Section-6

① Discuss the performance of solar plate collector Also explain the various material used for Solar Flat plate collector.

→ Performance of Solar plate collector

a) Fin Efficiency Factor (F_e) : It is defined as the ratio of actual rate of heat transferred to heat that would be transferred.

$$F_e = \frac{Q_{Actual}}{A_c [\alpha_0 \tau_0 I_t - U_L (T_p - T_a)]}$$

b) Collector efficiency Factor

It is defined as the ratio of useful heat removed by flowing fluid in the tubes to the rate of heat transferred to the fluid.

$$F_c = \frac{Q_4}{A_c (\alpha_0 \tau_0 I_t - U_L (T_f - T_a)}$$

c) Collector heat Removal Factor

The ratio of the actual useful energy gain by fluid to the rate of heat transferred to the fluid.

$$F_H = \frac{Q_u}{A_c[(\alpha_0 \tau_0 I_t - U_L(T_{fi} - T_a)]}$$

$$F_H = \frac{mC_f(T_{fo} - T_{fi})}{A_c(\alpha_0 \tau_0 I_t - U_L(T_{fi} - T_a)}$$

d) Collector Efficiency

The ratio of useful Energy absorbed by collector to the incident solar energy over it.

$$\eta_c = \frac{Q_u}{A_c I_t}$$

$$\eta_c = \frac{F_R A_c(\alpha_0 \tau_0 I_t - U_L(T_{fi} - T_a)}{A_c I_t}$$

$$\eta_c = F_R \alpha_0 \tau_0 - \frac{F_R U_L (T_{fi} - T_a)}{I_t}$$

$$\eta_c = mx + c$$

$$m = -F_R U_L$$

$$x = \frac{(T_{fi} - T_a)}{I_t}$$

$$c = F_R \alpha_0 \tau_0$$

Material used for Solar flate plate Collector :-

① Absorber plate :- It is used to grasp and absorb radiation

② Transparent Cover

It help in reducing the convective and radiative heat losses.

③ Insulation :- It minimum the heat loss by conductor.

④ Box :- It contain above component and keep them in to desired position