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# Heat transfer characteristics analysis of the large-scale cold storage solution based on moving bed

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Large-scale cold storage plays a crucial role in future net-zero emission scenarios. It is expected to drive advancements in technologies such as liquid air energy storage (LAES) and liquid nature gas (LNG) cryogenic energy utilization, with promising commercial prospects. To eliminate the use of flammable, explosive, and potentially polluting liquid-phase storage mediums, packed bed cold storage emerges as a promising solution. However, the inclined thermocline effect within the packed bed can compromise the quality of cold energy, leading to reduced efficiency. To address this challenge and develop an efficient, safe, and environmentally friendly cold storage technology, this study proposes a cold storage solution based on the moving bed technology. It utilizes quartz sand as the storage medium and employs gas-solid direct contact heat transfer to increase the heat transfer area and minimize the heat transfer temperature difference. The study establishes a gas-solid coupling heat transfer model and conducts heat transfer analysis, investigating the impact of different design parameters on heat transfer performance. The results highlight the outstanding performance of the moving bed-based cold storage technology, achieving an exergy efficiency of cold storage exceeding 90%, making it a highly competitive large-scale cold storage solution.

## Submitters Country

China

**Primary authors:** FAN, Xiaoyu (Key Laboratory of Cryogenic Science and Technology, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); LI, Yihong (Key Laboratory of Cryogenic Science and Technology, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); LI, Junxian (Key Laboratory of Cryogenic Science and Technology, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); WANG, Zhikang (Key Laboratory of Cryogenic Science and Technology, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); GAO, zhaozhao (Key Laboratory of Cryogenic Science and Technology, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); JI, Wei (Zhonglv Zhongke Energy Storage Technology Co., Ltd.); Dr CHEN, Liubiao (Key Laboratory of Cryogenic Science and Technology, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); WANG, Junjie (Key Laboratory of Cryogenic Science and Technology, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences)

**Presenter:** FAN, Xiaoyu (Key Laboratory of Cryogenic Science and Technology, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences)

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