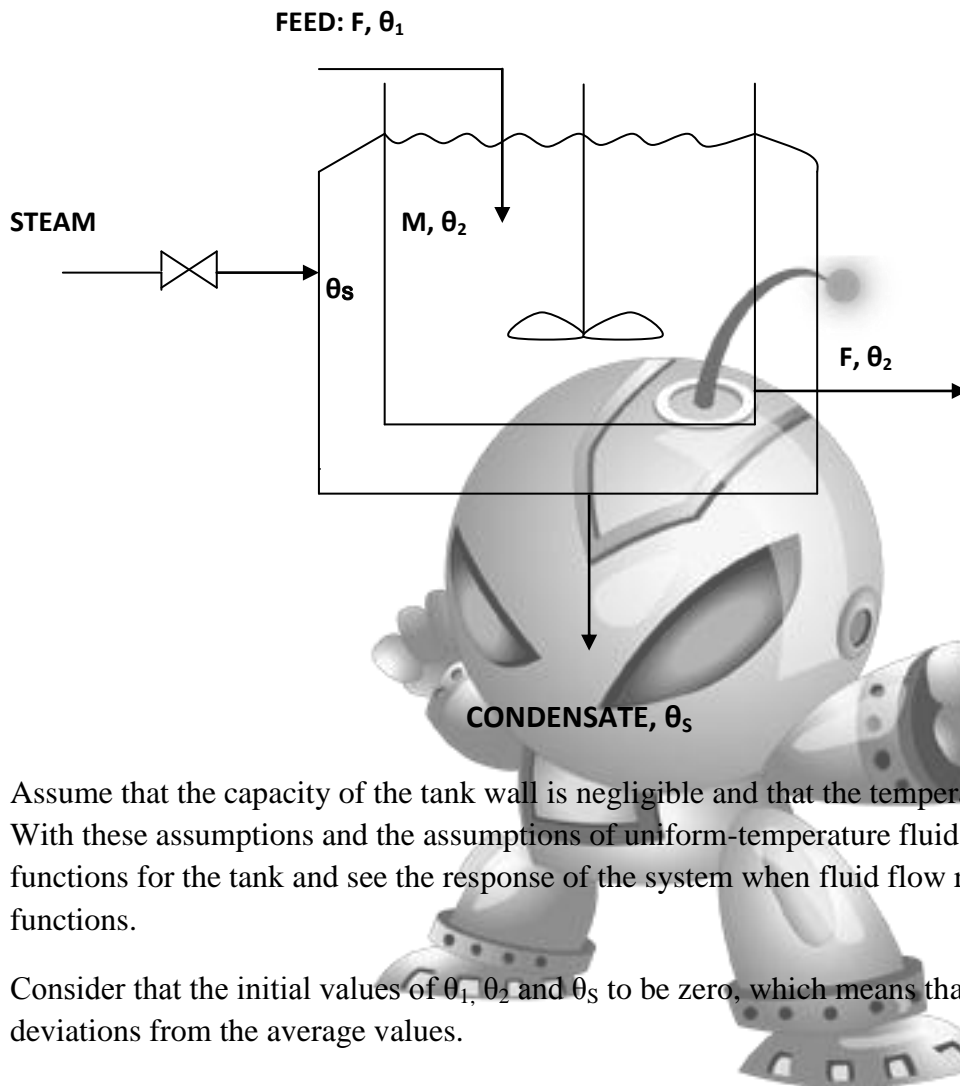


Avishkar 2011

Chemsoft Problem: 3

A jacketed tank is used to preheat a process stream. (Shown in figure)



Assume that the capacity of the tank wall is negligible and that the temperature inside the jacket is uniform. With these assumptions and the assumptions of uniform-temperature fluid in the tank, evaluate the transfer functions for the tank and see the response of the system when fluid flow rate and steam both are step input functions.

Consider that the initial values of θ_1 , θ_2 and θ_s to be zero, which means that these variables stand for deviations from the average values.

Data given:

Density of the fluid = 50 lb/ft^3

Heat capacity at constant pressure (C_p) = $1 \text{ Btu/ (lb)}^{\circ}\text{F}$

Volumetric flow rate of the fluid (F) = 250 lb/min .

Overall heat transfer coefficient of the jacket wall (U) = $10 \text{ Btu/ (hr (ft}^2) (^{\circ}\text{F))}$

Area of contact of steam jacket wall (A) = 50 ft^2

Total capacity of the tank (M) = 5000 lb .

[NOTE: solve this problem on MATLAB-Simulink]