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Analytical Design of IMC-PID Controller for Ideal Decoupling Embedded in Multivariable Smith Predictor Control System

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Abstract : In this paper, the analytical tuning rules of IMC-PID controller are presented for the multivariable Smith predictor that involved the ideal decoupling. Accordingly, the decoupler is first introduced into the multivariable Smith predictor control system by a well-known approach of ideal decoupling, which is compactly extended for general nxn multivariable processes and the multivariable Smith predictor controller is then obtained in terms of the multiple single-loop Smith predictor controllers. The tuning rules of PID controller in series with filter are found by using Maclaurin approximation. Many multivariable industrial processes are employed to demonstrate the simplicity and effectiveness of the presented method. The simulation results show the superior performances of presented method in compared with the other methods.

Keywords : ideal decoupler, IMC-PID controller, multivariable smith predictor, Padé approximation
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