

عنوان مقاله:

Optimal Synthesis of a Cascade Refrigeration System of LNG Through MINLP Model for Pure Refrigerant Cycles

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خلاصه مقاله:

Liquefied natural gas (LNG) is the most economical way of transporting natural gas (NG) over long distances. Liquefaction of NG by using vapor compression refrigeration system requires high operating and capital cost. Due to lack of systematic design methods for multistage refrigeration cycles, the conventional approaches of determining optimal cycle configuration are mostly based on trial-and-error and are very time consuming. Here a new Mixed Integer Non-Linear Programming (MINLP) model is introduced for selecting optimal synthesis of refrigeration system which would reduce both the OPEX and CAPEX of a LNG plant through Pinch technology. A superstructure of a complex refrigeration system is developed to select and optimize the key decision variables in refrigeration cycles (i.e. partition temperature, compression configuration, refrigeration features, refrigerant flow rate). This method reduces calculation time and increases design options that could be mounted over a multistage refrigeration cascade. Here a program (LNG-Pro) is developed that integrates the VBA, Refprop and Excel MINLP Solver to automate the methodology. Design of an LNG plant is described to illustrate advantages in adopting this method. Conceptual diagrams of pinch technology are shown to visualize the stepwise optimization procedure of compressor shaftwork. The proposed cascade by this method reduces compressor shaftwork of an LNG cascade from ۱۲۵۵ KJ/Kg to ۱۱۴۱.۹KJ/Kg.

کلمات کلیدی:

Cascade Refrigeration Cycle synthesis, Cryogenic, Liquefied Natural Gas, MINLP

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