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Exergy and Energy Analysis of Propane Precooled Mixed Refrigerant Process for Liquefaction of Natural Gas

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Abstract

In this work, liquefied natural gas (LNG) production cycle by means of Propane Precooled Mixed Refrigerant (PPMR) Process has been studied. Energy and exergy steady equations of equipments in the PPMR cycle have been established. The equipments are described using rigorous thermodynamics and no significant simplification is assumed. Taken some operating parameters as key parameters, influences of these parameters on coefficient of performance (COP) and exergy efficiency of the cascading cycle are analyzed. The results indicate that the PPMR cycle has good performance, with COP and exergy efficiency of 1.725 and 37.78%, respectively, for a typical operating condition. The power consumed for liquefaction of natural gas (NG) is equal to 42.2 MW. Parametric analyses are performed for the PPMR cycle to evaluate the effects of key factors on the performance of this process through simulation calculations. Results show that the COP and exergy efficiency will be improved with increasing of the inlet pressure of mixed refrigerant (MR) compressors, decreasing of the NG and MR temperature after precooling process, outlet pressure of turbine, inlet temperature of MR compressor and NG temperature after cooling in Mean Cryogenic Heat Exchanger (MCHE).

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