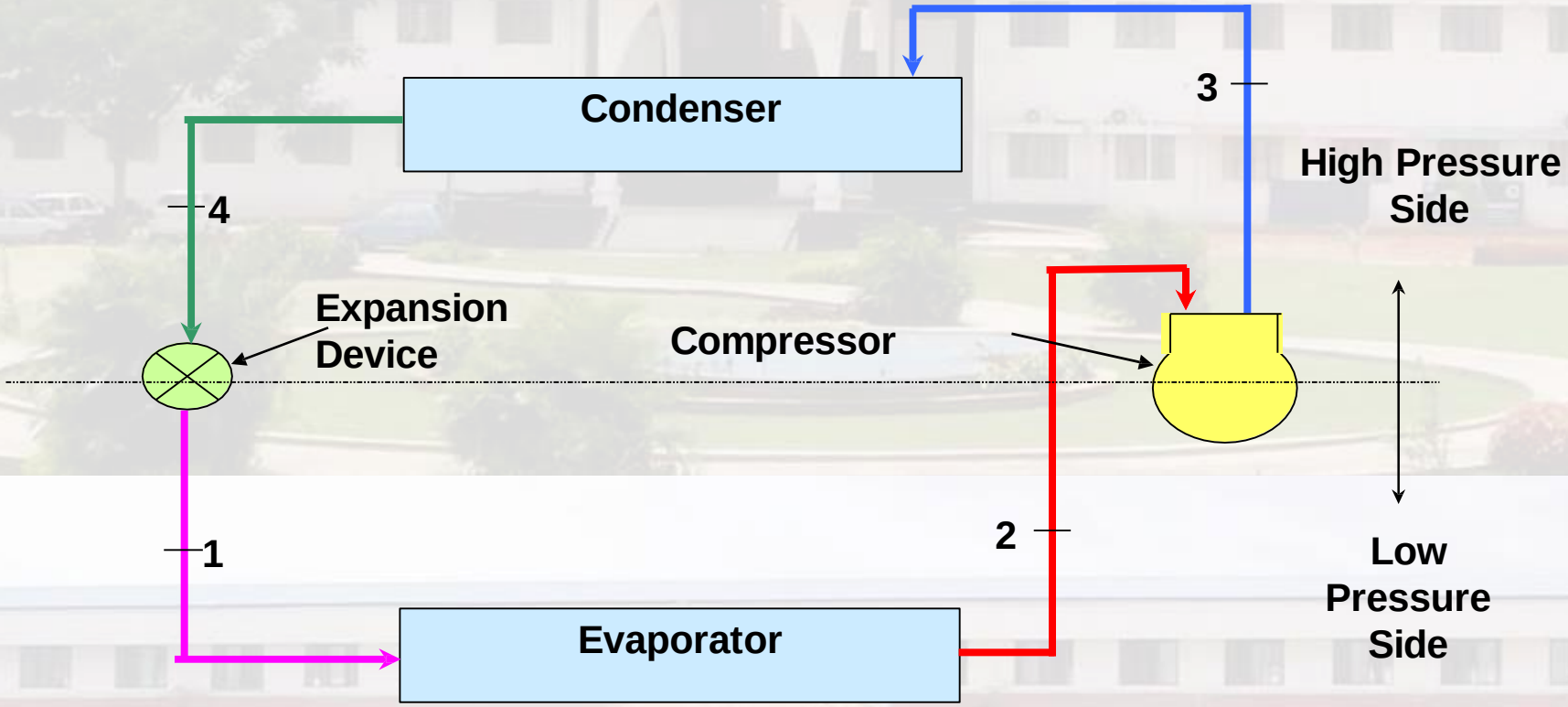
- If pressure high enough
  - Compressed air hotter than source of cooling
  - Expanded gas cooler than desired cold temperature

**Two advantages**

- Lot of heat can be removed (lot of thermal energy to change liquid to vapour)
- Heat transfer rate remains high (temperature of working fluid much lower than what is being cooled)

