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Dynamics and Control of Chemical Processes

Prof. Davide Manca
Chemistry, Material and Chemical Engineering Department, "G. Natta"
Politecnico di Milano

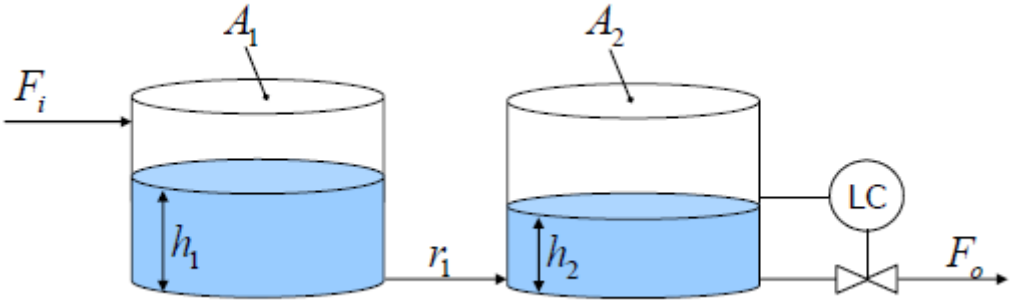
Lab #3

Exercise 1

There are two similar interacting tanks as those of Lab #2 with the following geometric characteristics:

- Tank 1: $A_1 = 30\ m^2$, $r_1 = 1.2\ s/m^2$
- Tank 2: $A_2 = 50\ m^2$

The input flow rate F_1 is 9.4 m^3/s and the system is in steady state conditions. In case of disturbances on the input flow rate, the flow exiting F_0 varies linearly with the height of liquid in the second tank according to the functional law: $F_0 = 1.43\ h_2$. The output of the second tank is regulated by a level controller with a set point of 6.6 m at stationary conditions i.e. in absence of disturbances. There is a step disturbance on the input flow rate to the first tank such that it doubles. You are requested to model and compute the dynamics of the two tanks when the controller is a proportional one tuned according to the Cohen-Coon method.



Exercise 2

With reference to the tanks system of Exercise 1, you are invited to evaluate the response of the system to a PI controller, whose parameters are estimated with the Cohen-Coon method.

Exercise 3

Solve the previous problem with a setpoint change in the height of the second to 8.6 m.