NUMERICAL AND EXPERIMENTAL INVESTIGATIONS OF A DIFFUSER AUGMENTED WIND TURBINE PERFORMANCE

By

Eng.: Mohamed Badr Saad Farghaly

A Thesis Submitted To The
Faculty of Engineering at Cairo University
In Partial Fulfillment Of The
Requirement for the Degree Of
DOCTOR OF PHILOSOPHY

In
AEROSPACE ENGINEERING

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Under the Supervision of

Dr. Galal Bahgat Salem,
Professor, Aerospace Department
Faculty of Engineering
Cairo University, Egypt

Dr. Farouk Mohamed Owis,
Professor, Aerospace Department
Faculty of Engineering
Cairo University, Egypt

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Approved By the Examining Committee

Prof. Dr. Galal Bahgat Salem, Thesis Main Advisor

Professor Emeritus, Aerospace Department, Faculty of Engineering, Cairo University, Egypt

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Prof. Dr. Farouk Mohamed Owis, Thesis Main Advisor

Professor, Aerospace Department, Faculty of Engineering, Cairo University, Egypt

---

Prof. Dr. Mohamed Madbouli Abdelrahman, Internal Examiner

Professor Emeritus, Aerospace Department, Faculty of Engineering, Cairo University, Egypt

---

Prof. Dr. Yehia Bahei-El-Din, External Examiner

Vice President for Research and Postgraduate Studies, British University in Egypt

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Abstract

The main purpose of the present thesis is investigate numerically and experimentally how to improve the performance characteristics of a DAWT system that may be used as an independent power supply to the remote and rural areas in Arab Republic of Egypt. The various diffuser geometric shape parameters that significantly affect the diffuser efficiency are studied numerically aiming to reaching the best diffuser configurations which satisfy the maximum approaching wind speed near the diffuser entrance. The subsequent improvement of the turbine performance characteristics due to applying the best diffuser configurations are calculated and compared with the conventional wind turbine. In additional, experimental tests are performed to validate the numerical models adopted in the current study.