

Weeklysubmissions-2

1. Summery about the convective heat transfer

Convective heat transfer is, from the movement of the liquid and gass, that can be divided into natural convection, and forced convection.

Natural convection is due to the reason of different density of the fluids, which is often caused by the different temperature of the fluids, or simply by the fact that they are different kinds of fluids. As long as the fluid has enough of space to move, the natural convection will commence when the situation is satisfied by the previous mention.

And Forced convection is motivated by an extra force, which is not a natural movement due to the quality of the air.

The total resistance of the glass does not affect much through increasing the thickness of the glass, because of the resistance of the glass is thickness devided by k and area of the glass, the sum of this number is 10 times less than other numbers that are included in total resistance, such as Resistance Convection from both side of the glass.

2.

Mistake on misunderstanding the definition of R_{conv_1} and R_{conv_2}

3.

$$A = 0.8 * 1.5 = 1.2$$

$$R_{g_1} = R_{g_2} = \frac{L_g}{K_g \times A} = \frac{0.006}{0.78 * 1.2} = 0.0064 \text{ } ^\circ\frac{C}{W}$$

$$R_{airGap} = \frac{L_{airGap}}{K_{airGap} \times A} = \frac{0.013}{0.026 * 1.2} = 0.4166 \text{ } ^\circ\frac{C}{W}$$

$$R_{conv_1} = \frac{1}{h_1 \times A} = \left(\frac{1}{10 * 1.2} \right) = 0.0833 \text{ } ^\circ\frac{C}{W}$$

$$R_{conv_2} = \frac{1}{h_2 \times A} = \left(\frac{1}{40 * 1.2} \right) = 0.0208 \text{ } ^\circ\frac{C}{W}$$

$$R_{tot} = R_{conv_1} + R_{conv_2} + 2 \times R_g + R_{airGap}$$

$$= 0.0833 + 0.0208 + 2 * 0.0064 + 0.4166 = 0.5335 \text{ } ^\circ \frac{C}{W}$$

$$\dot{Q} = \frac{\Delta T}{R_{Tot}} = \frac{30}{0.5335} = 56.23 \text{ W}$$

$$\dot{Q} = \frac{T_{inff_1} - T_{s_1}}{R_{conv_1}} \Rightarrow 56.23 = \frac{20 - T_{s_1}}{0.0833} \rightarrow T_{s_1} = 15.3 \text{ } ^\circ C$$

The steady rate of heat transfer is not affected much by the thickness of the glass, however, it's lessen when the thickness of the air gap increase, within the certain range.

If the distance of two glasses becomes too far, the convection of air will start to work inside the air gap, which will decrease the effect of insulation.