محاضرة اساسيات دورة التبريد الانضغاطية مثال عن الية عمل الضاغط

المادة: تكييف التاريخ ١٤ حزيران 2021

Example: - A two cylinders Freon (134a) compressor has a Bore and Stroke 5.65 and 5 cm respecting. It is speed 1420 rpm volumetric efficiency $\xi_{c.v} = 100\%$ working fluid reaches expansion valve at 40℃ and the temperature of its suction -10℃:-

a- Find the mass of the refrigerant, heat capacity and COP?

b- Find the mass of the refrigerant, heat capacity and COP if the clearance factor is 4%?

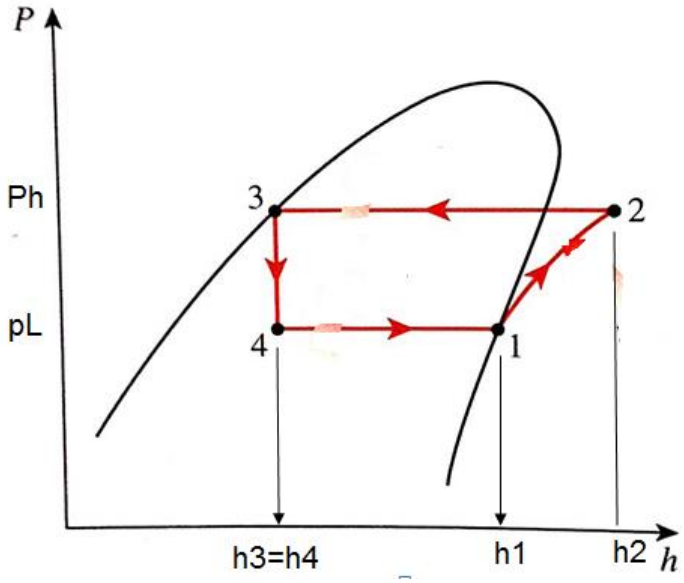
Solution: -

$$h_1 = 393\frac{kJ}{kg}$$

$$h_2 = 426\frac{kJ}{kg}$$

$$h_3 = h_4 = 258\frac{kJ}{kg}$$

A: -



$$\dot{V}_d = N.\frac{\pi D^2}{4}.L.\frac{rpm}{60}$$

$$\dot{V}_d = 2 \times \frac{\pi(5.65 \times 10^{-2})^2}{4} \times 5 \times 10^{-2} \times \frac{1420}{60}$$

$$= 5.95 \times 10^{-3}\frac{m^3}{s}$$

$$\dot{v}_1 = 0.099\frac{m^3}{kg} \quad Spicific\ volum\ from\ chart$$

$$m_f = \frac{5.9\dot{5} \times 10^{-3}}{0.099} = 0.06\frac{kg}{s} \qquad Mass\ of\ Working\ Fluid$$

$$COP = \frac{heat\ capacity}{work\ done} = \frac{\dot{m}_f(h_1 - h_4)}{\dot{m}_f(h_2 - h_1)}$$

$$heat\ capacity = \dot{m}_f(h_1 - h_4) = 0.06(393 - 258)$$
$$= 8.1\ kW$$

$$heat\ capacity = \frac{8.1}{3.5147} = 2.3\ \ Ton$$

$$COP = \frac{(h_1 - h_4)}{(h_2 - h_1)} = \frac{(393 - 258)}{(426 - 393)} = 4.09$$

b: -

$$\xi_{c.v} = 1 + C - C\left(\frac{\dot{V}_s}{\dot{V}_d}\right) \quad ie \quad \xi_{c.v} = 1 + C - C\left(\frac{\dot{V}_1}{\dot{V}_2}\right)$$

$$From\ chart\ \dot{V}_d \rightrightarrows \dot{V}_1 = 0.099\frac{m^3}{s} \quad and \quad \dot{V}_s \rightrightarrows \dot{V}_2 = 0.025\frac{m^3}{s}$$

$$\xi_{c.v} = 1 + 0.04 - 0.04\left(\frac{0.099}{0.025}\right) = 0.88$$

$$\dot{V}_d = 5.95 \times 10^{-3} \times 0.88 = 5.24 \times 10^{-3}\frac{m^3}{s}$$

$$\dot{m}_f = \frac{\dot{V}_d}{\dot{v}_1} = \frac{5.24 \times 10^{-3}}{0.099} = 0.053\frac{kg}{s}$$

$$COP = \frac{heat\ capacity}{work\ done} = \frac{\dot{m}_f(h_1 - h_4)}{\dot{m}_f(h_2 - h_1)}$$

$$heat\ capacity = \dot{m}_f(h_1 - h_4) = 0.053 \times (393 - 258)$$
$$= 7.15kW$$

$$heat\ capacity = \frac{7.15}{3.5147} = 2.03\ \ Ton$$

$$COP = \frac{(h_1 - h_4)}{(h_2 - h_1)} = \frac{(393 - 258)}{(426 - 393)} = 4.09$$