CFD Analysis of Sharkskin Denticles Roughness and its Impact on Hydrodynamic Drag Reduction

Thomas GALY
Student, Faculty of Mechanical Engineering, Kasetsart University, Bangkok, Thailand

Abstract:

This thesis investigates the hydrodynamic impact of sharkskin-inspired surface roughness on the drag coefficient and flow speed using CFD simulations. The study focuses on modifying the effective roughness height to isolate its influence on hydrodynamic performance. Rather than modeling each denticle in detail, a parameterized wall function approach is employed to mimic the effect of shark denticles on the boundary layer. This study will be based on different shark species and different areas of their bodies to compare and understand how different denticles suit different speeds and behaviors. Previous research has demonstrated that biomimetic denticle patterns can lead to notable drag reduction. In line with these findings, this research aims to evaluate how variations in roughness affect the drag coefficient and so the efficiency of a moving object in water, providing a simplified yet effective methodology to assess the benefits of such surface modifications. The theoretical framework developed here lays the groundwork for future studies and practical applications. Ultimately, the outcomes highlight opportunities for biomimetic design strategies in reducing drag in marine engineering applications.

Keywords:

CFD, Drag, Roughness, Denticles, Sharks.