

Special Problem 8

ChE 436

Purpose: Cause of Oscillations in Control Systems

Use Custom Process: $K_p = 2$

$$\tau_p = 200$$

$$\theta_p = 0$$

1. Zero dead time case
 - A. Predict the behavior for making a step change in manual mode from 50 to 60 (and back). Then do it in Custom Process. Explain what happened (offset? oscillations? etc.)
 - B. Predict the behavior for using a P-only controller on this system with $K_c = 2$. Then do it on the computer and explain what happened.
 - C. Set the controller to PI control with anti-reset windup, with the controller gain from part B above. Set the reset time as follows and explain what happens and why.
 - a. $\tau_I = 200$
 - b. $\tau_I = 100$
 - c. $\tau_I = 10$
2. Add dead time ($\theta_p = 100$)
 - A. Repeat part 1A using this dead time and explain what happened and why.
 - B. Using P-only control, change the controller gain to (a) $K_c = 2$ and (b) $K_c = 0.5$. Explain the results.
 - C. Using PI control, set $\tau_I = 200$ and explain the results.
3. Summary Questions
 - A. Based on the observations in manual mode, is the process stable or unstable
 - B. What is the effect of dead time on the control system?
 - C. If the process is stable, why can the control system make it unstable?