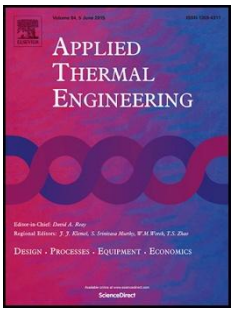
Accepted Manuscript



Title: Evolution and optimization of the dual mixed refrigerant process of natural gas liquefaction

Author: Mohd Shariq Khan, I.A. Karimi, Moonyong Lee

PII: S1359-4311(15)01338-1
DOI: http://dx.doi.org/doi: 10.1016/j.applthermaleng.2015.11.092
Reference: ATE 7373

To appear in: *Applied Thermal Engineering*

Received date: 29-9-2015
Accepted date: 27-11-2015

Please cite this article as: Mohd Shariq Khan, I.A. Karimi, Moonyong Lee, Evolution and optimization of the dual mixed refrigerant process of natural gas liquefaction, *Applied Thermal Engineering* (2015), http://dx.doi.org/doi: 10.1016/j.applthermaleng.2015.11.092.

Evolution and Optimization of the Dual Mixed Refrigerant Process of Natural Gas Liquefaction

Mohd Shariq Khan*, I.A. Karimi* and Moonyong Lee[]

**Department of Chemical Engineering and Biomolecular Engineering, National University of Singapore, 4 Engineering Drive 4 Singapore 117576*

[]*School of Chemical Engineering Yeungnam University Dae-dong 712-749, Republic of Korea*

[]Corresponding author's email address: mynlee@yu.ac.kr

Keywords: Dual Mixed Refrigerant, Natural Gas, Liquefaction, Efficiency Improvement, Box Optimization, Genetic Algorithm

Highlights

- Evolution and optimization of DMR process is presented
- Recent trend in DMR are high process safety/efficiency, utilization of cold energy
- Single objective study minimizing specific compression energy and UA is performed
- Multi-objective optimization is performed employing controlled elitist genetic algorithm.

Abstract

This study unfolds the important developments in the evolution of dual mixed refrigerant (DMR) process of natural gas (NG) liquefaction followed by its optimization. The initial designs of DMR process involve direct intermixing of non-equilibrium streams that causes thermodynamic irreversibility and reduces efficiency. Major developments that improved DMR process efficiency were the use of coil-wind type heat exchangers followed by three stage throttling in NG pre-cooling and direct utilization of cold energy available to the boil-off gas. After enumerating major developments a generic design of DMR process is selected and optimized for specific compression energy (SCE) and overall heat transfer coefficient (UA) using Box methodology and controlled elitist genetic algorithm. Single objective optimization of SCE and UA with Box methodology results in savings of 36% and 15% respectively. There exist a partial trade-off between SCE and UA thus the savings in SCE is offset by the increase of UA. Consequently a multi-objective optimization is performed that results in a simultaneous decrease of 24% and 3% in the SCE and UA value, compared to the base case.

1. Introduction