Design of IMC-PID controller for Improved Disturbance Rejection of Time Delayed Processes

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The well-known IMC PID rules have the advantage that a clear tradeoff between closed-loop performance and robustness to model inaccuracies is achieved with a single tuning parameter. The reported literatures show that IMC-PID provides good setpoint tracking but very sluggish disturbance response for tuning the process with a small time-delay/time-constant ratio. Therefore, controller design that emphasizes disturbance rejection rather than setpoint tracking, is an important design problem that has received renewed interest recently.
Therefore, in this article, we have proposed a filter, that has higher order, which previously proposed by the other workers. The generalized IMC-PID approach is used to obtain the PID parameters for process model by approximating the ideal controller with a Maclaurin series in the Laplace variable. It turns out that the PID parameters so obtained provides somewhat better closed-loop responses than those obtained previously for disturbance rejection. A simple two degree of freedom controller is used to improve controller performance for setpoint changes without affecting the response to disturbances.