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Project Title:

Development of a Model for Benchmarking of Energy Consumption & CO₂ Emission in Cold-End of Olefin Plant

Abstract:

Benchmarking of different process industries, such as petrochemical processes, with respect to energy consumption and CO₂ emission, is a fundamental measure while implementing a comprehensive energy plan at the national level. Olefin Plant is one of the process industries that is highly energy intensive and needs to be addressed when looking at petrochemical complexes. In this research, olefin cold-end, which requires heat removal from the process via refrigeration at very low temperatures, has been studied. In sub-ambient processes, shaft work requirement is a dominant factor that causes very high energy cost. A conceptual mathematical model has been developed to facilitate energy benchmarking in olefin cold-end processes. A conceptual model using Pinch analysis is developed to predict energy consumption in refrigeration cycles. To develop the model, the cold-end from five Iranian olefin plants were studied and the effect of different factors such as technology, capacity, feedstock and product types were investigated. The gap between the current level of energy consumption and best practice technology using Pinch analysis was determined. The comparison showed an average potential of 17.7 % reduction in shaft work requirement. Having developed the aforementioned model, there is no need to undertake a full retrofit study for olefin cold-end processes anymore because the model can easily be applied to similar processes and the scope for improvement can be identified.

Both time and money associated with extra engineering work can be saved. Application of this model to all olefin's cold-end processes in Iran showed that there would be 65,838 kW/h potential for energy consumption reduction, which is equivalent to about 382,519 t of CO₂ emissions.