

The performance of solar collector depends on following factors

(a) Fin Efficiency Factor (F_e): It is defined as the ratio of actual rate of heat transferred to the heat that would be transferred, if entire fins (plate area) are at temperature

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

Where,

Q_{actual} = Actual rate of heat transferred to the tube base

A_c = Collector Area

I_t = Incident total radiations

U_L = Overall heat loss coefficient

T_p = Plate ~~Top~~ Temperature

T_a = Ambient Temperature

τ_0 = Absorptivity and ~~Trans~~

τ_0 = Transmittivity

Collector efficiency factor (F_c):

It is define as the ratio of use full heat remove by following fluid in the tubes to the rate of heat transferred to the fluid, if the fin is at local fluid temperature.

$$F_c = \frac{Q_u}{A_c [\alpha_o T_o I_f - U_L (T_f - T_a)]}$$

where Q_u = Usefull heat removed by following fluid in the tubes and

T_f = Local fluid Temperature

Collector Heat Remobal Factor (F_H): It is define as the ratio of actual use full energy gain by fluid to the rate of heat transferred to the fluid, if the fin is at inlet fluid temperature.

$$F_H = \frac{Q_u}{A_c [\alpha_o T_o I_f - U_L (T_{fi} - T_a)]}$$

$$F_H = \frac{m C_f (T_{fo} - T_{fi})}{A_c [\alpha_o T_o I_f - U_L (T_{fi} - T_a)]}$$

$m =$ Mass flow rate of fluid/unit area collector

$C_p =$ Outlet Specific heat of fluid

$T_{fo} =$ Outlet fluid temperature

$T_{fi} =$ Inlet fluid temperature

Collector Efficiency (η_c) = It is defined as the ratio of useful energy absorbed by collector to the incident solar energy.

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

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

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

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

$$\eta_c = mx + c \quad (\text{Its linear eqn.})$$

$$m = -F_R U_L$$

$$x = \frac{(T_{fi} - T_a)}{I_t} \quad c = F_R \alpha_0 \tau_0$$

various Material Used for Solar flat plate collector is

There are following Material used for plate collector.

- (a) Absorber plate
- (b) Transparent covers
- (c) Insulation, and
- (d) Box.