Contribution ID: **124** Type: **Poster**

C1Po3C-04: Development of a 10 ton/day air liquefaction system for liquid air energy storage

Monday 19 May 2025 14:00 (2 hours)

To achieve carbon neutrality, the contribution of renewable energy to electricity generation is steadily increasing. However, renewable energy sources often experience significant output fluctuations due to varying weather conditions. Consequently, the demand for high-capacity energy storage systems is gradually rising to ensure grid stability. The Liquid Air Energy Storage (LAES) system liquefies air using surplus electricity for energy storage. When electricity is needed, the system pressurizes and vaporizes the liquid air to generate power through turbines. The energy storage using liquid air at ambient pressure is safe and eco-friendly. It also allows for the storage of large amounts of energy. In this study, a 10 ton/day air liquefaction system was developed as a pilot plant for liquid air energy storage. The system consists of two compressors in series, an air pre-treatment system, an air cooler, a liquefaction cold box, and a liquid air storage tank. The air is pressurized and pre-treated by removing water and CO2, then liquefied in the cold box through a modified Kapitza cycle. To enhance the process, a cold nitrogen stream is introduced into the cold box to simulate the recycling of cold thermal energy recovered during the power generation process. The cold stream is divided into two branches to improve cycle efficiency. Experiments were performed under various conditions, including different mass flow rates, split flow ratios to cryogenic expanders, and flow rates to the cold stream branches. The experimental results are presented and discussed in detail in this study.

Author: Dr IN, Sehwan (Korea Institute of Machinery and Materials)

Co-authors: Dr JEONG, Heechan (Korea Institute of Machinery and Materials); Dr LIM, Hyungsoo (Korea Institute of Machinery and Materials); Dr PARK, Junyoung (Korea Institute of Machinery and Materials); Dr KIM, Juwon (Korea Institute of Machinery and Materials); Dr PARK, Sehjin (Korea Institute of Machinery and Materials); Dr HONG, Yong-Ju (Korea Institute of Machinery and Materials)

Presenter: Dr IN, Sehwan (Korea Institute of Machinery and Materials)

Session Classification: C1Po3C - Liquid Air, CO2, Ar Liquefaction and Storage