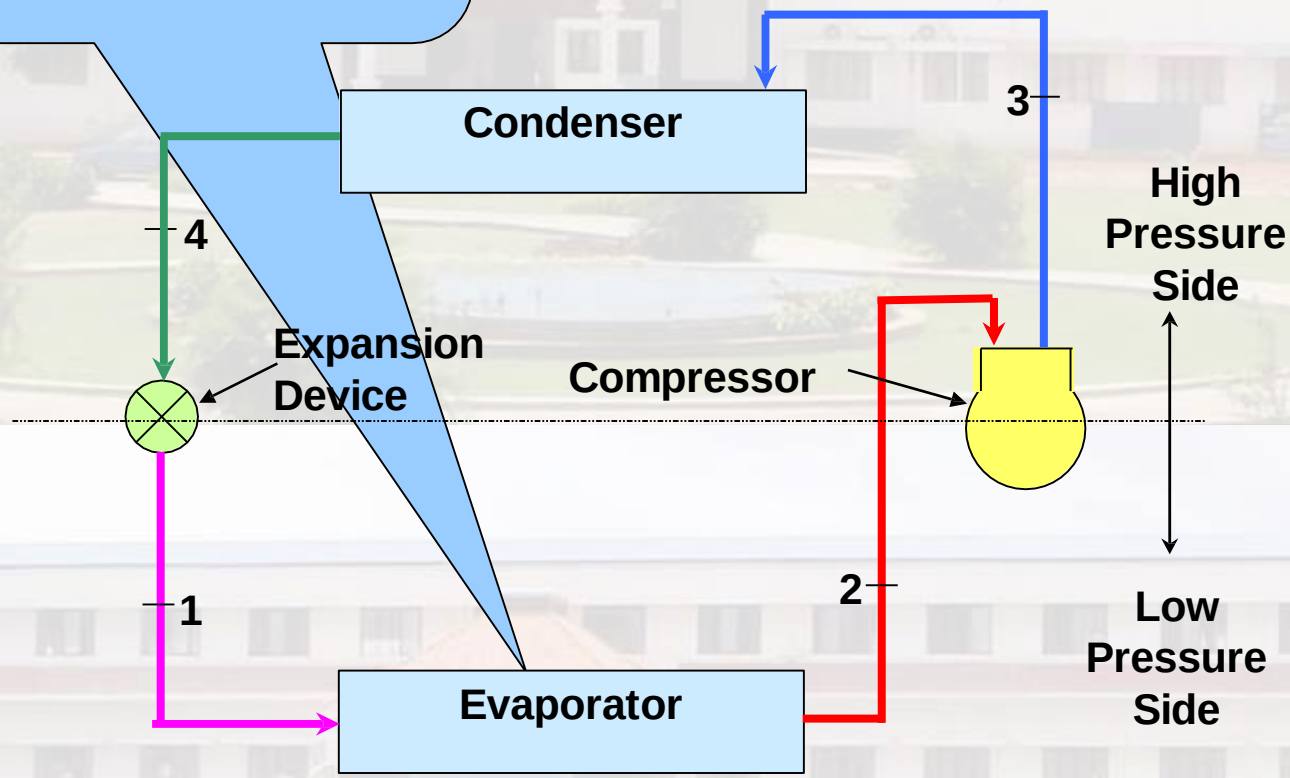
# VAPOUR COMPRESSION REFRIGERATION

## Refrigeration cycle



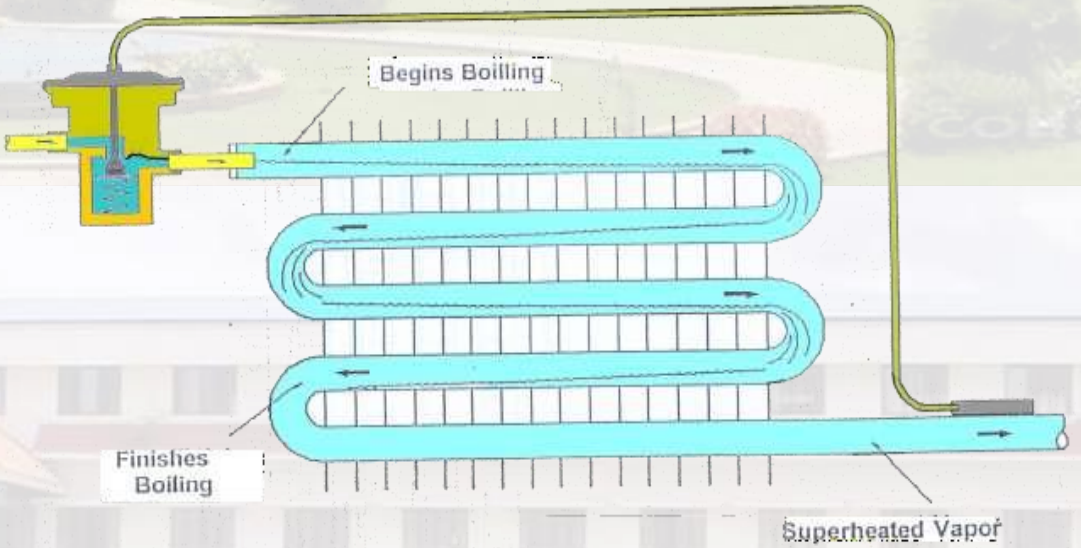
# REFRIGERATION CYCLE

Low pressure liquid refrigerant in evaporator absorbs heat and changes to a gas



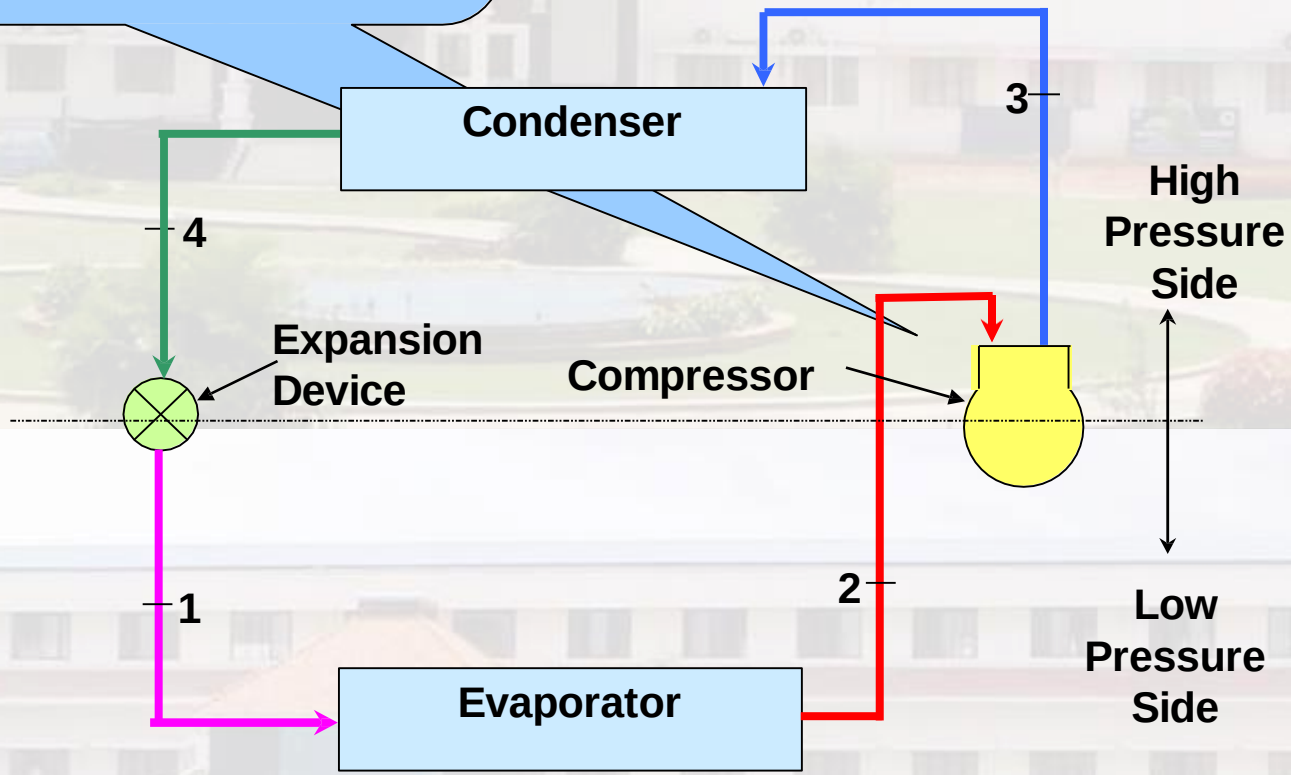
# EVAPORATOR

1) The evaporator coils are located in the compartment to be cooled.
2) The low pressure liquid refrigerant ,after passing through the expansion valve, expands.
3) Takes in heat from the surrounding and evaporates.
4) The gas is then sucked up by the compressor.
5) The amount of heat added to the liquid to make it saturated and change states is called Super Heat.



