WEEK_2 Againi

Write a summary about the convective heat transfer (half a page) and explain why increasing the thickness of a single pane glass does not increase the total resistane

convective heat transfer

Convection is a heat transfer throught movment of fluids, such as water and air. While conduction is willingness of the material to transfer the heat, convection is willingness f transferring the heat through moving of solids.

There are two types of convection:
-**Forced**: Due to an external force (artificial power like fan, or wind)
that produce the phenomenon.
-**Natural**: Due to the change of density, the hot air (less dense) goes up and the cold air goes down.

The rate of heat convection depends of three factors:
-the **difference on temperature**,
-the **velocity** of the fluids
-the **type** of liquid or gas.

Newton's law of cooling indicates that the rate of heat convection is directly proportional to a constant, depending on each material, the area of the surface directly affected and the variation of temperature.
In other words, it is directly proportional to
-the **variation of temperature**
and inversely proportional to
-total **resistance of the material**.

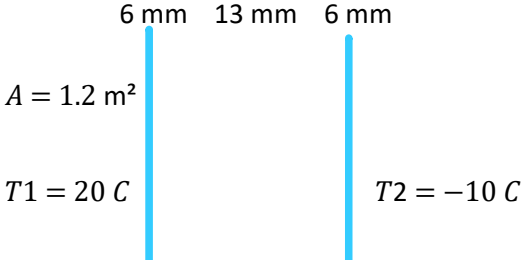
On a real situation, conduction and convection act together in the same situation. For instance, between an interior and an exterior, acts a convection heat transfer on the interior space until the surface of the solid material, where conductive heat transfer goes along the solid material and finally in the exterior acts another convection heat transfer.
Increasing the thickness of a single pane of glass is not representative in the improvement of total resistance because the constant (k) proper of each material is near to 1 and it is not important in the division. **The fact that is really representative in the improvement of the total resistance is the area of the surface**, if it goes down, the resistance will rise.

Newton law of cooling:
the higher 'h' is there is less resistance (because 'h' and R are not proportional)

$$Rconv=\frac{1}{hxAs}$$

Solve the same problem as that of double pane window with the air-gap thickness of 13 mm and glass thickness of 6 mm, comment on your results and explain why we have an optimal range for the air-gap's distance !

EXERCISE



$$Rconv1=\frac{1}{hA}$$

$$Rg1 = Rg2 = \frac{L}{kA}$$

$$Ra = \frac{L}{kA}$$

$$Rconv2 = \frac{1}{}$$

$T1 = 20\ C$ | $T2 = -10\ C$

$h1 = 10\ \frac{W}{m^2 C}$ | $ka = 0.026 \frac{W}{mC}$ | $h2 = 40\ \frac{W}{m^2 C}$

$kg = 0.78\ \frac{W}{m\ C}$

$\text{Ra} = \frac{L}{kA}$

$\text{Rconv2} = \frac{1}{hA}$

$\boldsymbol{Rtot = Rconv1 + Rg1 + Ra + Rg2 + Rconv2}$

Rtot = 0.0833 + 0.0064 + 0.4166 + 0.0064 + 0.0208

Rtot = 0.5335 $\frac{C}{W}$

$Q = \frac{T1 - T2}{Rtot}$

$Q = \frac{20 - 10}{0.5335\ \frac{C}{W}}$

$\boldsymbol{Q = 56.23\ W}$

The increase of the glass thickness is not representative in the increase of the total resistance due to the properties of the material, which has not a good thermodynamic behavior. His resistance value is the lowest among the different layers we are studying: Air in interior conditions, glass, air camera, air in exterior conditions.

On the other hand, increasing the air gap distance improves the total resistance in an amount higher than the resistance provided by the glass. The effect of the glass is to produce the air camera in which the resistance is even higher than outside the wall.

If the air-gap distance increases, the air located in the camera between both glasses will start moving as fluid and stop working as a solid material. In that case, the resistance in the air gap, will decrease considerably.