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M. Mehdizadeh Fard, F. Pourfayaz, M. Mehrpooya, A.B. Kasaeian

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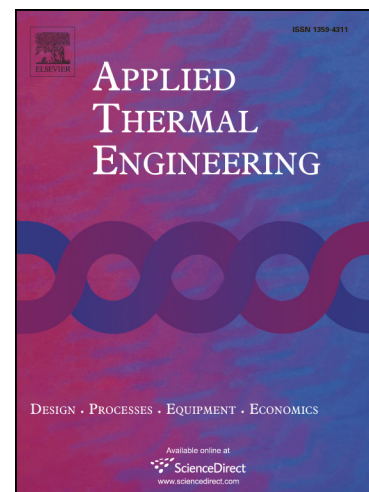
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# Improving Energy Efficiency in a Complex Natural Gas Refinery using Combined Pinch and Advanced Exergy Analyses

M. Mehdizadeh Fard, F. Pourfayaz<sup>\*</sup>, M. Mehrpooya, A.B. Kasaeian

Department of Renewable Energies and Environment, Faculty of New Sciences and  
Technologies, University of Tehran, Iran

<sup>\*</sup> E-mail address of corresponding author: [Pourfayaz@ut.ac.ir](mailto:Pourfayaz@ut.ac.ir)

## Abstract

A real-life case study of a Heat Exchanger Network (HEN) in a complex natural gas refinery was considered, using the pinch technology concept combined with advanced exergy analysis (so-called CPEA). This could be done by supertargeting, a tradeoff between capital and operational costs, applied to the five divided zones in the plant, based on the concept of zonal targeting method. It was shown that the potential of improvement on both the utility consumption and the heat recovery were about 36.09% and 42.65% respectively, so there was a huge potential of the energy saving relative to the existing network. Meanwhile, a new approach to the advanced exergy analysis of HENs has been proposed by considering  $\Delta T_{\min} = 0^{\circ}\text{C}$  in the well-developed Carnot factor-Enthalpy diagram of balanced exergy composite curves. Considering unavoidable exergy loss in the retrofitted network, it was shown that the CPEA method led to the exergetic efficiency of 88.27%, which shows more than 78% improvement compared with 49.45% of the existing network. So from practical points, the CPEA method represents a new attempt to develop a systematic framework to optimize complex HENs in

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