

عنوان مقاله:

Numerical Simulation of Underwater Supersonic Gaseous Jets of Underwater Vehicle with Porous Media Layer

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خلاصه مقاله:

With regard to the pronounced pressure pulsation and cyclic thrust oscillation observed in the tail flow field of an underwater vehicle operating under over-expanded conditions, and drawing inspiration from flow control techniques involving porous media structures like submarine coral reefs and breakwaters, this paper presents an innovative proposition to incorporate a porous media layer on the tail wall of the nozzle in order to regulate the structure of the tail gaseous jets. To optimize the flow control of underwater vehicles, the utilization of porous media layers with varying degrees of porosity is employed to establish a model for underwater supersonic gaseous jets. This model scrutinizes the intricate structure of the tail gaseous jets, as well as the consequential wall pressure and thrust engendered by the nozzle. The findings eloquently demonstrate that the porous media model, boasting a porosity of ۰.۳۴, exerts a diminished influence on the morphological characteristics of the tail gaseous jets, while concurrently yielding a superior flow control effect on the pulsation of tail wall pressure and attenuating the differential thrust generated by the underwater vehicle. Consequently, this innovative approach effectively mitigates overall thrust oscillation, thereby enhancing the stability of the underwater vehicle throughout its submerged operations.

کلمات کلیدی:

Underwater vehicle, Underwater supersonic gaseous jets, Pressure pulsation, Porous media, Flow control

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