Contribution ID: **225** Type: **Contributed Oral Presentation**

Exergy analysis of LNG boil-off gas reliquefaction systems

Tuesday, 30 June 2015 17:45 (15 minutes)

Boil-off gas (BOG) generation and its handling is an important issue in LNG value chain because of economic, energy and safety reasons. Absorption of BOG in high pressure subcooled LNG facilitates liquid pumping and avoids the necessity of high-energy gas-compression. Condensation of BOG by nitrogen refrigeration cycle ensures returning of condensed BOG back to storage tank. Reverse Brayton cycle with nitrogen as working fluid is a preferred refrigeration cycle for reliquefaction systems because it is compact, safe, easy to operate and has quick start-up capability when compared with mixed refrigerant cycles. During the last decade several variants of reliquefaction systems with different configurations have been proposed in literature. Thermodynamic analysis of these systems are required to understand their strengths and weaknesses in order to arrive at an informed decision regarding their possible adoption.

In the present work, reliquefaction systems having Reverse Brayton refrigeration cycle with nitrogen as working fluid is analysed using first and second law of thermodynamics. Exergy analysis on a simplified base-level reliquefaction system with minimum number of equipment has been performed and used as the yardstick for evaluating the modified systems. The base cycle is modified with precooling, stages of compression and arrangement of heat exchangers etc. Aspen Hysys 8.6®, a process simulator is used for simulating different configurations of reliquefaction systems. The results show that exergy destruction in components and the occurrence of pinch in the heat exchanger where BOG condenses are important factors and they affect reliquefaction capacity. The analysis of modified cycles shows that change of configuration coupled with addition of precoolers and intercoolers decreases the destruction of exergy and hence the operating cost of the system.

Primary author: Mr KOCHUNNI, SARUN KUMAR (Cryogenic Engineering Centre, Indian Institute of Technology)

Co-authors: Prof. CHOWDHURY, KANCHAN (Cryogenic Engineering Centre, Indian Institute of Technology); Prof. GHOSH, PARTHASARATHI (Cryogenic Engineering Centre, Indian Institute of Technology)

Presenters: Prof. CHOWDHURY, KANCHAN (Cryogenic Engineering Centre, Indian Institute of Technology); Prof. GHOSH, PARTHASARATHI (Cryogenic Engineering Centre, Indian Institute of Technology)

Session Classification: C2OrH - Cryogenics for Power Applications, Energy, Fuels and Transformation II

Track Classification: CEC-09 - Cryogenics for Power Applications, Energy, Fuels and Transportation