Temperature Measurements – PH-41H

December 5, 2006

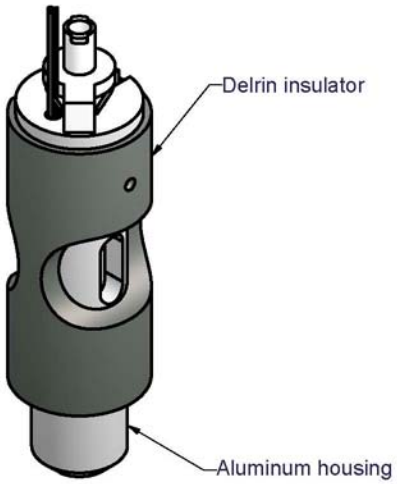

Figure 1 - PH-41H

Test Set-up

Temperature was controlled by a Eurotherm 2116. A second thermocouple was attached to a handheld readout and lowered into the reservoir. The reservoir was filled with tap water as a test fluid. The output power of the controller was set to 10% of maximum and the controller was tuned at these conditions.

The thermocouple (TC) locations shown in Figure 2 are summarized as follows:

- TC1 – thermocouple embedded in the heating element.
- TC2 – thermocouple immersed in the test fluid.
- TC3 – thermocouple embedded in the aluminum housing in the wire groove of the aluminum housing.
- TC4 – thermocouple embedded in the aluminum housing; drilled 0.38" deep through the flange on top.

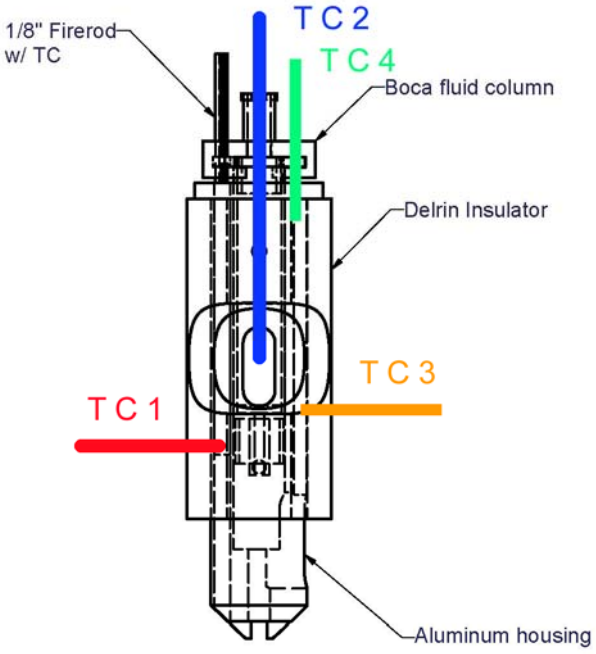

Figure 2 - Thermocouple locations

Test Procedure

Three test runs were made. Test Run 1 started with the temperature at 25°C. A setpoint of 50°C was established and the heating element turned on with no programmed ramp rate.

Test Run 2 was a repeat of the first test, only with a ramp rate of 3 °C/minute. At the end of an 11 minute period the heater was turned off and the assembly allowed to cool.

Test Run 3 used a ramp rate of 3 °C/minute to a setpoint of 60 °C.

At the end of run 3, the assembly was allowed to stay at temperature for 30 minutes. The plastic reservoir was briefly removed and inspected with no visible change or damage to the plastic. The maximum operating temperature for polypropylene or polyethylene is between 71 and 82 °C. The reservoir was replaced and the temperature was ramped to 70 °C and held for an additional 30 minutes. Again, a brief inspection revealed no damage to the reservoir material.

Test Data

Measurements for the three runs are shown in the following 3 figures.

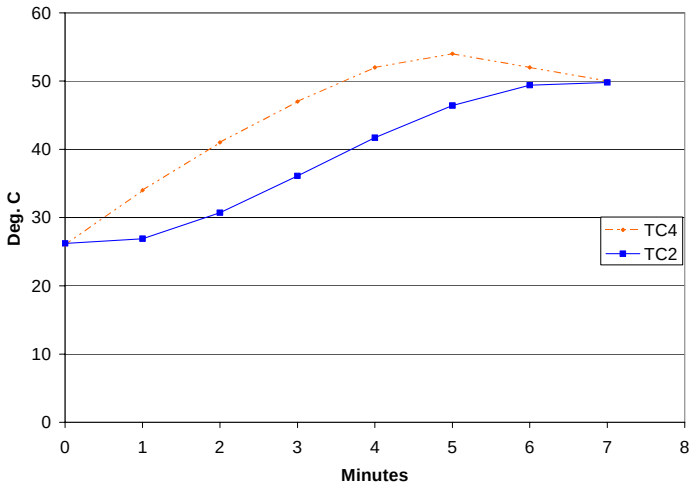

Figure 3 - Test Run 1 (no ramp rate)

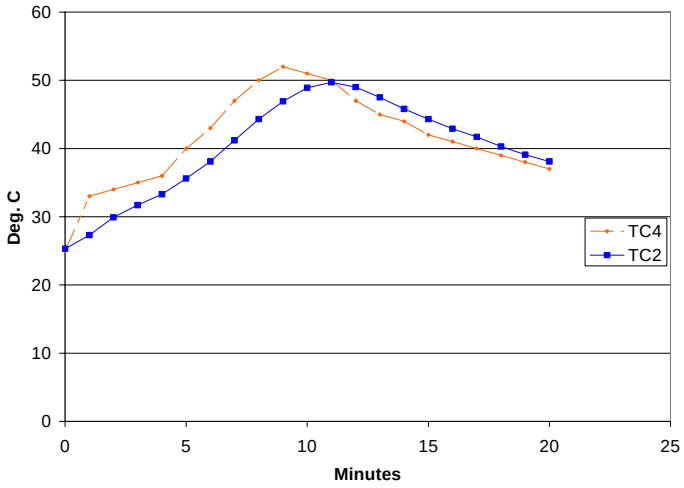

Figure 4 - Test Run 2 (3 C/min ramp)

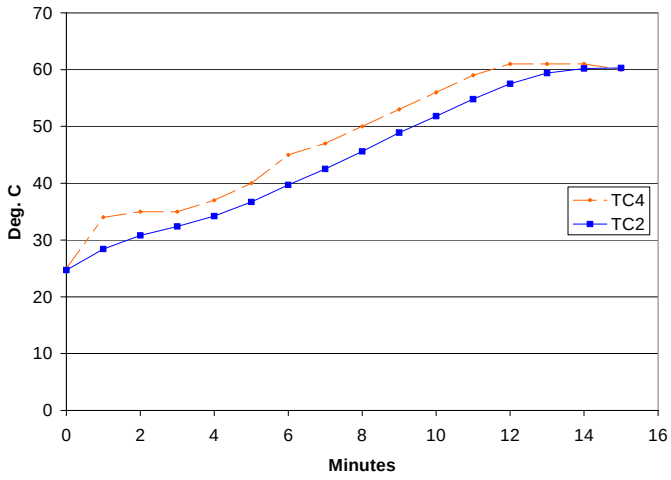

Figure 5 - Test Run 3 (3 C/min ramp to 60 C)