Examples on tuning PID controllers

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1 Margins with SIMC PI controller for integrating pluss time delay process

Given an integrating pluss time delay process with model

$$h_p(s) = k\frac{e^{-\tau s}}{s}, \tag{1}$$

and with velocity gain (slope), $k = 1$, and time delay, $\tau = 1$.

Use a PI controller with transfer function

$$h_c(s) = K_p\frac{1 + T_i s}{T_i s}. \tag{2}$$

1. Use the Skogestad SIMC method with the simple robust lower bound $T_c = \tau$ in order to find the PI controller parameters. Here T_c is a user specified time constant for the set-point response.

2. Calculate the Gain Margin (GM) of the feedback system. What is the interpretation of the Gain Margin ?

3. Find the Phase Margin (PM) of the feedback system. What is the interpretation of the Phase Margin ?