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Theoretical research of the performance of the self-pressurization liquid hydrogen transfer system for a cryogenic storage vessel

Self-pressurization transfer is used widely for transferring liquid hydrogen, where a fraction of the liquid in the storage vessel is vaporized and superheated throughout the vaporizer by exchanging heat with ambient air, and returned to pressurize the ullage volume of the storage vessel to expel the liquid hydrogen. In this paper the pressurization performance of the self-pressurization transfer system during the liquid hydrogen discharge is investigated. The influence of the structure design of the vaporizer as well as the structure design of the inlet and outlet tube of the vaporizer is mainly focused. Therefore theoretical model of the self-pressurization transfer process is established taking no account of the heat and mass transfer inside the storage vessel. The relationship among the pressurized gas (vaporized hydrogen liquid) requirement, the inlet pressurized gas temperature and the structure design of the vaporizer is analyzed. Based on the research results, the optimization of the vaporizer structure design is presented.

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