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## **C3Po1D-01: Simulation and experiment of a hydrogen pump with an integrated closed impeller**

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In order to improve the efficiency and anti-cavitation performance of the liquid hydrogen transfer pump, a newly type of closed impeller which integrates both the inducer and the centrifugal impeller is designed to replace the traditional separated impeller. The design specifications include a head of 145 m, a rated speed of 8000 rpm, and a flow rate of 10 L/s. The operational conditions for liquid hydrogen are converted into those for liquid nitrogen using a similar conversion principle to assess the pump's performance. Through simulation calculation, the designed pump head is 154.4 m under the designed condition of liquid hydrogen. After similar conversion, the head under liquid nitrogen condition is 20 m. The flow characteristics, pressure distribution, velocity distribution and cavitation distribution under liquid nitrogen condition were analyzed by simulation. The entropy production under different operating conditions is also analyzed. Ensuring accurate control of clearance size and managing it effectively through gap sealing are vital components of the design and assembly process. The experience of liquid nitrogen experiment will provide guidance for subsequent liquid hydrogen testing.

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