Simultaneous Optimization for Heat-Integrated Crude Oil Distillation System
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Abstract
Crude oil distillation is a process of major importance in the refining industry. The operating variables of the distillation process have a critical effect on the process profit and energy recovery. However, the objective of heat recovery and product profit of the system does not always coordinate with each other. In this paper, a systematic approach which has considered the product profit and energy recovery simultaneously during the optimization of the crude oil distillation systems is presented, while meeting required product qualities by searching for an optimal operating condition by manipulating the operating variables. The shortcut model (SCFrac) in ASPEN Plus was used to describe the crude oil distillation process, and the pinch analysis was adopted to identify the target of energy recovery without knowing exact heat exchanger network structure. The optimization problem was solved by applying a particle swarm optimization (PSO) algorithm to achieve the objective of maximum net profit. Finally, a case study was used to illustrate the application of the approach for crude oil distillation systems and the results showed good agreement with rigorous simulation.

Keywords: Crude oil distillation; Shortcut model; Optimization; PSO; Net profit

References
P. Promvitak, K. Siemanond, S. Bunluesiriuang, V. Raghareutai, 2009, Retrofit design of heat exchanger networks of crude oil distillation unit, Chemical Engineering Transactions, 18, 99-104
S. V. Inamdar, K. S. Gupta, D. N. Saraf, 2004, Multi-objective optimization of an industrial crude distillation unit suing the elitist non-dominated sorting genetic algorithm, Chemical Engineering Research and Design, 82(A5), 611–623