ChE 433 Digital Process Control Laboratory

DeltaV Tutorial Exercise, Experiment 4

The objective of this tutorial is for us to learn how to use the DeltaV Control Studio as well as apply some of what we have just learned about flow control. We will also see the effect a digital filter can have on control loop performance.

FC4-1 on LAB4 will be our test apparatus.

Should you get stuck, check out the Power Point files on the desktop of the Engineers Console. They should help guide you through the Windows menus.

Turn on the air and cold water valve to the LAB4 apparatus.

Using the DeltaV Explorer, open the Control Studio, EXPT4/LAB4_TEST. Go online and set the "OUTLET_VALVE" to True. This opens the outlet valve to permit draining the tank.

On DeltaV menu, open lab4_seq "Operator" display. Set Mode of FC4-1 to **AUTO** and set the set point to 0.5 GPM.

For this exercise, we will be using the "Typical Tuning Settings" located in a file on the workstation desktop. Open the Tune display. Estimate the tuning constants for the flow loop and enter them. Remember Reset units are in seconds. Set the PV filter to 0.0 seconds.
Your initial tuning settings are?
Gain = _____**Reset**=_____**Rate**=_____
Wait for the loop to stabilize.
Open the trend display for LAB4, Experiment4FlowandLevel.
Change Set Point to 0.6 GPM. Wait for the loop to stabilize.

Now run the Auto Tuner. When the Auto Tuner program is complete, use those settings. What did the Auto Tuner tell you?
Gain = _____**Reset**=_____**Rate**=_____
Gain Margin=_____Phase Margin=_____

Lower the Set Point to 0.5 GPM. Note this trend and print it out. Note disturbance and print the trend plot. Label the trend with the control settings.

Now we are going to add a filter to the Flow Transmitter signal. *(I know there is a filter as part of the controller, but we are going to get used to using the Engineers Console and Palette.)*

Using the DeltaV Explorer, open the Control Studio, EXPT4, LAB4.
Break the connection between the FI4-1 **OUT** and FC4-1 **IN**.
From the Palette, drag in a Filter block. Enter a filter time constant of **3.0 sec**.
Save and Download this test. Print the block diagram.

Now with the Control Studio, go to View On-Line and observe the lagging effect.
What do you think will happen if you now use the Auto Tuner? _____
Estimate what you think the new tuning settings should be?
Gain = _____**Reset**=_____**Rate**=_____

Run the Auto Tuner and see. Note the new tuning settings. Change the Set Point to 0.60 GPM. Plot trend display, noting the new settings.
What are the new settings?
Gain = _____**Reset**=_____**Rate**=_____
Gain Margin=_____Phase Margin=_____

Clean up. Delete the Filter block and wire it back the way you found it. Set the controller settings to Gain=1.0, Reset=1.0 and Rate=0.0 for the next group. Download this configuration.

Be sure to sign and date the plots and give them to the TA.