Application of Statistical and Computational Methodology for Robust Controller Design

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Abstract

The article aims to design a robust controller for the pilot plant distillation column through a multi-disciplinary approach. The research effectively used statistical, computational, control engineering and chemical engineering techniques to develop a robust control system. Taguchi's robust engineering approach and multi-response optimization techniques are effectively adopted to identify the optimal parameters for the process. Also, Minitab statistical software and Matlab-Simulink software are effectively used for the analysis and interpretation. In addition, noise factors and control factors are used to enhance the controller design. Further, identified optimal parameters are validated through a simulation study and real-time chemical analysis. It is observed that the inclusion of noise parameters in the controller design helps to achieve desired results with optimal utilization of available resources. Also, it is determined that Taguchi's robust design approach can be effectively integrated with multi-response optimization techniques for better results. The research provides a systematic approach for controller design for industrial Multi Input Multi Output (MIMO) systems with effective utilization of statistical and computational techniques.

Keywords: Taguchi Robust Design, Multi Input Multi Output, Multi-response optimization, Control Engineering