TUNING OF A NOVEL FEEDBACK FIRST-ORDER COMPENSATOR USED WITH A HIGHLY OSCILLATING SECOND-ORDER PROCESS

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ABSTRACT

Compensators are used in place of classical PID controllers for possible achievement of better performance. Highly oscillating processes require more effort in selecting proper controllers or compensators.

In this work a novel compensator based on a series proportional controller and a feedback lag-lead compensator is proposed and applied to control a process having 85 % overshoot and about 6 seconds settling time. The proposed control scheme uses the gain constant of both the proportional controller and the feedback lag-lead compensator to control the steady-state characteristics of the closed-loop control system. The proposed controller-compensator is tuned using MATLAB optimization toolbox. It was possible with the proposed scheme to satisfy a system performance with only 0.0993 % overshoot and a settling time of 0.3886 seconds and steady-state error as low as 0.05 for a unit step input. Comparison with classical a PID tuned control was in favor of the proposed compensator.

KEYWORDS: Highly Oscillating Processes, Feedback Lag-Lead Compensator, Series Proportional Controller, Control System Performance, Compensator Tuning