Next Generation Regulatory Controller for Chemical Processes

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

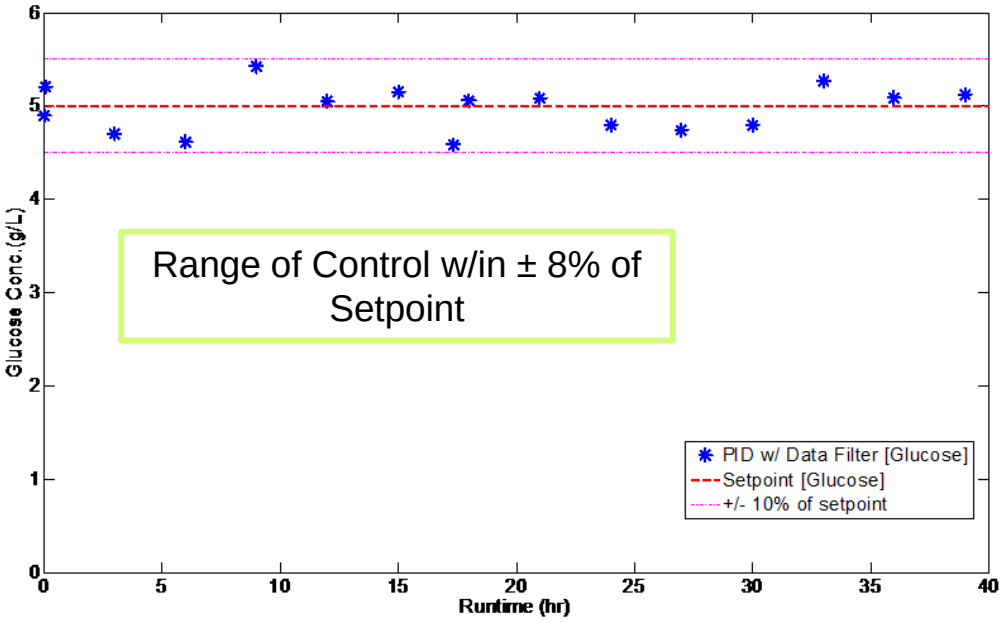
Meeting the stringent demands on manufacturing processes in the 21st century effectively requires a fundamentally re-imagined alternative next generation regulatory controller that takes proper advantage of modern digital electronic technology to overcome the weaknesses of current PID controller technology

Application on a parallel bioreactor system for making monoclonal antibodies

Parallel Bioreactor System
(DasGip, Jülich Germany)

OPC

BioAnalyzer
(Nova Biomedical, Waltham MA)



Range of Control w/in ± 8% of Setpoint

The bioreactor is integrated through an OPC interface with a bioanalyzer (Nova Bioprofile 100+) that provides measurements of the metabolites. To demonstrate the performance of our regulatory controller, Chinese hamster ovary (CHO) K1 cells were cultured in serum free suspension culture with 30% DO and pH 7.3 and glucose and glutamine media concentrations measured at 3-hour intervals over the course of a single 80 hour experiment. Our control algorithm was used to maintain media nutrient concentrations at desired set-points one at a time. Based on the Nova Bioprofile readings of media concentration, the controller either adjusted the feed rate of a 50g/L stock solution of glucose or a 29.3g/L solution of glutamine. The results show that the controller maintained glucose within 8% of the set-point compared to the ±25% of the set-point that is common with standard control.