Contribution ID: **178** Type: **Poster presentation (105min)**

Numerical Simulation of the Cavitating Flow Characteristics of Liquid Hydrogen in Throttling Flow

Due to their firm structure, reliable performance and long-life, differential pressure flowmeters are still widely applied in the field of cryogenic fluid flow meter. However, cryogenic fluids comprise of lower saturation temperature and less vaporization latent heat. They are prone to cavitate in the process of throttling flow. In the present paper, liquid hydrogen is taken as the test fluid and computational fluid dynamics technology is used to study the flow characteristic of liquid hydrogen through standard orifice plate and multi-hole balance throttling element. The RNG k-ε turbulence model and the full cavitation model with physical parameter function depending on temperature were used to simulate the cavitation phenomenon in throttling flow. Firstly, the computational results of the pressure and temperature distributions along the cavitating hydrofoil for liquid hydrogen are compared with the NASA's experimental data to validate the cavitation model. Then cavitation characteristics are detailedly analyzed, especially the cavitation inception and growth of cavity in standard orifice and multi-hole balanced throttling flow are compared. The numerical results indicate that the characteristics of flow field play an important role in liquid hydrogen cavitation.

Author: Dr LIU, Haifei (State Key Laboratory of Technologies in Space Cryogenic Propellants)

Co-authors: Mrs CHEN, Hong (State Key Laboratory of Technologies in Space Cryogenic Propellants); Mr YANG, Lufeng (State Key Laboratory of Technologies in Space Cryogenic Propellants); Mr XUAN, Zhiyong (State Key Laboratory of Technologies in Space Cryogenic Propellants)

Presenters: Dr LIU, Haifei (State Key Laboratory of Technologies in Space Cryogenic Propellants); Mrs CHEN, Hong (State Key Laboratory of Technologies in Space Cryogenic Propellants); Mr YANG, Lufeng (State Key Laboratory of Technologies in Space Cryogenic Propellants); Mr XUAN, Zhiyong (State Key Laboratory of Technologies in Space Cryogenic Propellants)

Track Classification: C-06: Heat transfer and thermo-physical properties of solids and fluids