Songphol Jongtanapiman 2011: Controller Design of Continuous pH Processes Using Model-based Control Technique. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Assistant Professor Chanin Panjapornpon, Ph.D. 85 pages.

This work presents a control method designed for a continuous pH process with a fluctuation in influent pH. Two process configurations, a single mixing tank and two mixing tanks in series, are considered as case studies. The proposed method is capable of handling process uncertainties and coupling effects between the level and pH. In the control system, a state feedback controller is formulated by using an input-output linearization combined with an optimization to estimate the disturbances in the influent pH and unit interactions. A closed-loop compensator with predicted disturbance is applied to eliminate offset responses. A net proton–hydroxide ion estimated from measured pH is used in a developed model to improve the process prediction. The control objective is to handle the level and pH of a bench-scale, continuous pH process of HCl-NaOH system by adjusting their manipulated inputs. Performance of the proposed method is evaluated by setpoint tracking and disturbance rejection tests and is also compared with the proportional-integral controller. The results of both case studies showed that the developed controller can enforce the process with uncertainties to desired setpoints effectively while the outputs under the proportional-integral controller showed the oscillation and cannot achieve the desired target.

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