Week 5: Lecture 2

Common Refrigerants

R12	- CCl_2F_2 - dichlorofluoromethane
R22	- $CHClF_2$ - has less chlorine, a little better for the environment
R134a	- $C_2H_2F_4$ - tetrafluorethane - no chlorine
Ammonia	- NH_3 - corrosive and toxic

How to Choose a Refrigerant

- the heat of vaporization of the refrigerant should be high. The higher h_{fg}, the greater the refrigerating effect per kg of fluid circulated
- the specific heat of the refrigerant should be low. The lower the specific heat, the less heat it will pick up for a given change in temperature during the throttling or in flow through the piping, and consequently the greater the refrigerating effect per kg of refrigerant
- the specific volume of the refrigerant should be low to minimize the work required per kg of refrigerant circulated
- the cirtical temperature of the refrigerant should be higher than the condesning pressure to prevent excessive power comsumption
- since evaporation and condenser temperatures are fixed by the temperatures of the surroundings - selection is based on operating pressures in the evaporator and the condenser
- selection is based on the suitability of the pressure-temperature relationship of the refrigerant
- other factors include:
  - chemical stability
  - toxicity
  - cost
  - environmental friendliness
  - does not result in very low pressures in the evaporator (air leakage)
  - does not result in very high pressures in the condenser (refrigerant leakage)

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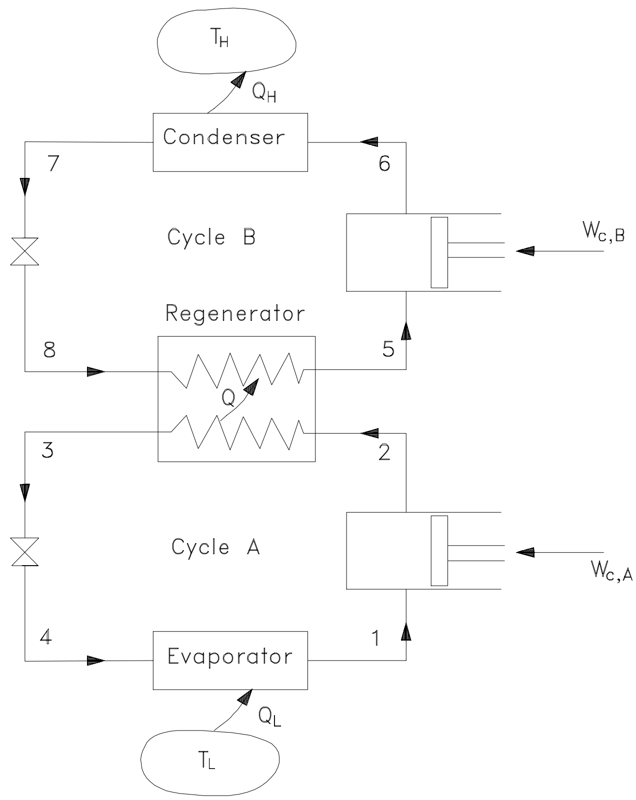
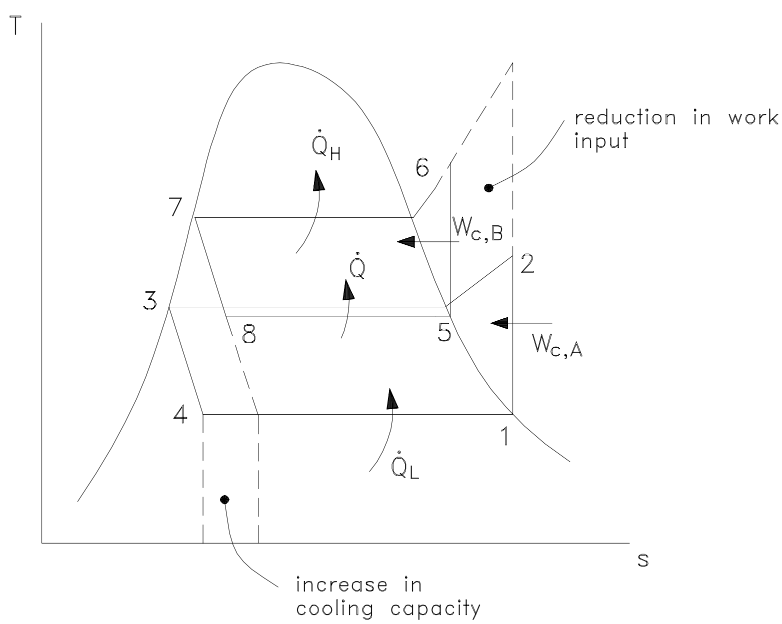


Cascade Refrigeration System

- combined cycle arrangements
- two or more vapour vapour compression refrigeration cycles are combined

Advantages

- the refrigerants can be selected to have reasonable evaporator and condenser pressures in the two or more temperature ranges



$$COP = \frac{Q_L(\uparrow)}{W_{net}(\downarrow)} \quad overall(\uparrow)$$