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Thermodynamic Optimization of Atmospheric Distillation Unit

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Highlights

- Data driven model of atmospheric distillation column is presented
- Optimization of the exergy efficiency improves column energy efficiency
- Inclusion of product qualities substantiate the optimization results

Abstract

This paper presents a methodology for optimising the exergy efficiency of atmospheric distillation unit without trading off the products qualities and process throughput. The presented method incorporates the second law of thermodynamics in data driven models. Bootstrap aggregated neural networks (BANN) are used for enhanced model accuracy and reliability. The standard error of the individual neural network predictions is taken as the indication of model prediction reliability and is incorporated in the optimization objective function. The economic analysis of the recoverable energy (sum of internal and external exergy losses) reveals the energy saving potential of the proposed method, which will aid the design and operation of energy efficient atmospheric distillation columns.

Keywords: atmospheric distillation; ; ; , exergy, optimization, neural networks.

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Abstract

This paper presents a methodology for optimising the exergy efficiency of atmospheric distillation unit without trading off the products qualities and process throughput. The presented method incorporates the second law of thermodynamics in data driven models. Bootstrap aggregated neural networks (BANN) are used for enhanced model accuracy and reliability. The standard error of the individual neural network