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Data Article

Data on conceptual design of cryogenic energy storage system combined with liquefied natural gas regasification process

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A R T I C L E   I N F O

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A B S T R A C T

This paper describes data of an integrated process, cryogenic energy storage system combined with liquefied natural gas (LNG) regasification process. The data in this paper is associated with the article entitled “Conceptual Design and Exergy Analysis of Combined Cryogenic Energy Storage and LNG Regasification Processes: Cold and Power Integration” (Lee et al., 2017) [1]. The data includes the sensitivity case study dataset of the air flow rate and the heat exchanging feasibility data by composite curves. The data is expected to be helpful to the cryogenic energy process development.

Specifications Table

Subject area	Chemical Engineering
More specific subject area	Process Systems Engineering
Type of data	Figures and Tables
How data was acquired	Through the computational process simulation by software, Aspen HYSYS
Data format	Filtered and analyzed
Experimental factors	Air flow rate, heat exchanging feasibility

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Experimental features	Feasibility check, sensitivity analysis, performance evaluation
Data source location	Department of Chemical and Biomolecular Engineering, Yonsei University, Republic of Korea
Data accessibility	Data with this article

Value of the data

- The increase of the air flow rate causes increase of the power generation.
- The increase of the air flow rate causes decrease of the minimum temperature difference of the heat exchanger.
- The pinch point can be shown not only at the inlet or outlet but also inside the heat exchanger when the phase changing occurs.

1. Data

In this data article, we share sensitivity analysis data of the cryogenic energy storage system combined with liquefied natural gas (LNG) regasification process. In this data, the case study simulation results by air flow rate and the heat exchanging composite curves are illustrated.

2. Experimental design, materials and methods

2.1. Sensitivity analysis of the air flow rate

The air is used as the working fluid in this integrated energy storage system. To find the optimal flow rate of the air, the simulation case study is performed by the air flow rate for the sensitivity analysis. The flow rate of the LNG is fixed as 1.00 kg/s for every case. We set five cases of the air flow rate as follows: Case 1 is 0.40 kg/s, Case 2 is 0.45 kg/s, Case 3 is 0.50 kg/s, Case 4 is 0.55 kg/s and Case 5 is 0.60 kg/s of air flow rate. The specific work output of the cryogenic energy release system by the air flow rate is shown in Table 1. The stream notations are shown in Fig. 2 in Ref. [1].

The simulation result shows that the total work output is almost linear to the air flow rate.

2.2. Feasibility analysis for the heat exchangers

The detailed heat exchanging simulations are performed to check the feasibility and the results are shown in Table 2. The pinch temperature is set as 3 °C for every heat exchanger as the constraint. Therefore, the minimum temperature difference of the heat exchanger have to be larger than 3 °C. Finding pinch point is an important part in the procedure of the heat exchanging feasibility check. The hot stream is air and the cold stream is LNG for all heat exchangers. The cold LNG is vaporized via

Table 1
Specific work output by the air flow rate (kJ/kg-LNG).

Specific work output	Case 1	Case 2	Case 3	Case 4	Case 5
Air expander 1	30.23	34.01	37.79	41.57	45.35
Air expander 2	31.98	35.97	39.97	43.97	47.97
Air expander 3	33.27	37.42	41.58	45.74	49.90
Air expander 4	33.26	37.42	41.58	45.74	49.89
Total work output	128.74	144.82	160.92	177.02	193.11

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