

**CM4110**  
**Shell and Tube Heat Exchanger**  
**Basco Type 500 U Tube BEU Water Heater Model #05036-5"- 1-4 pass**  
**Experimental Notes**

This exchanger has 1 shell pass, 4 tube passes with 4 tubes per pass for a total of 16 tubes on the tube side. There is saturated steam on the shell side (at 40.5 psia) that condenses to saturated liquid (condensate). There is cool water on the inlet of the tube side which increases in temperature but still remains liquid water. Flow range is 0 to 11.5 gpm.

**If loop tuning is required:**

Follow instructions on p. 6-7 and 6-8 (CX1000 Manual) to change the tuning constants (P, I, D) on FIC-02 Cooling Water (CW) flow. Record the values for P, I, D before you change them. You will have to change the SP to see how the various tuning constants perform. Record your observations and the tuning constants you believe to be optimum. Typical range would be 6-9 gpm for FIC-02. For TIC-04, you can't go below 55F for the SP (Temp CW in is usually 52F) or above 150F.

To do this you may need to do the following:

- a) Put arrow on FIC-02 CW In, press tuning.
- b) Put arrow at 1.P, hit enter, then up or down arrow to get the P value you want.
- c) Then press enter.
- d) Press Control/Group to get back to main menu.
- e) Put arrow on FIC-02 CW In. Press SP to change SP. Watch and record what happens.
- f) Repeat steps a through e as needed.

**Typical Calculations**

1. Determine  $U_o$ ,  $Q_{\text{tubeshide}}$ ,  $Q_{\text{shellside}}$  using the experimental data you obtained for each case you ran. In every case, assume that inlet Pressure of steam is the value displayed on the LCD display of FT01 and that we have saturated steam vapor.
2. Compare  $U_o$ ,  $Q_{\text{tubeshide}}$ ,  $Q_{\text{shellside}}$ . Do they make sense? Provide a discussion of your results. Discuss your observations.
3. When you do the  $\Delta T_{LM}$  calculation, assume  $T_1=T_2$ = temperature of saturated steam at  $P_{\text{shell}}$ . This value can be read on the LCD display for FT01.