2022

EGR 550 Mechatronics

PROJECT – 4 | SINGLE HEATER & DOUBLE HEATER - CONTROL LAB

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EGR-550; Project 4; 1-heater & 2-heater control lab

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Aim: To obtain tuning constants for PID control of temperature & demonstrate step changes in temperatures & comment on performance of TC lab using the constants.

Procedure:

* The PID constant are obtained using IMC correlations
* It is tuned to minimize sum of absolute error & achieve overshoot ratio less than 10%
* The following constants are used for PID.

$K_c = 10.0$

$\tau_I = 50.0$

$\tau_D = 1.0$

* Both heater1 & heater 2 lab is performed for 10mins.
* The model uses linearized FOPDT, energy balance & PID controller for predictions.
* Output:

fig: control of heater 1

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-fig: 2 ; control of heater 2.

fig : 3 step response

1. It is an unstable process. It is because the parameters that were used to measure the response do not have the following;
   * constant mean.
   * constant variances
   * constant distribution.
2. It is because the proportional control doesn't account for the duration of the mistake. Thus, there will always be an effect.
3. Effect of deadtime on P- controller:
   when dead time is larger than the dominant time constant performance of P controller may be decreased significantly

   Effect of deadtime on PI - controller:
   PI controller's performance is severely limited by deadtime
   PI controller doesn't have any knowledge about deadtime
   2p when the output doesn't match desired response.
   It has an impatient response.

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OUTPUTS:

