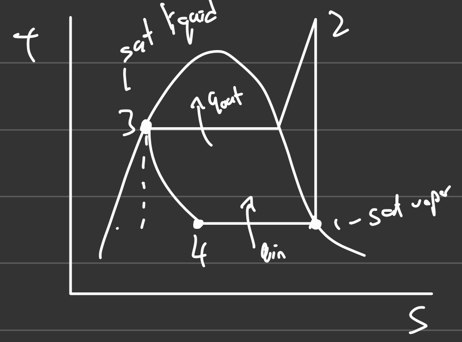
The carnot refrigerator cannot be implemented practically. So:

Ideal Vapor - compression Ref. cycle:

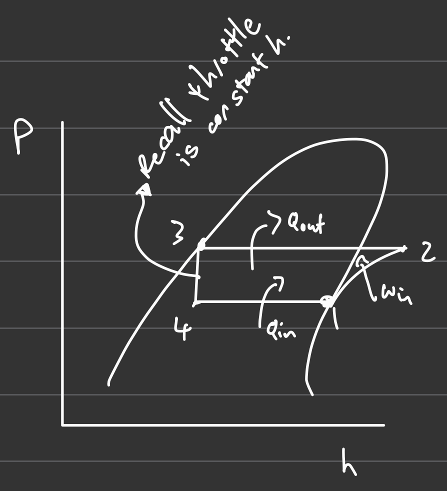


1-2 isentropic compression

2-3 Constant -P heat rejection - condenser - To room

3-4 Throttling in exp. device

4-1 Constant -P heat absorbtion - evaporator - food heat



$$COP_R = \frac{q_L}{w_{net,in}} = \frac{h_1 - h_4}{h_2 - h_1}$$

$h_1 = h_g @ P$

$h_3 = h_f @ P$

$$COP_{HP} = \frac{q_H}{w_{net,in}} = \frac{h_2 - h_3}{h_2 - h_1}$$

steady flow.

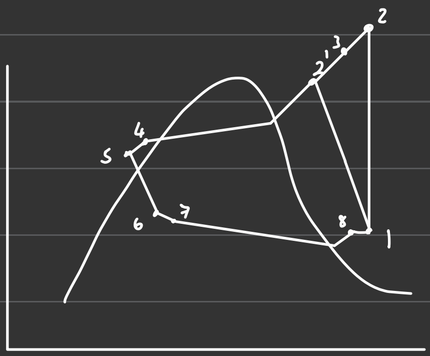
Do not use T here as this is not Carnot.

1 ton?

Real Vapor-compressor refs.

Due to irreversibilities,

- fluid friction
- heat transfer w. surroundings



1. non-isentropic compression
2. superheate vapor at evap. exit
3. subcooled liq. at condensor exit
4. Pressure drops in condenser and evap.

Dual stage refs. cycle.

$$P_i = \sqrt{P_L P_H}$$ optimal intermediate P.