A Methodology for Optimal Tuning of PID Controllers Subject to Process Constraints

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Abstract

This presentation is concerned with the tuning of Proportional-Integral-Derivative (PID) controllers. Rather than developing new analytic tuning rules, the approach taken is to calculate tuning parameters which minimize an objective function subject to a number of constraints, most importantly controlled and manipulated variable, and rate of change constraints. The tuning methodology is applicable to open loop stable or unstable processes. It is independent of the PID controller form, ideal, cascade or parallel. The methodology accommodates PID controllers using proportional and/or derivative action on the error or process variable. To account for robustness in response to modeling errors, constraints on the maximum sensitivity have been considered. Implementation of the proposed methodology does not require elaborate optimization techniques and computing platforms. Microsoft Excel and its Solver function are used in this work. Its performance is compared to that of classical tuning methods using simulation and experimental results.

Biographies

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