Design Problem 5 – Introduction to Process Control

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Objectives

1. Use CHEMCAD to design a temperature controller on a heat exchanger.
2. Use CHEMCAD control valve, temperature sensor, and ramp programmer.
3. Run a dynamic simulation in CHEMCAD.

Problem Background and Statement

You were previously introduced to piping elements in CHEMCAD. In lab 1, we examined the piping unit and pumps with a fixed pressure increment. In labs 2 and 3, we examined hydraulic calculations in CHEMCAD using nodes and pumps with characteristic curves. In lab 4, we examined pumps, reflux vessels, condensers and reboilers in a distillation process. In this lab, we will introduce four more elements, namely control valves, control sensors, ramps, and steady state controllers for programming changes in streams. Because of the heat exchangers we covered in previous lessons, a natural place to go next is to learn how to learn how to control heat exchangers under temperature and flow control.

Your instructor will provide you with a PowerPoint presentation that contains the detailed instructions for building and running the simulations. The file is located in Canvas. Carefully follow the procedure in the PowerPoint and run the simulations. When finished, proceed to the questions and submission requirements below.

Questions:

1. Answer the five exercise questions in PowerPoint Slide 12.

2. Complete the five plots in PowerPoint slides 30-34. Plots are graded based on accuracy and professional appearance. All axes are labelled and each plot has title.

3. Answer questions 1 to 5 in PowerPoint slides 36-40 and question 6 in PowerPoint slide 45. Answer the questions concisely and in less than 100 words. Answers will be based on technical accuracy, grammar, clarity, and brevity.

Submission Requirements

1. Print completed slide 12 in pdf format.

2. Print completed slides 30-34 (plots) in pdf format.

3. Print of completed slides 36-40 (questions 1 to 5) in pdf format.

4. Print of completed slides 45 (question 6) in pdf format.

5. Bundle 1-4 into a single pdf with cover page and upload to Canvas.

6. Upload final CHEMCAD file to Canvas.

7. All work is due NLT 1445 hours (End of lab hour).