

Design of Multi-Loop Controller for Minimization of Energy Consumption in the Distillation Column

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Abstract : An attempt has been made to design a decoupling controller for systems with more inputs more outputs with dead time in it. The de-coupler is designed for the chemical process industry 3×3 plant transfer function with dead time. The Quantitative Feedback Theory (QFT) based controller has also been designed here for the 2×2 distillation column transfer function. The developed control techniques were simulated using the MATLAB/Simulink. Also, the stability of the process was analyzed, together with the presence of various perturbations in it. Time domain specifications like setting time along with overshoot and oscillations were analyzed to prove the efficiency of the de-coupler method. The load disturbance rejection was tested along with its performance. The QFT control technique was synthesized based on the stability and performance specifications in the presence of uncertainty in time constant of the plant transfer function through sequential loop shaping technique. Further, the energy efficiency of the distillation column was improved by proper tuning of the controller. A distillation column consumes 3% of the total energy consumption of the world. A suitable control technique is very important from an economic point of view. The real time implementation of the process is under process in our laboratory.

Keywords : distillation, energy, MIMO process, time delay, robust stability

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