Research on 3D Modeling and CFD Analysis of Performance in Open Water of Skewed Propeller

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ABSTRACT

Based on the coordinate transformation formula for transforming the local to the global coordinate, this paper builds the 3D modeling of the skewed propeller by UG software. Dispose the propeller locally for the convenience of numerical calculation, and gridding the flow field of propeller. Lastly calculate the performance in open water of propeller by FLUENT software, and compare the results between calculation and experiment. Based on the research, the calculations of the performance in open water of propeller by CFD is good, and meet the engineering requirement.

KEY WORDS: 3D Modeling; UG; Skewed Propeller; CFD; FLUENT; Performance in Open Water;

INTRODUCTION

The numeric calculation of the performance in open water is more and more important in the comparison of the performance between different propellers. The panel method can get gratifying precision, but because without considering the viscosity of fluid, it can’t get the fluid characteristics in connection with viscosity, such as the tip whorl and so on.

By the development of the computational fluid dynamics, in the past 20 years, the CFD (computational fluid dynamics) in vessel propeller has had a great development. In 1980s, the international scientists simplify the propeller computational model by RANS formula, and since 1990s, the scientists at home and abroad have started the research on numeric calculations on the real geometry of propeller by RANS formula. Thus it opens the wide development space in the numeric calculations on the hydrodynamic performance of propeller. And this paper will research the application of FLUENT software in the calculation of the performance in open water of propeller.

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3D MODELING METHOD OF PROPELLER

It is known that the marine propeller is a sophisticated geometry, and its blade shape is designed by 2D offsets, thus it is difficult to design the 3D modeling. In these years, by the development of the computer technology, CAD has been widely used in electronic, mechanic and aviation. This paper will model the 3D shape of marine propeller by UG software.

TRANSFORM METHOD OF 3D OFFSETS OF MARINE PROPELLER

Figure 1 The coordinate of propeller

Figure 2 The schematic of the blade section of propeller