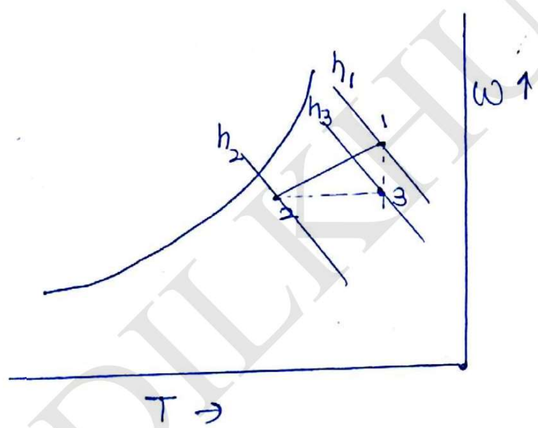
Theoretically there is no improvement in COP but practically as the vapour is bypass the pressure loss during the flow reduces hence COP improve ~~slightly~~ slightly.

Float Valve:-

These valves are used for regulating the level of liquid refrigerant. It is called as high side float valve if used on high pressure side i.e. Condenser. and called as low side flot valve if used on low pressure side i.e. evaporator.

Sensible Heat factor & latent heat factor:-



Total heat removed

$TH = h_1 - h_2$

latent heat $LH = h_1 - h_3$

Sensible heat $SH = h_3 - h_2$

$$SHF = \frac{h_3 - h_2}{h_1 - h_3} \qquad LHF = \frac{h_1 - h_3}{h_1 - h_3}$$

~~Bypass factor & contact factor (β)~~

$$\boxed{SHF + LHF = 1}$$

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outside

$\dot{m}_a = 50$ kg/sec.

DBT = 45 °C

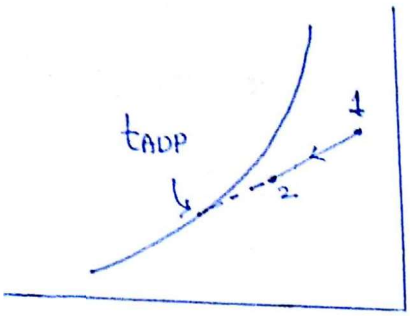
ϕ = 30%

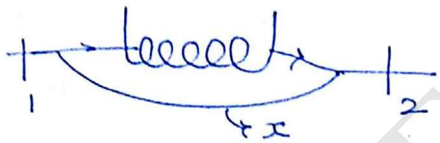
inside

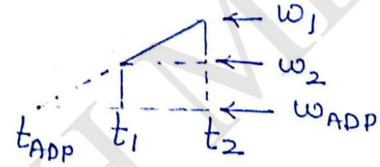
$t = 25$°C

ϕ = 50%

By pass Factor & Contact factor (η)
(Coil eff.)







*

$$BPF = \frac{t_2 - t_{ADP}}{t_1 - t_{ADP}} = \frac{\omega_2 - \omega_{ADP}}{\omega_1 - \omega_{ADP}} \simeq \frac{h_2 - h_{ADP}}{h_1 - h_{ADP}}$$

Contact Factor

*
$$\eta = \frac{t_1 - t_2}{t_1 - t_{ADP}} =$$

$$\boxed{BPF + \eta = 1}$$

Note ① The by pass factor depends on the placing of the coil. it also depends on the air velocity, as the air velocity increases by pass factor increases.

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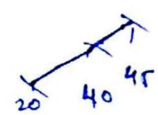
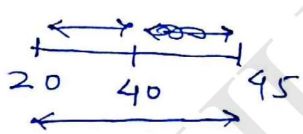
(2) latent heat factor is high when the relative humidity is high eg. during rainy season LHF is also high for the place of high occupancy like movie hall, auditorium.

Que Air at 20°C DBT and 40% RH is heated to 40°C using electric heater. The surface temp. of the coil is 45°C, the bypass factor will be.

$$BF = \frac{45-40}{45-20}$$



$$BF = \frac{5}{25} = \frac{1}{5} = 0.2$$



Ques In an air Conditioning process 5 KJ/min of heat is extracted from the room if the SHF = 0.8, then the latent heat load is

