

HVA 240
Principles of Process Control
Assignment 8
September 1, 2007

Solve the following problems on a separate sheet of paper. In the case of problems requiring computation, show the steps in your work to obtain your answer. Remember to reference the source of your data.

- 1) How is it possible in two-mode and three-mode controllers (such as PI and PID) for there to be more than one set of controller settings that give a one-quarter decay ratio.
- 2) Why don't all liquid-level control loops have the same tuning parameters, all flow control loops the same tuning parameters, and so on?
- 3) Using the software you purchased for this course, Controller Tuning 101, perform an open-loop tuning exercise. Follow the instructions below

Program Setup

Controller => Deselect all options. This means the controller will

- 1) Have an interacting algorithm
- 2) Apply derivative on measurement
- 3) Will NOT be a cascade controller

Time Scale = 1x

Calc Steps = 1000

Controller Setup

Place the controller in Manual. The controller will disappear and you will be left with only the process.

Process Setup

K_p = 4

T_d = 0.6

td1 = 0.5

td2 = 0.2

Integrator = No

Manual output = 60%

With a manual output of 60%, run the simulation. Print the resulting traces and perform an open loop analysis for PI and PID.

Place the controller back in AUTO. Enter the resulting controller tuning values. Set the Load change and Filter (T_f) to zero.

- a) Enter a Setpoint of 60% and run the simulation. Is the response what you expected? Tweak the response, if necessary, until you achieve quarter-wave damping. How far from the analysis are your final values?
- b) Enter a Setpoint of 50% and load change of 10%. Run the simulation. How do these results compare to part 'a'?