Process Control, 3P4  
Tutorial 2

This tutorial, leading into assignment 1, has two main goals: to get even more comfortable with concept of process control; to recall the concepts of process simulation you learned about in your prerequisite courses.

Question 1 [4]

Engineers do not design sensors, they select them.

Consider a temperature sensor.

1. What does it mean for a temperature sensor to have “high accuracy”.

2. What does it mean for a temperature sensor to have “high reproducibility”.

Use the following figure to help with your answers.

![Temperature Sensor Targets]

[Diagram with targets labeled A, B, C, D]
Question 2 [4]

What is the economic cost of an error of 0.5\% in the flow rate for a pipeline that carries 100,000 barrels/day of crude oil? (assume the error is not in your favour, i.e. it really is a cost, and not a profit)

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Question 3 [4]

Consider the following tank system:

Write out the mass balance for the tank in the form:

\[
\text{rate of accumulation of mass} = \text{rate of mass flow in} - \text{rate of mass flow out}
\]

so that you obtain a differential equation relating height \( h \), flows \( F_i \) and \( F_0 \), and the cross-sectional area, \( A \). The flows are considered to be volumetric flows.