

Numerical Study of a Novel Variable Diameter Cavitator Structure

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Abstract - Supercavitation is a perspective method for drag reduction. Cavitator is one of the most crucial parts of a supercavitation vehicle and cause 70%~80% of total drag. So, the design of cavitator remains a key issue. The requirements of diameter differ at various speed and it is difficult for cavitators with fixed structure to be adapted to complex operating conditions. In this paper, a novel variable diameter cavitator is designed to solve this problem. Based on ANSYS Fluent dynamic mesh techniques and UDF (user-defined function), three-dimensional CFD (computational fluid dynamics) simulations are performed to investigate the variation rules. According to a series of results from numerical simulation, hydrodynamic characteristic of variable diameter cavitator is obtained. The corresponding cavitator structural configuration are designed for realizing the function of changing the diameter. Results show that there is a nonlinear hysteresis property of cavity deforming affected by variable diameter cavitator.

Keywords: cavitator, Numerical simulation, Supercavitation, Dynamic mesh