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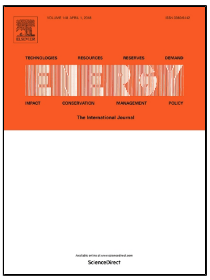

Shape Optimization and Experimental Validation of a Drag Vertical Axis Wind Turbine

A. Ramadan, K. Yousef, M. Said, M.H. Mohamed

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Shape Optimization and Experimental Validation of a Drag Vertical Axis Wind Turbine

A. Ramadan [1], K. Yousef [2], M. Said [3]& M. H. Mohamed [4, *]

[1] College of Engineering and Technology, Arab Academy for Science and Technology and Maritime Transport (AAST) Cairo, Egypt.

[2] Mechanical engineering Dept. York University. Canada

[3] Blue Power Co. Besheer Nema st. Heliopolis,Cairo, Egypt

[4] Mechanical Power Engineering Dept., Faculty of Engineering-Mattaria, Helwan University, P.O. 11718, Cairo, Egypt

[4] Mechanical Engineering Dept., College of Engineering and Islamic Architecture, Umm Al-Qura University, P.O. 5555, Makkah, Kingdom Saudi Arabia

*** Corresponding author:**

E-mail: mhmohamed@uqu.edu.sa

moh75202@yahoo.de

Abstract

In recent years, the energy crisis severly appears due to the enormous human development. The renewable energy is a new source for world energy demand nowadays, especially the wind energy. Generally, wind energy is the most promising source for electric power demand in world because of the availability of the high wind speed around the year in several locations. This work investigates the drag type wind turbines, which have strong potential in small electric power generation demands. The scenario of this work is divided into two sections; the first one is the numerical analysis for the conventional Savonius with fully optimizing for the shape of the blade using a genetic algorithm. This optimization is performed to maximize the power coefficient with the same dimension of the conventional Savonius turbine. The second part is conducted experimentally to measure the performance of the conventional Savonius with the two and three blades; in addition, the optimal blade design (S shape) is tested to compare the performance of this new design with the conventional one or standard semi-circular blade. The results indicated that the captured efficiency of the optimal shape blade has the optimum value with 28% in contrasts to 14 and 10% for the two and three blades respectively.

Keyword

Drag wind turbine; Wind energy; Rural zones; Genetic Algorithm; Power generation.