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CFD analysis of human powered submarine to minimize drag (Article)

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Abstract

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This paper deals with finding the optimum fineness ratio, i.e. ratio of length to maximum diameter, of human-powered submarine of different shapes to reduce the drag force on the body using Computational Fluid Dynamics (CFD) analysis. These types of submarines are used in events like ISR and eISR. This paper focuses on finding the total drag force on submarine models with a constrained diameter and different fineness ratios. The analysis is done by using ANSYS Fluent. In this paper, only the fully submerged flow is considered on a hull without any appendages. The total drag on a body is caused in three different parts that are wave drag, skin friction drags and base drag. The analysis is done different shapes of submarines like Conic shape hull, Elliptical shape hull, Ogive shape hull and Parallel mid-body hull by flowing water at velocities of 3 m/s, 4m/s and 5 m/s. The fineness ratios at which the drag is minimum are found in all submarine shapes. The optimum value of fineness ratio, which gives minimum drag is obtained by the analysis is 6 for Conical shape hull, Elliptical shape hull and Ogive shape hull whereas for the submarine with Parallel mid-body hull shape the optimum fineness ratio is 7. © TJPRC Pvt. Ltd.

Author keywords

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