Mechanical Engineering Department MEC1405
Latent Heat of Vaporization of Water

Object:
To determine the latent heat of vaporization of water at atmospheric pressure.

Apparatus:

Electric water heater instrumented with power measurement. Stop watch. Electronic scales for heater and water weight measurement.

Theory:
Vaporization of water at atmospheric pressure occurs at around 100°C. The latent heat of water is important in calculations relating to steam plant. Usually the value of latent heat (h_{fg}) at the required pressure is found from steam tables. This experiment aims at determining the latent heat experimentally by measuring the amount of energy required to evaporate a measured amount of water.

Procedure:
1. Place more than a liter of water in the supplied electric water heater. The heating element should be well submerged in water. Place the water heater with the water and cover on the electronic scale and note the initial weight.

2. Switch on the heater and allow the water to start boiling. Take care as boiling water is dangerous. Allow boiling to occur in steady state say for 15seconds. Briefly switch off heater to have a stable weight measurement and record the weight of the heater and water. Immediately turn on the heater again.

3. Allow boiling to occur for 2 minutes, timing yourself with a stop watch. Turn off the heater and take the weight measurement again.

4. Change the power input to the heater by putting in a series resistor or use a variac to have a lower voltage supply to the heater. Repeat the experiment.

Analysis:
5. By calculating the power supplied to the water heater both in the high power and low power states, calculate the latent heat of vaporization of water in these two experiments if heat losses are neglected.
6. If you were to account for heat losses in your equations, write these equations and calculate the latent heat of vaporization.

Conclusion:
Compare the calculated value with that from steam tables at atmospheric conditions.
Comment on the experiment.