

You have obtained the responses for the following open-loop experiments to changes in their inputs:

- 1. Liquid level in one tank**
- 2. pH in a tank**
- 3. Outlet temperature of a plate heat exchanger**

The process parameters (τ_p and k_p) in the first experiment and the process reaction transfer function (G_{prc}) for the second and third experiments were obtained. The obtained open-loop results will be used to design and tune the proper controller for the above processes.

I. Liquid level in one tank

1. Select the proper controller to control (tightly) the liquid level in one tank.

The selection should be based on quantitative (i.e. IAE, ISE, ITAE) and on qualitative reasoning.

2. Select the controller settings using the criteria used in 1.
3. Compare the settings you have obtained in (2) with those obtained using the 1/8-decay ration criteria.
4. The design should be made for the same input changes you have used in the open-loop experiment.
5. Implement your controller settings experimentally and compare the response with the theoretical one.

II. pH in a tank:

1. Repeat steps 1 and 2 of I
2. Compare the controller settings obtained in step 1 with those obtained using Cohen-coon method.
3. Compare the controller settings obtained using step 1 with those obtained using Ziegler-Nichol's tuning technique.
4. The design should be made for the same input changes you have used in the open loop experiment.
5. Implement your controller settings experimentally and compare the response with the theoretical one.

III. Temperature in the plate heat exchanger

- Repeat steps 1 through 5 of II.