FEASIBILITY STUDY OF INCORPORATING VERTICAL AXIS WIND TURBINE ON BOAT

ZAKWAN BIN DERAMAN

FACULTY OF MARITIME STUDIES AND SCIENCE MARINE
UNIVERSITY MALAYSIA TERENGGANU

2013

FEASIBILITY STUDY OF INCORPORATING VERTICAL AXIS WIND TURBINE ON BOAT

By

ZAKWAN B DERAMAN

A thesis submitted in partial fulfilment of
the requirement for the award of degree of
Bachelor of Applied Science (Maritime Technology)

DEPARTMENT OF MARITIME TECHNOLOGY
FACULTY OF MARITIME STUDIES AND MARINE SCIENCES
UNIVERSITI MALAYSIA TERENGGANU
2013

DEPARTMENT OF MARITIME TECHNOLOGY
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE

DECLARATION AND VERIFICATION REPORT

FINAL YEAR RESEARCH PROJECT

It is hereby declared and verified that this research report entitled:
FEASIBILITY STUDY OF INCORPORATING VERTICAL AXIS WIND TURBINE ON BOAT by **ZAKWAN B DERAMAN**, Matric No. **UK 20936** have been examined and all errors identified have been corrected. This report is submitted to the Department of Maritime Technology as partial fulfillment towards obtaining the **BACHELOR OF APPLIED SCIENCE (MARITIME TECHNOLOGY)**, Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu.

Verified by:

.....

Principal Supervisor

Name: En. Mohd Azlan Bin Musa

Official stamp:

MOHD AZLAN BIN MUSA
PENSYARAH
JABATAN TEKNOLOGI MARITIM
FAKULTI PENGAJIAN MARITIM DAN SAINS MARIN
UNIVERSITI MALAYSIA TERENGGANU
21030 KUALA TERENGGANU

Date: 14/1/13

.....

Head of Department of Maritime Technology

Name: Assoc. Prof. Dr. Mohammad Fadhli B Ahmad

Official stamp:

ASSOC.PROF. DR. MOHAMMAD FADHLI AHMAD
HEAD
DEPARTMENT OF MARITIME TECHNOLOGY
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU (UMT)
21030 KUALA TERENGGANU

Date: 14/1/13

DECLARATION

I hereby declaration that this thesis entitled Feasibility Study Of Incorporating Vertical Axis Wind Turbine On Boat is the result of my own research except as cited in the references.

Signature : .....

Name : ZAKWAN BIN DERAMAN

Matrix No. : UK 20936

Date : 20 DECEMBER 2012

ACKNOWLEDGEMENTS

At the end of my thesis I would like to thank all those people who made this thesis possible and an enjoyable for me.

First of all I wish to express my sincere gratitude to ALLAH S.W.T for give me the strength to finishing my thesis, I wish to thank sincere to my supervisor En. Mohd Azlan bin Musa for guidance and moral support that he gave along my research thesis.

I am grateful to all my friend to their encouragement and help especially my housemate that were always gave me suggestion and ideal.

Finally, I would like to express my deepest gratitude for a constant support, emotional understanding and love that I received from my parent Deraman Bin Noh Aizon Bt Mustapha and also all my family.

THANK YOU.

FEASIBILITY STUDY OF INCORPORATING VERTICAL AXIS WIND TURBINE ON BOAT

ABSTRACT

Rising of fuel price, global warming, and dependency on oil was encouraged researches to find alternatives solution in order to minimize the dependency on the fuel. One of the alternative solutions is by using wind turbine as a renewable energy. Wind turbine can propel a boat at all directions to the wind including directly to windward. This thesis presents a study the usage of wind turbine assisted propulsion system on boat as second device. Savonius type of wind turbine was chosen as a second device for Discovery IX which is one of FMSM research boat. This turbine was designed and the amount of power saving was calculated base on previous study. Then, economic analysis was analyzed based on the propulsion force of the turbine. By using this device, it shows that it can save fuel consumption up to 40% in operation cost with selected route. The results of the analysis indicate that Annual Average Cost (AAC) for boat with wind turbine is low than the boat without wind turbine. Investment of the Savonius wind turbine on the Discovery IX takes 1 year to recover.

KAJIAN BAGI MENGGABUNGKAN TURBIN ANGIN PAKSI MENEGAK PADA BOT

ABSTRAK

Kenaikan harga minyak, pemanasan global dan kebergantungan kepada bahan api telah mendorong para penyelidik untuk mencari penyelesaian alternative untuk mengurangkan kebergantungan kepada bahan api. Salah satu alternative adalah dengan menggunakan turbin angin sebagai tenaga yang boleh diperbaharui. Turbin angin boleh menggerakkan bot dari setiap arah angin. Tesis ini membentangkan kajian tentang penggunaan sistem pendorongan bot dibantu oleh turbin sebagai peranti kedua. Turbin ini telah di reka dan jumlah penjimatan kuasa telah dikira berdasarkan kajian yang sebelum ini. Kemudiannya, analisis ekonomi telah dianalisis berdasarkan kuasa pendorongan daripada turbin. Dengan menggunakan turbin, penggunaan bahan api boleh menjimatkan kos operasi bot ini hingga 40%. Hasil daripada analisis menunjukkan bahawa *Annual Average Cost (AAC)* untuk bot dengan bantuan turbin angin rendah berbanding bot yang tiada turbin angin. Untuk mendapatkan semula kos pelaburan turbin angin Savonius pada *Discovery IX* mengambil masa selama 1 tahun.