Heat transfer - CONDUCTION

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oct. 2nd 2019: SHORT SUMMARY

Heat has three ways to transfer: through conduction, through radiation and through convection.

We can find conduction when heat transfers through solids.

If we work under the hypothesis of a steady operation (with constant rate of transfer) we can describe the heat's rate of transfer with **Fourier's Law of heat conduction**:

$\dot{Q}$ = -kA dT/dx = kA T_1-T_2/L

in which k is the THERMAL CONDUCTIVITY (willingness to transfer heat) of the material through which the heat is transferring, A is the area of the surface through which the heat is transferring, deltaT (T_1-T_2) is the temperature change across the width of the section and L is the thickness of the section.

What we are able to see from this equation is that the rate of conduction is directly proportional to the conductivity, the area and the difference of temperature, while it is inversely proportional to the thickness of the section.

We can define the thermo-resistance of a wall by transforming Fourier's formula:

$\dot{Q}$ = dT/R if **R = L/kA**

in which R is the thermo-resitance of the wall.

EXERCISE

L = 0.4 m A = 20 m^2 deltaT = 25 K k = 0.78 W/mK

SIMPLE METHOD

$\dot{Q}$ = 0.78 W/mk × 20 m^2 × 25 K / 0.4 m = 975 W

RESISTANCE CONCEPT

R = 0.4m / (0.78 W/mk × 20 m^2) = 0.026 K/W

$\dot{Q}$ = 25 K / 0.026 K/W = 961.5 W