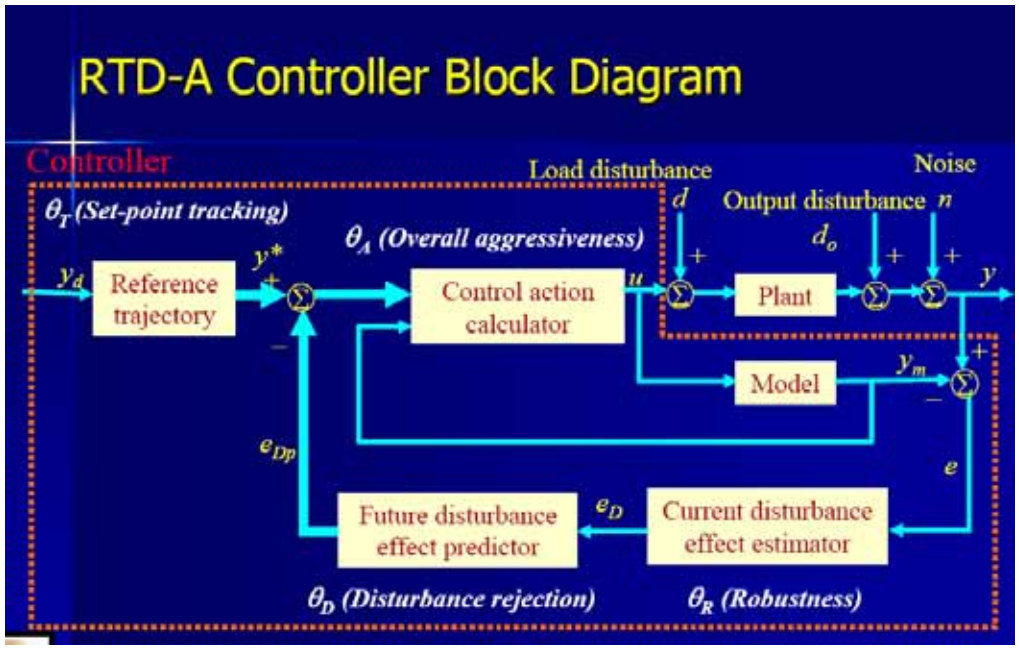
Next Generation Regulatory Controller for Chemical Processes

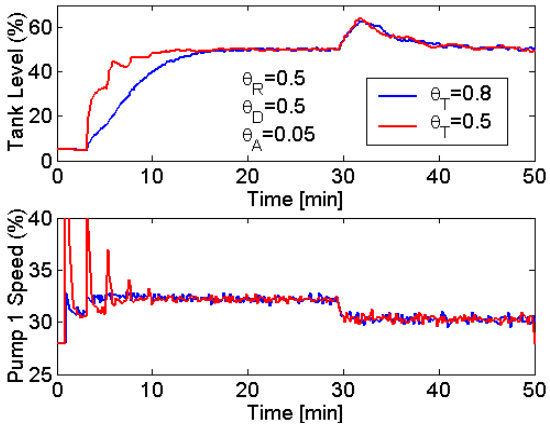
Babatunde A. Ogunnaike, Department of Chemical Engineering
University of Delaware (ACS PRF 47540-AC9)

Meeting the stringent demands on manufacturing processes in the 21st century effectively requires a fundamentally re-imagined alternative next generation regulatory controller that takes proper advantage of modern digital electronic technology to overcome the weaknesses of current PID controller technology

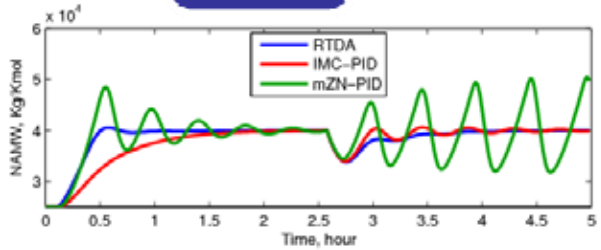


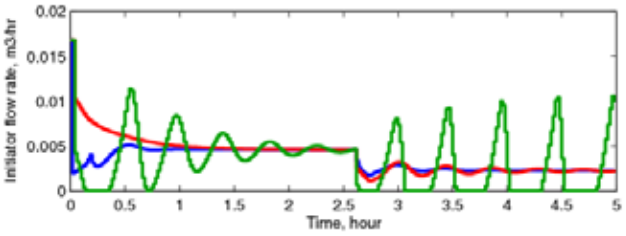
Application on simple water tank process

Set-point tracking: θ_T



Simulation results on Polymerization process





By using a combination of Bayesian Estimation (for current disturbance estimation), the statistical theory of stochastic forecasting (for future disturbance prediction), and least squares optimization (for control action calculation) we have successfully developed a controller with transparent tuning which is also more effective than currently available technology. We have also used robust stability analysis to develop easy to apply tuning rules which have been tested in simulation on a model of an industrial polymerization reactor, and most recently on a simple water tank. A Patent application and application on a more complex process is pending.