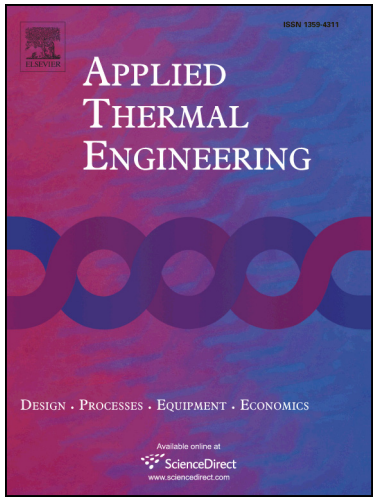

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Plant-wide Control of Coupled Distillation Columns with Partial Condensers

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Abstract

Conventional distillation control processes use vapor distillate flowrate to control column pressure and condenser heat removal to control the reflux drum level. These intuitive control systems work well for isolated columns or columns with total condensers. However, these controls are not effective when columns with partial condensers occur in series. The pressure and reflux drum level interact in such systems in ways that defeat conventional control systems, rendering them unable to maintain product purities in the presence of large feed flowrate and composition disturbances. This investigation documents a plant-wide control structure that can address this issue by controlling pressure through reflux heat removal rate and reflux drum level by reflux flow rate. This control system demonstrates its capability to handle large disturbances in throughput and feed composition through a series of Aspen simulations. This alternative system is no more complicated than the conventional system and should work on distillation columns of nearly all designs, not just the coupled partial condenser designs for which it is essential.

Common natural gas processing provides a specific example of this alternative control system. Natural gas commonly includes high concentrations of CO_2 that must be removed prior to pipeline or LNG distribution. The existence of a minimum-boiling temperature azeotrope between ethane, virtually always