

Conceptual Design of Hydrogen Liquefaction Process Using Liquefied Natural Gas Cold Energy

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Recently, hydrogen is considered an alternative energy source as one of the renewable energy. The large-scale transportation and storage of hydrogen is essential in order to grow into an energy source suitable for the hydrogen society. Liquid hydrogen is known through previous studies as the most efficient way to transport and store. However, the problem is that the cryogenic cooling requires a lot of energy to liquefy hydrogen.

This study investigates a method for efficient use of the energy needed for hydrogen liquefaction. In conventional hydrogen liquefaction processes, liquid nitrogen is used as refrigerant, but the proposed process is applied to use liquefied natural gas (LNG) cold energy to improve the efficiency. Through simulation of hydrogen liquefaction process, the energy efficiency and economic evaluation are analyzed. Comparing the results of the two processes, the liquefaction efficiency is improved by 18%, and the capital and operating costs are improved by 49% and 35%, respectively. This study can contribute to improving the liquefaction efficiency by using LNG cold energy, which is needed to liquefy hydrogen.