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# C1Po2C-03: Theoretical power consumption analysis of pressurization process of reciprocating liquid hydrogen piston pump

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Compared with other off-site hydrogen refueling stations, the liquid hydrogen refueling stations have the advantages of high storage and transportation efficiency, good economy of medium and long-distance transportation, low construction investment and high hydrogen purity, which has become an inevitable trend in the development of hydrogen refueling stations in the future. The energy consumption of liquid hydrogen pump is much lower than that of compressor in high-pressure gas hydrogen refueling station, which is the key technical link for the development of the liquid hydrogen refueling station. However, there are few published data on the research of reciprocating liquid hydrogen piston pump, and its thermodynamic process is still unclear.

In this paper, the thermodynamic analysis of the high-pressure pressurization process of the reciprocating liquid hydrogen piston pump is carried out in view of the influencing factors such as the gas content of liquid hydrogen, the surrounding environment heat leakage, the piston friction loss and the liquid hydrogen evaporation loss in the working process of the reciprocating liquid hydrogen piston pump, and the main reasons affecting the efficiency of the reciprocating liquid hydrogen piston pump are calculated. The key technologies such as improving the efficiency of liquid hydrogen piston pumps, reducing cold capacity loss, and reusing cold energy were further discussed, and some suggestions were put forward for the development of liquid hydrogen piston pumps in the future.

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