

Design of PI controller with input constraint: application on blending process

ABSTRACT

Because of their simplicity, reliability and effectiveness, proportionalóintegralóderivative (PID) controllers remain the most widely used controllers in the process industries. Actuator saturation is among the most common and significant problem in control systems design. Normal PID controller does not take this into consideration. Normally, an anti-windup compensator is employed in the system to overcome the problem. In this contribution, a new set of controller tuning relations is developed to tune the PI controller when the system is under saturation. The blending process was described as first order plus time delay (FOPTD) process and an expression is developed for saturation level, U as a function of controller gain, K_c with the range of R 0.462 (ratio of time delay to time constant). The proposed tuning rule relate the parameters of the controller to the parameters of a FOPTD model of the plant to a step change in the set point. The proposed method was applied to PI controller and tested on the process of blending system of sweetened condensed milk. The performance of the controller with various tuning formulae incorporated with classical anti-windup strategies has been compared. The simulation results showed that the proposed method could give satisfactory performance in controlling the process.