EXPERIMRNT 2: TO DETERMINE THE THERMAL CONDUCTIVITY OF THE GIVEN COMPOSITE WALLS.

Theory

In engineering applications, we deal with many problems. Heat Transfer through composite walls is one of them. It is the transport of energy between two or more bodies of different thermal conductivity arranged in series or parallel. For example, a fastener joining two mediums also acts as one of the layers between these mediums. Hence, the thermal conductivity of the fastener is also very much necessary in determining the overall heat transfer through the medium. An attempt has been made to show the concept of heat transfers through composite walls.

Composite Wall Plates

- M.S :- 25 cm x 12mm thick
- Bakelite :- 25 cm x 10 mm thick
- Aluminum :- 25 cm x 10mm thick

Specifications

1. Test Plate: Aluminum ,MS, Bakelite and Heater Nichrome strip wound on mica sheet
2. Dimmer stat 0 -2 amp
3. Voltmeter 0 – 230V
4. Ammeter 0 – 2 Amp.
5. Enclosure size 580mm x 300mm x 300mm approximately with one side of Perspex sheet.
6. Thermocouples – ChromelAlumel – (8 No)
7. Temperature indicator 0 – 300 ˚C.
8. ON/OFF switch

Instrument Image

Procedure

1. Arrange the plates properly (symmetrically) on both side of heater plate.
2. See that plate is symmetrically arranged on both sides of heater plate(arranged normally).
3. Close the box by cover sheet to achieve the environmental conditions.
4. Start the supply of heater, by varying the dimmer stat adjusts the input power of heater.
5. Take the readings of all thermocouples at an interval of 10 minutes until steady state is reached.
6. Note down the steady state readings in the observation table

Observation

1. Voltmeter reading (V) = ______________Volts.
2. Ammeter reading (I) = ______________Amps.

Sr.no.	**Thermocouple readings °c**							
	T_1	**T_2**	**T_3**	**T_4**	**T_5**	**T_6**	**T_7**	**T_8**
1								
2								
3								

Calculations

Mean Temperature Reading:

$T_a = (T_4+T_5)/2$ °C

$T_b = (T_3+T_6)/2$°C

$T_c = (T_2+T_7)/2$ °C

$T_d = (T_1+T_8)/2$°C

Heater Input
$Q = V \times I$ Watts

Heat flux
$q = Q / A$ watts/ m^2 Where $A = \pi/4 \times d^2$ (d= 0.250m)

Total thermal resistance of composite slab
$\mathbf{R_{total} = (T_a - T_d)/q}$ m^2k/w

Thermal conductivity of composite slab

$\mathbf{K_{composite} = q x b / (T_a - T_d)}$ w/m^2k (Where b= total thickness of the composite slab=0.064m)

Conclusion

Marks Obtained **Sign of Faculty**