ABSTRACT

The control of an integrating process with dead time is still being a challenging one to stabilize it under the parameter uncertainty of the process. In this research work an integrating process with dead time is considered as a benchmark system, which is the mathematical model of the distillation column. Most of the conventional controller design technique fails to maintain the steady state of the integrating process after applying the load disturbance. By designing control strategies such as IMC and Modified Smith Predictor better time domain specifications can be achieved with better load rejection. But the conventional controllers cannot withstand the uncertainty. This leads to the design of robust control. The design of robust control involves higher analytical calculations and results in higher order controller, which makes the physical realization of the controller difficult. This problem can be overcome by designing a fixed order controller satisfying the robust control principles. The PID control structure is considered as a fixed order controller (second order), because of its simplicity in design with higher control capability. The control parameters such as $K_p$, $K_i$ and $K_d$ are plotted as a 3D plot by satisfying the robust control principles. Also the control parameters stabilizing range are used in the Hurwitz criteria. Finally the first order robust controller with three tuning parameters ($x_1$, $x_2$ and $x_3$) is proposed for the integrating process with dead time and the simulation results are compared with the various conventional, advanced control strategies and robust control. The robust stability and robust performance of the controller are analyzed with various robust conditions and the results are compared with the conventional controller design and results are found to be satisfactory.