Model Refinement of a Fermentation Process with Ex-Situ Butanol Recovery during Adaptation Period

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In our previous work, a fermentation process integrated with adsorption columns was suggested as one of ways to overcome the limitation of traditional ABE fermentation, we developed the dynamic model for it, and optimized major operating variables. However, due to the nature of the fermentation process, model parameters can vary with scale-up, changing in operating condition or restart with new seed so the reduction in the productivity or volumetric productivity is unavoidable in the start-up operation. Thus, during the adaptation period, parameters in the dynamic model need to be adjusted, and then recipe optimization is repeated with the updated model to recover the decreased productivity to its maximum value. In this study, we perform an open-loop sensitivity analysis with respect to model parameter variations to determine the significant parameters to adapt. In addition, we design a strategy for model refinement during adaptation period, and carry out case studies of the perturbations of the significant parameters.