# VAPOUR COMPRESSION REFRIGERATION

The superheated vapour enters the compressor where its pressure is raised

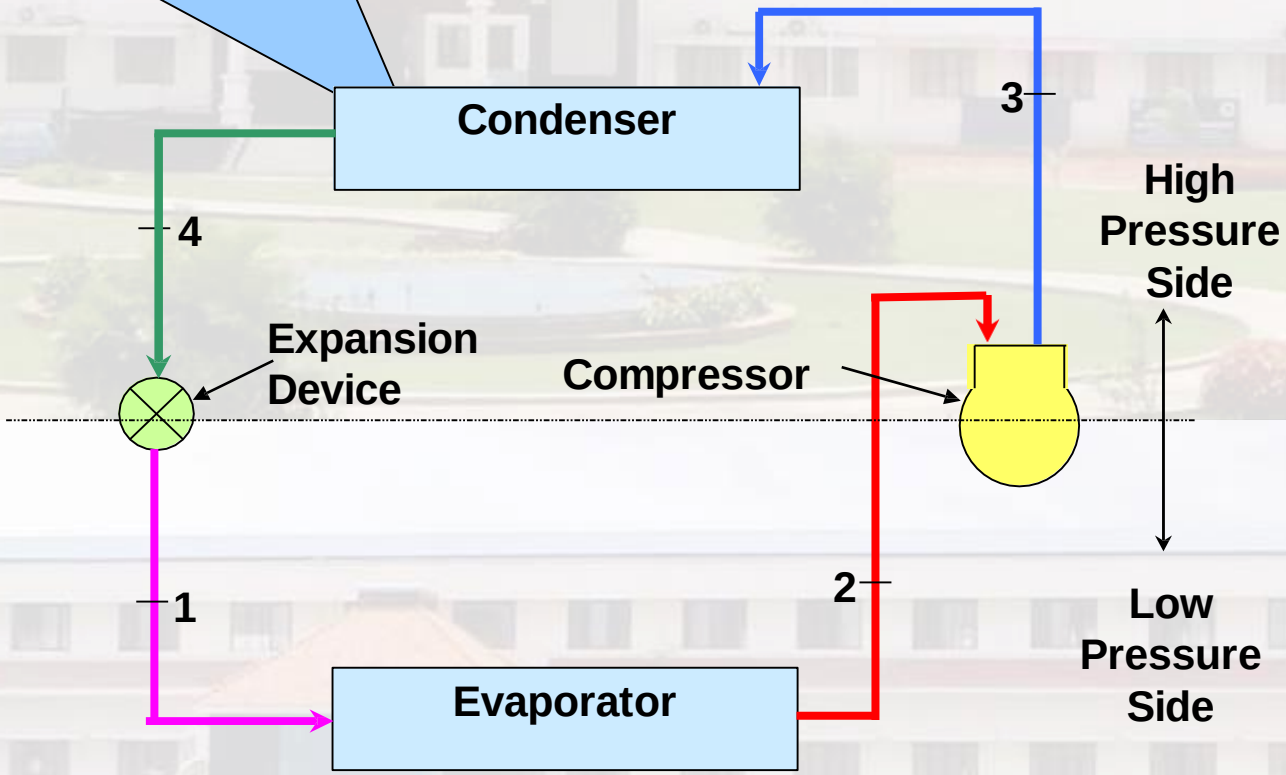


# COMPRESSOR

- The compressor is the heart of the system. The compressor does just what it's name is. It compresses the low pressure refrigerant vapor from the evaporator and compresses it into a high pressure vapor.
- The inlet to the compressor is called the Suction Line.
- It brings the low pressure vapor into the compressor.