$$SHF = \frac{SH}{TH}$$

~~$SH = 5 \times 0.8/10 = 4$~~

SH = 4 KJ/min

LH = 1 KJ/min

$SHF + LHF = 1$

~~$LH = 1 - 5 \times 0.8$~~

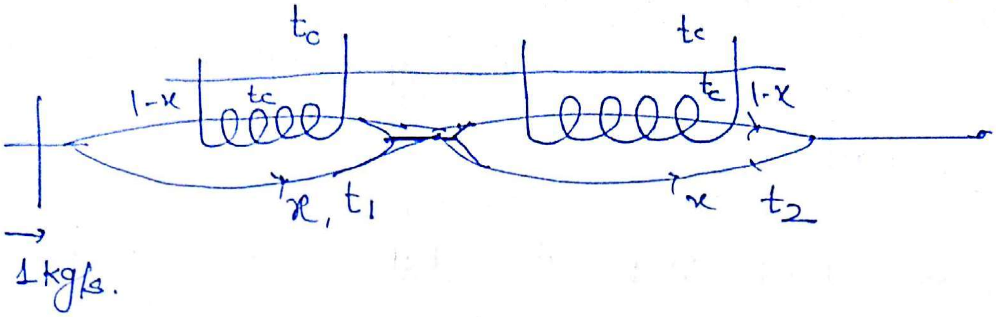
$LHF = 0.2$

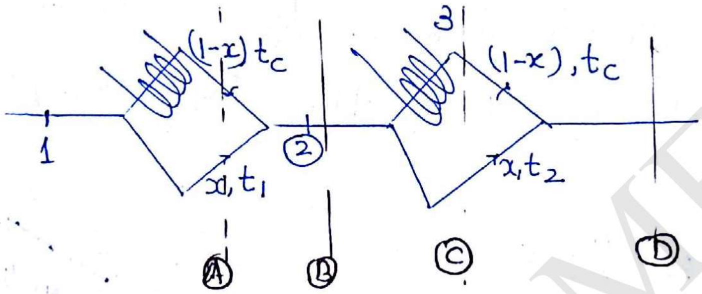
LH

$LH = 0.2 \times 5 = 1$ KJ/min

Effective bypass Factor:-

Note: for calculation of effective BF Dry Air is Considered





energy Conserv. Ⓐ → Ⓑ

$$(1-x)h_c + x h_1 = 1 \times h_2$$

$$(1-x)C_{pa} t_c + x C_{pa} t_1 = C_{pa} t_2$$

$$(1-x)t_c + x t_1 = t_2 \quad -①$$

Similarly Ⓒ & D

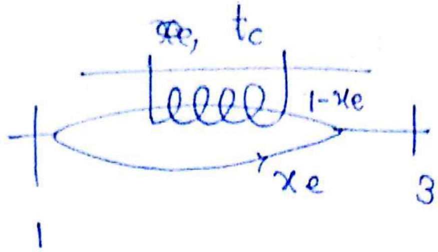
$$(1-x)t_c + x t_2 = t_3 \quad -②$$

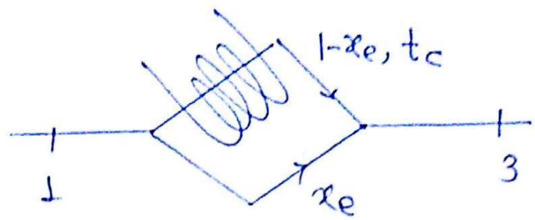
From ① & ②

$$(1-x)t_c + x\{(1-x)t_c + x t_1\} = t_3$$

$$t_c - x t_c + x t_c - x^2 t_c + x^2 t_1 = t_3$$

$$(1-x^2)t_c + x^2 t_1 = t_3 \quad -③$$





$$(1-x_e)\,t_c + x_e\,t_1 = t_3 \quad \text{--- (4)}$$

$$(1-x^2)\,t_c + x^2\,t_1 = t_3 \quad \text{--- (3)}$$

From (3) & (4)

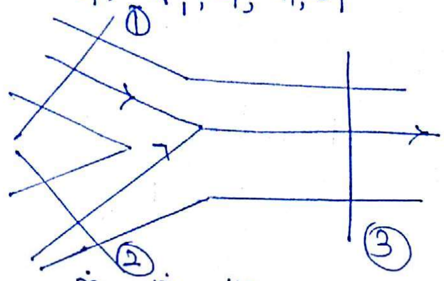
$$\therefore \; x_e = x^2$$

For 'n' coils

$$\boxed{x_e = x^n}$$

Adiabatic Mixing of Air streams :-

$\dot{m}_{a_1}, \dot{m}_{v_1}, \omega_1, h_1, t_1$



$\dot{m}_{a_2}, \dot{m}_{v_2}, \omega_2$

h_2, t_2

① Consv. of mass

(a) dry air $m_{a_1} + m_{a_2} = m_{a_3}$ —(a)

(b) water vapour

$m_{v_1} + m_{v_2} = m_{v_3}$ —(b)

∴ (No Condensation)

→ $\omega = \dfrac{m_v}{m_a}$

From (b)

$$\omega_1 m_{a_1} + \omega_2 m_{a_2} = \omega_3 m_{a_3}$$

$$\omega_1 m_{a_1} + \omega_2 m_{a_2} = \omega_3 m_{a_1} + \omega_3 m_{a_2}$$

$$\boxed{\frac{m_{a_1}}{m_{a_2}} = \frac{\omega_3 - \omega_2}{\omega_1 - \omega_3}}$$

Similarly ② energy consv.

$$m_{a_1} h_1 + m_{a_2} h_2 = m_{a_3} h_3$$

$$\boxed{\frac{m_{a_1}}{m_{a_2}} = \frac{h_3 - h_2}{h_1 - h_3}}$$