

Accepted Manuscript

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PII: S0894-1777(18)30591-0
DOI: <https://doi.org/10.1016/j.expthermflusci.2018.05.024>
Reference: ETF 9489

To appear in: *Experimental Thermal and Fluid Science*

Received Date: 22 November 2017
Revised Date: 14 April 2018
Accepted Date: 21 May 2018

Please cite this article as: C. Sun, Y. Li, H. Han, J. Zhu, S. Wang, Experimental Research on the Adaptability of Liquid Natural Gas Spiral Wound Heat Exchanger in Dual Mixed Refrigeration Liquefaction Process, *Experimental Thermal and Fluid Science* (2018), doi: <https://doi.org/10.1016/j.expthermflusci.2018.05.024>

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Experimental Research on the Adaptability of Liquid Natural Gas Spiral Wound Heat Exchanger in Dual Mixed Refrigeration Liquefaction Process

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ABSTRACT: As the key equipment of natural gas liquefaction process, the performance of spiral wound heat exchanger (SWHE) influences operating costs and reliability of the whole system. In order to investigate the adaptability of LNG SWHE in dual mixed refrigeration (DMR) liquefaction process, an experimental device using DMR liquefaction process and a multi-phase multi-stream thermal model for SWHE are both constructed. The variations of feed gas flow rate are selected as disturbances to test the dynamic responses of the LNG SWHE. And the results show that when the feed gas mass flow rate decreases to 0 kg h^{-1} , slug flow may occur in the outlet pipeline of mixed refrigerant in shell-side. And during the cooling process of feed gas in SWHE, two critical values (-80 and $-106 \text{ }^\circ\text{C}$) were both obtained. In addition, with an adequate mass flow rate of mixed refrigerant, the LNG SWHE in DMR liquefaction process could overcome some disturbances and can be operated at a stable state.

Keywords: LNG, DMR, Spiral wound heat exchanger, Experiment

1. Introduction

Natural Gas is recognized as a safe and environmental responsible fuel [1, 2]. And the LNG is an economical way to transport and store natural gas [3]. In addition, LNG plants can successfully

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