

Aerodynamic performance of biomimicry snake-shaped airfoil

ABSTRACT

The cross-section shape and proportionality between geometrical dimensions are the most important design parameters of any lifting surfaces. These parameters affect the amount of the aerodynamic forces that will be generated. In this study, the focus is placed on the snake-cross-section airfoil known as the S-airfoil. It is found that there is a lack of available researches on S-airfoil despite its important characteristics. A parametric study on empty model of the S-airfoil with a cross-section shape that is inspired by the *Chrysopelea paradise* snake is conducted through numerical simulation. Simulation using 2D-ANSYS FLUENT17 software is used to generate the lift and drag forces to determine the performance of airfoil aerodynamic. Based on the results, the S-airfoil can be improved in performance of aerodynamic by reducing the thickness at certain range, whereby changing the thickness-to-chord ratio from 0.037 to 0.011 results in the increment of lift-to-drag ratio from 2.629 to 3.257. On other hand, increasing the height-to-chord ratio of the S-airfoil will increase maximum lift coefficient but drawback is a wide range of angles of attack regarding maximum lift-to-drag ratio. Encouraging results obtained in this study draws attention to the importance of expanding the research on S-airfoil and its usage, especially in wind energy.

Keyword: Snake-cross-section airfoil; Parametric study; CFD simulation; Lift force coefficient; Aerodynamic performance