Volumetric Efficiency of a reciprocating compressor

It is the ratio of actual volume of refrigerant entering in compressor to the swept volume

.

$$\eta_v = \frac{\dot{m} v_1}{\frac{\pi}{4} D^2 L N K}$$

$$\eta_v = 1 + C - C\left[\frac{P_{higher}}{P_{lower}}\right]^{1/n} \quad ; \quad \eta_v = 1 + C - C\left[\frac{P_{cond.}}{P_{evop.}}\right]^{1/n}$$

n= polytropic index

C =clearance ratio

Refrigeration Capacity RC

$$RC = m^0 \, RE$$

$$RC = \dot{m} (h_1 - h_4)$$

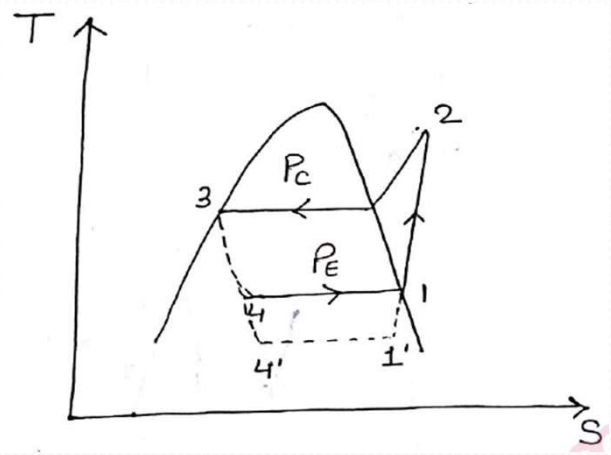
Power Input to the Compressor

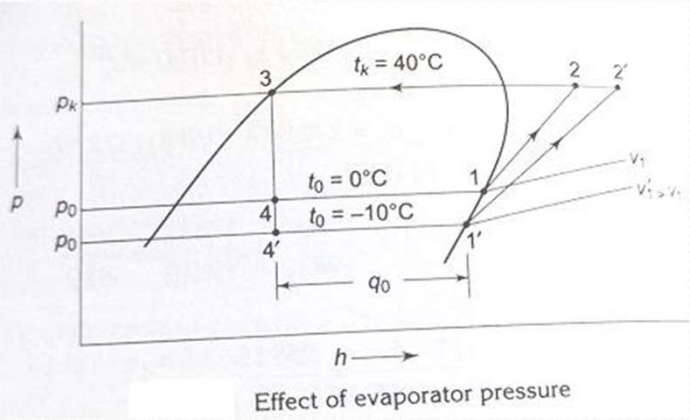
$$P_{in} = \dot{m} \, W_{in}$$

$$P_{in} = \dot{m} (h_2 - h_1)$$

Effect of variation of properties on the performance of VC cycle

