MENG345 Lab. Project

1) SYNOPSIS

Thermal conductivity of a material is a measure of the ability of the material to conduct heat. A high value for thermal conductivity indicates that the material is a good heat conductor, and a low value indicates that the material is a poor heat conductor or insulator.

For this project it is required to determine experimentally the thermal conductivity of two different materials, a good conductor and a poor conductor. The HT11C Linear Heat Conduction Accessory will be used in performing the tests.

You are required to prepare two samples, one for good conductor and one for poor conductor. The samples for the good conductors should be 30mm long and 25mm diameter and for the poor conductors it should be as thin as possible with 25mm diameter.

2) PROCEDURE

In case of good conductor

Place the sample between the heated and cooled sections of the HT11 and clamp them together.

Switch on the MAINS.

Turn on the cooling water and adjust the flow control valve (NOT the pressure regulator) to give approximately 1.5 liters/min. use the selector switch to display the flow rate on the panel display on the console and control the valve setting using the AUXILIARY CONTROL knob. If using the HT11, the cold water flow rate is controlled using the manual control valve next to the test section column).

Set the heater voltage to 9 volts:

Adjust the voltage control potentiometer to give a reading of 9 volts on the top panel display with the selector switch set to position V.
Allow the HT11C to stabilize. use the lower selector switch on the console to set the console display to each temperature sensor in turn).

When the temperatures are stable record the following: T1, T2, T3, T6, T7, T8, V, I, Fw.

Set the Heater Voltage to 12 Volts and allow the HT11C to stabilize, then repeat the above readings.

In case of poor conductor (insulator)

Place the sample between the heated and cooled sections of the HT11 and clamp them together.

Switch on the MAINS.

Turn on the cooling water and adjust the flow control valve (NOT the pressure regulator) to give approximately 1.5 liters/min use the selector switch to display the flow rate on the panel display on the console and control the valve setting using the AUXILIARY CONTROL knob. If using the HT11, the cold water flow rate is controlled using the manual control valve next to the test section column).

Set the heater voltage to 1.5 volts:

Adjust the voltage control potentiometer to give a reading of 1.5 volts on the top panel display with the selector switch set to position V.
Allow the HT11C to stabilize. use the lower selector switch on the console to set the console display to each temperature sensor in turn.

When the temperatures are stable, select the icon to record the following: T1, T2, T3, T6, T7, T8, V, I, Fw.

Set the heater voltage to 2 volts allow the HT11C to stabilize, then repeat the above readings.

In both cases the following equations are applied:

$$k_{int} = \frac{Q\Delta x_{int}}{A_{int}(T_{hotface} - T_{coldface})}$$

$$T_{hotface} = T3 - \frac{(T2 - T3)}{2}$$

$$T_{coldface} = T6 + \frac{(T6 - T7)}{2}$$

3) PRESENTATION

Projects will be presented as reports. The report will contain following sections:

- Title page containing the author(s) details.
- Abstract➔ briefly write the objectives of the project, the procedure for performing the tests and key results.
- Introduction➔ explain the detailed aims and objectives of the project and the significance of being a good conductor and insulator for a material. Describe the sample preparation process and give details of the experimentation procedure.
- Calculations and data analysis➔ perform the associated calculations in this section. Show your data in graphs where necessary. Analyze your results.
- Discussion and Conclusion➔ discuss the results and write your conclusion.

<u>IMPORTANT NOTES:</u> Submission deadline is April 24, 16:30. Submit a hardcopy soft binded report. You can work with groups that will involve no more than five students. In case of group work, only one report will be submitted. Please submit your projects to Mr. Hussain Shawish, office no: ME025.