- After the compressor compresses the refrigerant into a high pressure Vapor, it removes it to the outlet called the Discharge Line.

# VAPOUR COMPRESSION REFRIGERATION

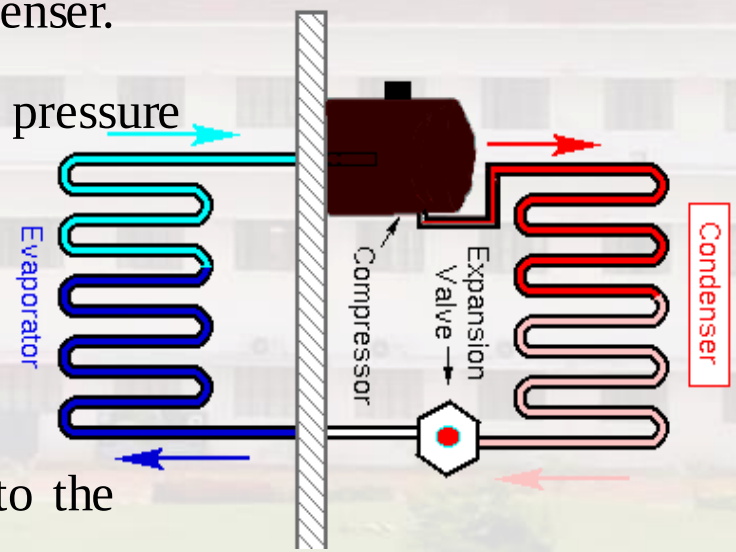
The high pressure superheated gas is cooled in several stages in the condenser



# CONDENSER

- The Discharge Line leaves the compressor and runs to the inlet of the condenser.
- Because the refrigerant was compressed, it is a hot high pressure vapor (as pressure goes up –

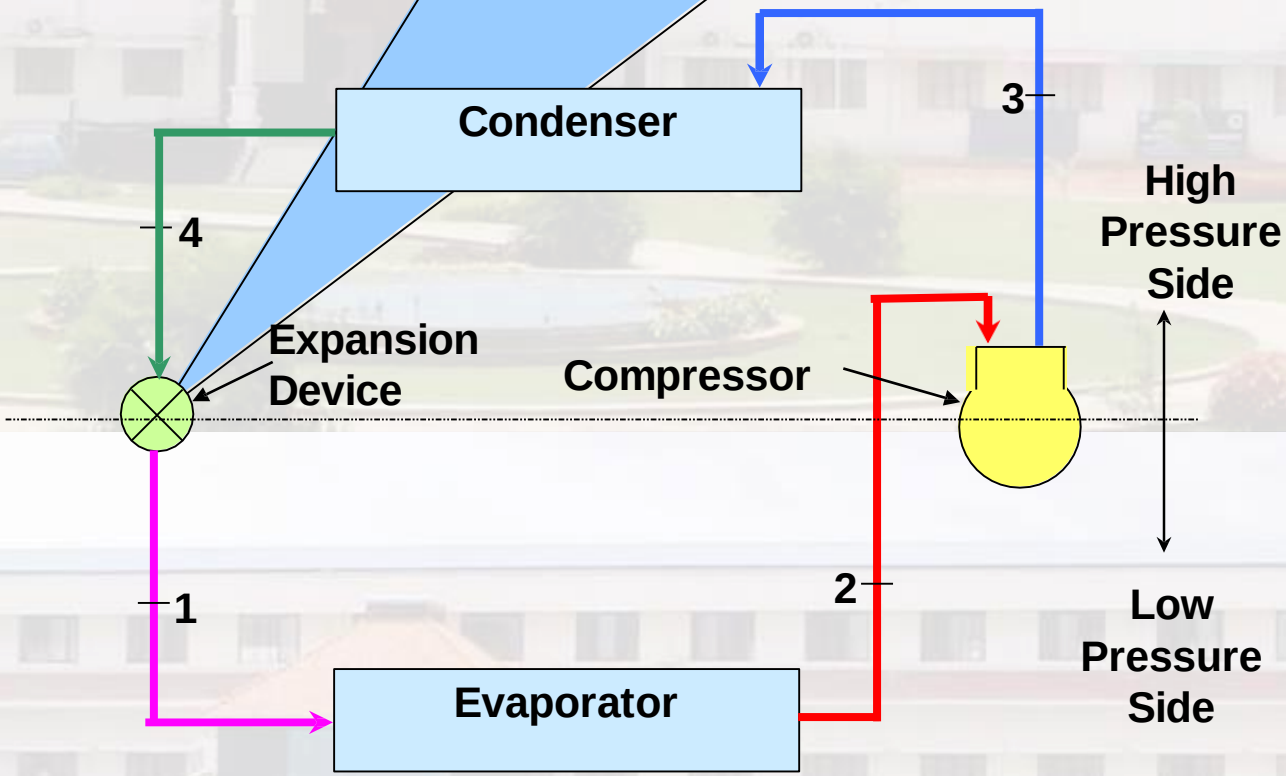
temperature goes up).