1. Decrease in Evaporator pressure

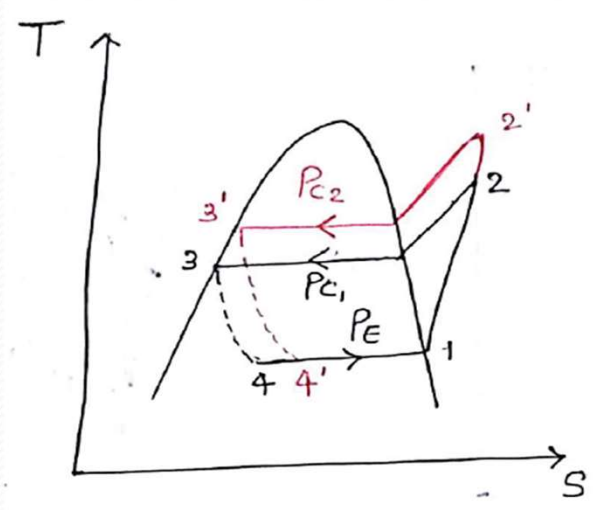


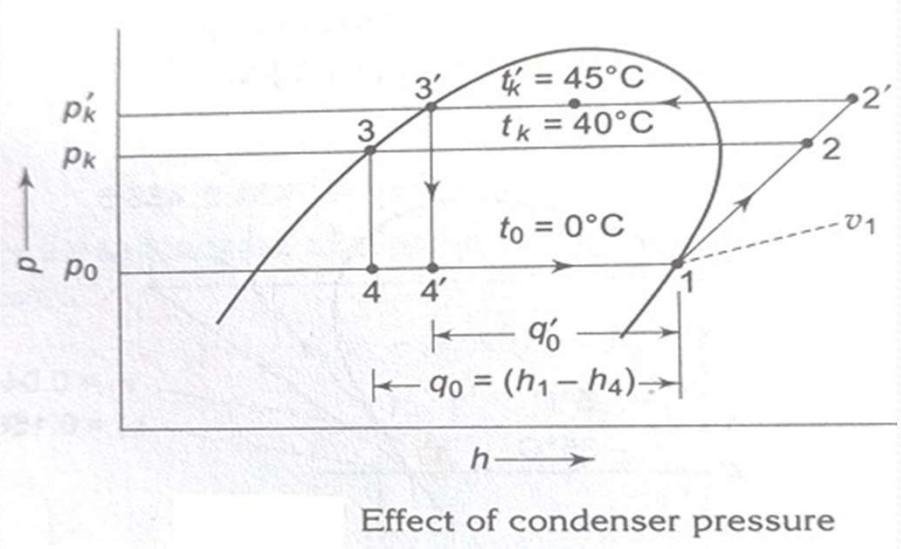


Effect of evaporator pressure

i. Decrease in RE
ii. Increase in compression pressure
iii. Decrease in CoP
iv. Decrease in volumetric Efficiency

2.Increace in condenser pressure





Effect of condenser pressure

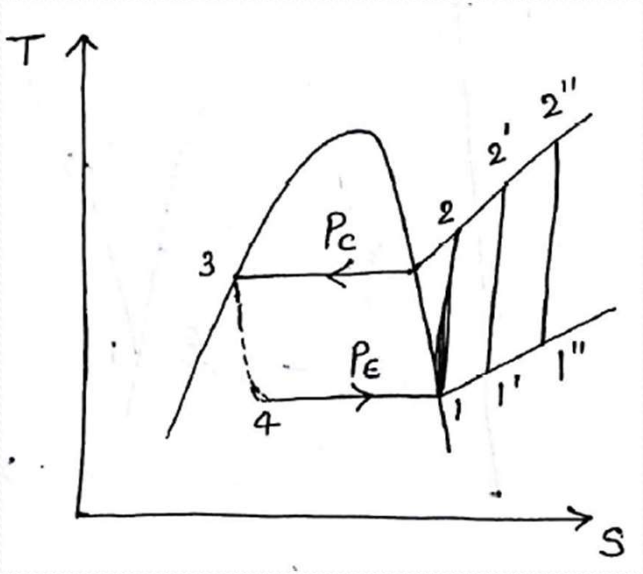
i. Decrease RE

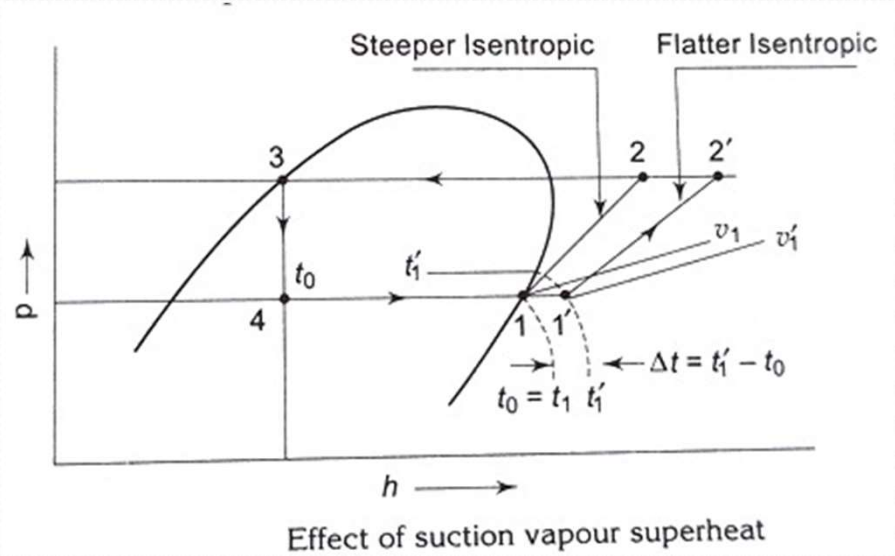
ii. Work input

ii. Decrease Cop

iv Decrease in volumetric Efficiency

- Super heating





Effect of suction vapour superheat

i. Increase in RE
ii. Work input increase
iii. Cop may increase or decrease depending on refrigerant