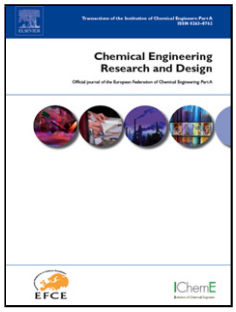

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Effect of multi-recycle streams on triple-column pressure-swing distillation optimization

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Highlights

- Multi-recycle TCPSD processes were investigated to separate a ternary azeotrope.
- The characteristics and feasibility of multi-recycle TCPSD processes were analyzed.
- Multi-recycle TCPSD processes were simulated by Aspen Plus and compared with economics.

ABSTRACT: Different structures of multi-recycle triple-column pressure-swing distillation (TCPSD) are synthesized and explored. Acetonitrile/methanol/benzene ternary mixture is set as a case to identify the applicability of different multi-recycle TCPSD flowsheets. Four multi-recycle flowsheets are analyzed and compared with convention TCPSD process and rigorous steady-state simulations are implemented using Aspen Plus. Operating parameters are optimized by using the sequential iterative optimization procedure when the split fraction changes with the objective function of minimum total annual cost. Two structures are found that distillate compositions surpass the distillation boundaries at finite reflux ratios. However, the results show that different multi-recycle TCPSD processes are feasible.

Keywords: multiple recycle; triple-column; pressure-swing distillation; optimization