

Optimal operation and tracking control of vapor-recompressed batch distillation

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Abstract

Vapor recompressed batch distillation (VRBD) is an energy-integrated configuration which works on the principle of a heat pump. Operation of such a column is challenging due to unsteady, nonlinear dynamics and strong interplay between separation and energy efficiency. In this paper, a two-step approach is proposed for optimal operation and control of such a column. Initially, an openloop optimal operation policy is generated for maximization of an overall performance index using offline optimization. To this end, three performance indices are proposed to capture interplay between separation and energy efficiency. Subsequently, a model-based output feedback controller is designed to track this optimal performance trajectory. The effectiveness of the proposed approach is demonstrated using a benzene-toluene separation case study wherein it is shown that the proposed approach helps to achieve optimal operation in the presence of operational disturbances.

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