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An Experimental Study on Hydrodynamic Performance of Flexible Model Propellers

Marine propellers operating in the ship stern wake generate an unsteady propeller fluid force and cause a hull vibration. The deformation of metal marine propeller is not considered, because it is sufficient stiffness. However, marine propeller using the composite material called flexible propeller appeared, by controlling the actively blade deformation in response to load changes in one propeller rotation, the possibility of flexible propeller with excellent hydrodynamic performance than enough rigid propeller came into sight.

In this study, we made elastically deformable highly skewed model propellers, the model propellers were made by resin with smaller flexural modulus than metal, and it was carried out propeller open water tests, fluctuating pressure measurements and blade deformation measurements in uniform flow and wake in cavitation tunnel. As a result, it was found that the flexible propeller with high skew had a high risk to lower the thrust, torque and efficiency than the metal propeller by the blade tip deformation, but it had a possibility greatly improved cavitation performance. Further, at the time of the propeller reverse it was found that there was a risk of unstable vibration occurs in blade tip part.

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