



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكرو فيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



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شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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Cairo University

AERODYNAMIC DESIGN OPTIMIZATION OF SMALL WIND TURBINE BLADES

By

Karim Sayed Abdelwahed Ahmed

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Mechanical Power Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Aerodynamic Design Optimization of Small Wind Turbine Blades

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Summary:

A particular shape optimization study of the standard SG6043 airfoil that applies the genetic algorithm is reported to find the maximum lift-to-drag ratio. The operating angle of attack is considered as an optimization parameter in four scenarios. This is followed by a CFD analysis using $\gamma - Re_{\theta}$ SST $k - \omega$ transition model to further validate the numerical model in addition to experimental work. An optimum rotor design is then implemented using the optimized airfoils to evaluate the impact of the improved lift-to-drag ratio on the power coefficient and annual energy production of small wind turbines.

Disclaimer

I hereby declare that this thesis is my own original work and has not been submitted before to any institution for assessment purposes. I have acknowledged all sources used and have cited these in the reference section.

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