

***Development and Validation of a  
Small-Scale Hydrogen Liquefier Using a  
Modified Linde-Hampton Cycle***

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Recent trends are towards the use of renewable energy and hydrogen is seen as a key fuel source for the future. In terms of overall efficiency existing analysis show liquid hydrogen as the most efficient method of transportation for hydrogen fuel; however, liquefaction plants are far and few. To promote the hydrogen infrastructure, Korea Institute of Science and Technology (KIST) and Hylum Industries, Inc. will develop the first small-scale commercial hydrogen liquefier for Korea's Gangwon province. A 30 Kg/day liquefaction rate, direct-cooling type hydrogen liquefier using a modified Linde-Hampton Cycle has been designed and fabricated. The liquefaction cycle in respective order consists of a compressor, liquid nitrogen precooler, single-stage G-M cycle cryocooler, JT-expansion nozzle, two single-stage series G-M cryocoolers, and a vacuum jacketed internal storage tank. The liquefier was specially fabricated to minimize heat leak while maximizing overall cycle and storage efficiency. A detailed overview of component fabrication and experimental procedure and validation are discussed in this paper.