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Optimization-based Design of Crude Oil Distillation Units using Surrogate Column Models and a Support Vector Machine

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Highlights

- A systematic method for the design of crude oil distillation unit is proposed.
- Support vector machine is applied to remove infeasible designs from the solution space.
- Optimization-based design of CDU using ANN improves computational performance.
- Optimal CDU shows significant improvement in total annualized cost.

Abstract

This paper presents a novel optimization-based approach for the design of heat-integrated crude oil distillation units, which are widely used in refineries. The methodology presented combines, within a unified framework, surrogate distillation column models based on artificial neural networks, feasibility constraints constructed using a support vector machine, and pinch analysis to maximize heat recovery, in order to optimize the distillation column configuration and its operating conditions. The inputs to the surrogate column model are given by the column structure and operating conditions, while the outputs are related to the column performance. The support vector machine classifier filters infeasible design alternatives from the search space, thus reducing computational time, and ultimately

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