Contribution ID: **400** Type: **Poster Presentation (120m)**

Study on motion characteristics of check valve in reciprocating liquid hydrogen pumps

Tuesday 23 July 2024 14:00 (2 hours)

Reciprocating liquid hydrogen pump is the key equipment for the liquid hydrogen transport technology in the hydrogen energy industry. The check valve, serving as a vital component in the pump, regulates the flow of liquid hydrogen into and out of the pump chamber during each stroke of the reciprocating motion. This paper simulates the check valve motion based on the mechanical equilibrium equation and the fluid continuity equation. By using Runge-Kutta method to solve the model, the cylinder pressure, valve lift and velocity are obtained and discussed. Furthermore, influences of discharge pressure, spring stiffness and spool-head angle of the valve cone on the valve motion are studied by altering structural parameters of the check valve and working condition of the pump. The results demonstrate that the discharge pressure directly affects the initial speed of the valve and then has a greater impact on the valve movement. This work would contribute to understanding the valve motion mechanism of reciprocating liquid hydrogen pumps and further investigation is encouraged.

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Session Classification: Tue-Po-1.5

Track Classification: Tracks ICEC 29 Geneva 2024: ICEC 03: Expanders, pumps, compressors, regenerators and other components