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Investigation of a novel integrated process configuration for natural gas liquefaction and nitrogen removal by advanced exergoeconomic analysis

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A novel integrated process configuration for natural gas liquefaction and nitrogen removal is introduced and analyzed. The process configuration and specification of the streams and components are presented. Next the process is evaluated by the conventional and advanced exergy and exergoeconomic methods. Based on the results exergy efficiency and exergy destruction rates of the process are gained 41.27 \% and 89,904 kW, respectively. Exergy destruction and investment cost rates within the process components are divided into avoidable-unavoidable and endogenous-exogenous parts. From this analysis, improvement potentials of the process component's performance and investment costs of the process were determined by using the economic relations between them. The results indicate that exergy destruction and investment cost rates in the process components are endogenous. The process components interactions do not affects the exergy efficiency significantly. The cost of exergy destruction in the compressors is avoidable while investment costs in these components are unavoidable. The cost of exergy destruction in the heat exchangers and air coolers is unavoidable while investment costs in these components are avoidable.

\textbf{Keywords:} Natural gas liquefaction, nitrogen removal, advanced exergoeconomic and integration

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