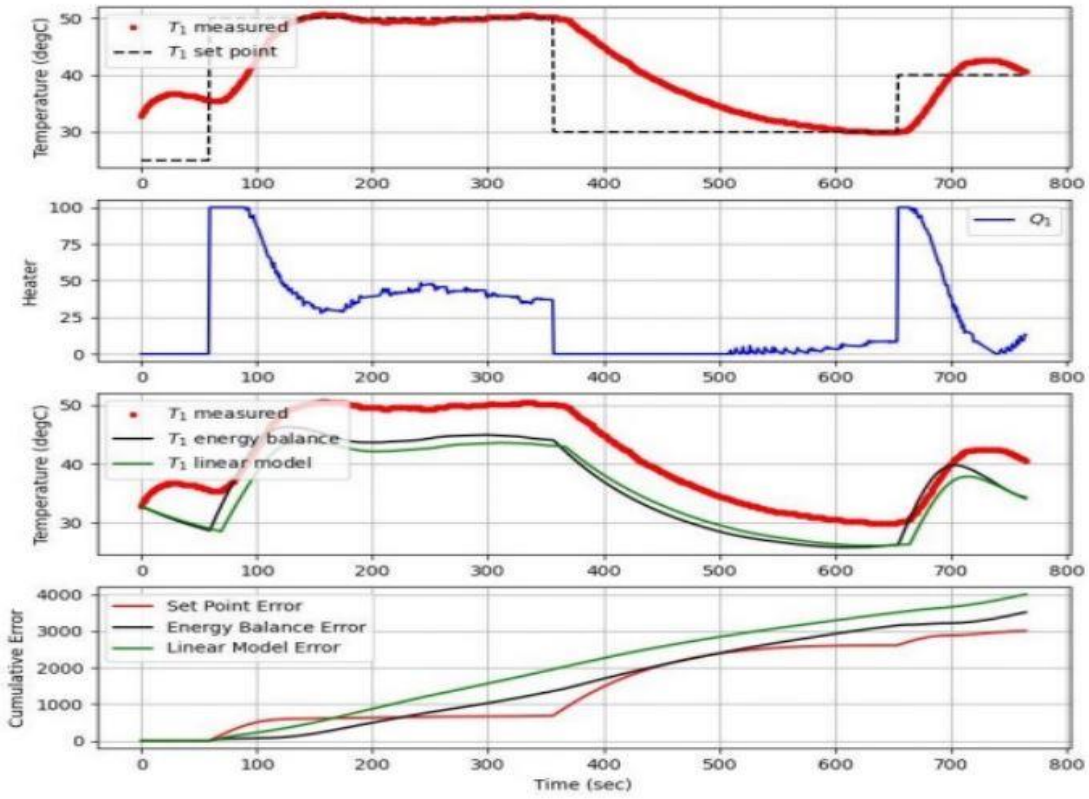

Fig -1: Control of heater -1

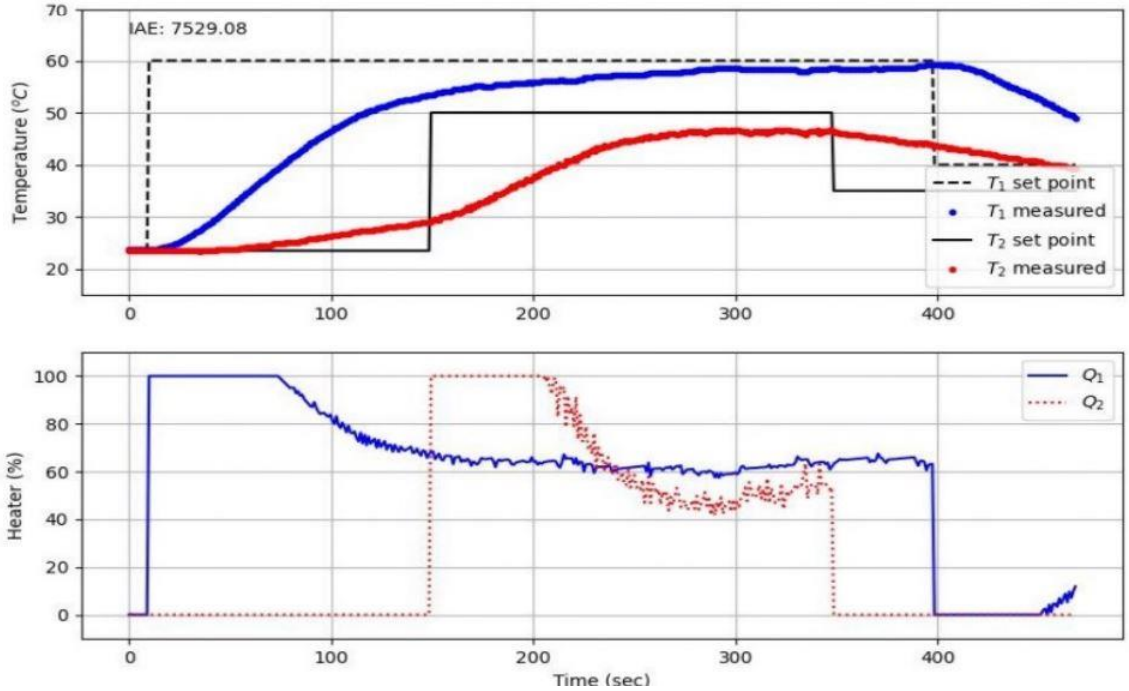

Fig-2: Control of Heater-2

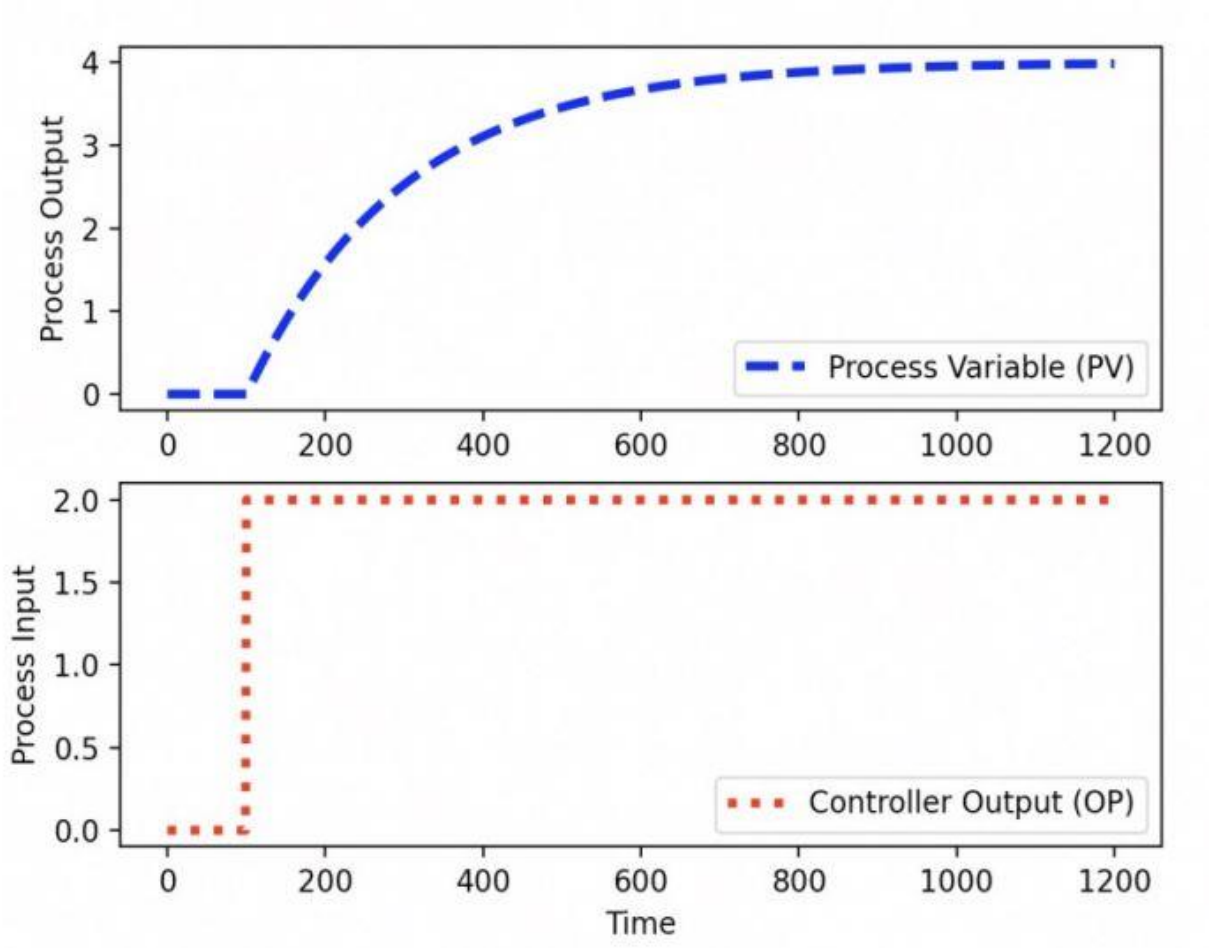

Fig -3: Step-Response