Special Problem 7
ChE 436

For the Heat Exchanger process, consider a case where the design or expected operating exit temperature is 140°C but may range from 132°C to 148°C. The disturbance flow rate is expected to remain steady at about 10 lit/min.

a) Perform the necessary open loop dynamic modeling studies to determine a first order plus dead time (FOPDT) model which describes process operation near the design operation conditions. *Report values of dynamic constants.*

b) Using the K_p, τ_p, and θ_p from part *a,* compute the tuning parameters for a PID controller (w/derivative on measurement) from the IMC tuning correlations in the Control Station software (also found in the appendix). *Report tuning constants.*

c) Using your K_C, τ_1, and τ_D from part *b* , implement a PID controller with anti-reset windup and derivative on measurement. *Turn in plot of controller response to a setpoint change from 140°C to 148°C.*

d) Determine a "best" tuning by adjusting K_C (leave τ_1 and τ_D as determined by the IMC algorithm) by trial and error until the controller displays a 10% to 15% overshoot in response to set point steps from 140°C up to 148°C and plot this set point step response. *Turn in plot and value of K_C.*

e) Run three more tuning cases and plot the response of each to steps in set point form 140°C up to 148°C. For each, use your best K_C and τ_1 from part *d* , but use 0.5, 2 and 5 times your τ_D from part *d* . Comment on how this tuning parameters impacts controller performance. *Turn in 4 plots on one page, along with comments.*