

Vortex-tube turbo-expander refrigeration cycle for performance enhancement of nitrogen-based natural-gas liquefaction process

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In the proposed refrigeration cycle, vortex tube as an expansion device was integrated with turbo-expander in order to reduce the overall required energy for LNG production. A well-known commercial simulator Aspen Hysys® v9 was employed for modeling and analysis of proposed LNG process. The hybrid vortex-tube turbo-expander LNG process resulted in the specific energy requirement of 0.5900kWh/kg LNG. Furthermore, the energy efficiency of the proposed LNG process was also compared with previous N₂ expander-based LNG processes. The results demonstrated that the proposed hybrid configuration saved up to 68.5% (depending on feed composition and conditions) in terms of the overall specific energy requirement in comparison with previous studies. This research was supported by the Basic Science Research Program Foundation of Korea (NRF) funded by the Ministry of Education (2018R1A2B6001566), the Priority Research Centers Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (2014R1A6A1031189).