- The hot vapor enters the condenser and starts to flow through the tubes.
- Since the air is cooler than the refrigerant, heat jumps from the tubing to the cooler air (energy goes from hot to cold – latent heat).
- As the heat is removed from the refrigerant, it reaches it's saturated temperature and starts to boil (change states), into a high pressure liquid.
- The high pressure liquid leaves the condenser through the liquid line and travels to the metering device. Sometimes running through a filter dryer first, to remove any dirt or foreign particles.

# VAPOUR COMPRESSION REFRIGERATION

Liquid passes through expansion device, which reduces its pressure and controls the flow into the evaporator

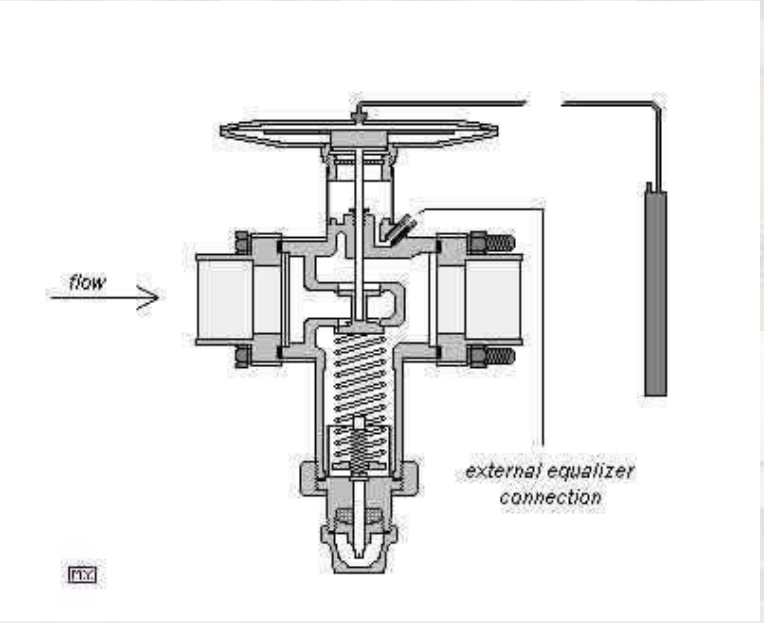


# THERMAL EXPANSION VALVES

- EXPANSION:

1) The expansion valve acting as a regulating valve, limits the amount of refrigerant flowing through.

2) Resulting in reduction of pressure of the liquid and expansion takes place



# THANK YOU