Week2_GANHUI

1. summary about the convective heat transfer and why increasing the thickness of a single pane glass does not increase the total resistance

Convective heat transfer has two types, one is forced and another is natural.

Convective heat transfer always occurs as a result of the transfer of energy between a moving gas or liquid and a solid. Natural convection is caused by different temperature in the fluid (gas or solid). when the cooler fluid goes down and transfer into warm air, then due to the density change, the warm air to rise. This is the air circulation inside of the house. Due to different temperatures inside and outside, there is a heat transfer in the wall.

Rate of convective heat transfer depends on three conditions: temperature difference, velocity of liquid or gas and kind of liquid or gas.

Due to the resistance of a single pane glass is very small, increasing the thickness of a single pane glass has little effect on the total resistance. So i think it is not useful to increase the thickness of the glass.

2. **an explanation about what mistakes you made in the class that resulted in wrong answers**

I typed the wrong number in my calculator during the class, so i made a wrong resistance of the glass and got a wrong result.

3. **solve the same probelm as that of double pane window with with the air-gap thickness of 13 mm and glass thickness of 6 mm,**

commment on your results and explain why we have an optimal range for the air-gap's distance !

$$R_{g_1} = R_{g_2} = \frac{L_g}{(K_g \times A)} = \frac{0.006}{0.78 * 1.2} = 0.0064\,°\frac{C}{W}$$

$$R_{airGap} = \frac{L_{airGap}}{(K_{airGap} \times A)} = \frac{0.013}{0.026 * 1.2} = 0.4167\ °C/W$$

$$R_{conv_1} = \frac{1}{h_1 \times A} = (\frac{1}{10 * 1.2)} = 0.0833\,°C/W$$

$$R_{conv_2} = \frac{1}{h_2 \times A} = (\frac{1}{40 * 1.2)} = 0.0208\,°\frac{C}{W}$$

$$R_{tot} = R_{conv_1} + R_{conv_2} + 2 \times R_g + R_{airGap} = 0.0833 + 0.0208 + 2 * 0.0064 + 0.4167$$
$$= 0.5272\,°\frac{C}{W}$$

$$\dot{Q} = \frac{\Delta T}{R_{Tot}} = \frac{30}{0.5272} = 56.90W$$

$$\dot{Q} = \frac{T_{inff_1} - T_{s_1}}{R_{conv_1}} = \rightarrow 56.9 = \frac{20 - T_{s_1}}{0.0833} \rightarrow T_{S_1 = 15.26\,°C}$$

why we have an optimal range for the air-gap's distance

The convection resistance of airgap is much higher, if the distance of airgap is too big , the total resistance maybe infinitely.