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Design of Photovoltaic Systems

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NPTEL Online Certification Course

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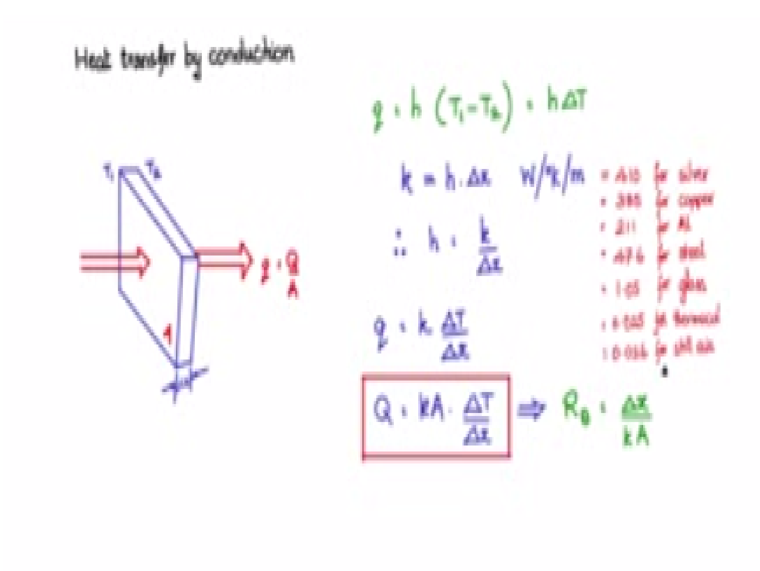

Heat transfer by conduction this is heat transfer mechanism where in hear flows from hotter part of the body to a cold of the part of the body through solid, consider this block which as a cross section area a through which heat power flows q which is given by the heat power q by the cross section area A, the hotter surface at t_1 colder surface is that t_2 and the thickness of the clock is δ x. now q is given by h x t1 – t2 which is obtain from basically h x δt relationship the thermal coefficient relationship where h is the thermal coefficient.

Now there is another parameter k which is defined in the literature and in the physics tables this is called thermal conductivity, thermal conductivity is defined as thermal coefficient h x δ x is the thickness of this block or the length of the block which is along measure along the heat flow direction w/ 0c / m, so therefore h thermal coefficient is given by thermal conductivity k / δ x, so substituting k / δ x here you will find the specific power q = k δ t / δ x, now this is the heat flow rate equation or the furrier law.

If you multiply throughout by the cross section area of the block you will obtain w which is k x a to δ t / δ x and from here you can see that r θ the thermal resistance is nothing but δ x / ka, now absorb that the thermal resistance is inversely proportional to a the cross section area orthogonal to the flow of heat power. So great of the cross sectional area smaller will be the thermal resistance and better will be the heat conduction through that material.

So in heat zinc the reason why they have the convoluted fins is basically to increase the cross sectional area normal to the flow of the heat power without increasing the volume too much, so therefore the fins actually give a much greater cross sectional area and as a result the heat zinc have low thermal resistance. So greater the area better will be the thermal resistance lower will be the thermal resistance.

So this relationship q = ka Δ t / Δ x where are thermal resistance r Δ is = Δ x / ka is very important relationship in the heat transfer by conduction. So heat transfer by conduction this is what normally literature uses where k here is call the thermal conductivity, thermal coefficient in to Δ x, now it is a material property, so k = 410 in vat for 0 k/ m for silver it is 385 for copper, 211 for aluminum, 47.6 steel. 1.05 glasses you see it is so low for glass that is why glass is a good thermal insulator.

Still better thermacol which you would have normally found and packing material and it is actually poly urethane is 0.025 for thermacol and still a 0.026, so you see that still a thermacol galas or all very good thermal insulators and the at the higher side where k as large value they are all very god conductors of heat. So where you want the heat to be conducted quickly with as little impedance as possible you have to use thermal conductivity values which are higher and if you want to reading the heat you do not want tot the heat conduct out you have to packet with materials having low thermal conductivity.