



MURDOCH
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Faculty of Science and Engineering
School of Engineering and Energy

Testing of the FolksWind 1.5kW Vertical Axis Wind Turbine

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ENG450: Engineering Internship with the National Small Wind Turbine Centre

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Abstract

In recent years the small wind industry has shown exponential growth; however there have been growing concerns over the safety and reliability of small wind turbines on the market. The International Electrotechnical Committee and the International Energy Agency are working to rectify these issues by introducing stricter requirements on small wind turbines; firstly through amendments to international standards and secondly with the introduction of a Standard Labelling Program to increase consumer awareness. In Australia, since commencing operation in 2008, the National Small Wind Turbine Centre has been working to improve the safety and performance of small wind turbines by providing independent testing services to manufacturers.

Pure Engineering Pty Ltd in conjunction with Tromes Design has engaged the National Small Wind Turbine Centre to test their 1.5kW FolksWind vertical axis wind turbine in accordance with the international small wind turbine standards contained within the international series of standards IEC61400. The prototype turbine is currently in the development phase. Over the course of this project the intern has assisted the centre with the testing of the FolksWind turbine. The majority of work undertaken has involved monitoring the power performance of the turbine to allow the manufacturers to make changes in an attempt to reach an optimal system configuration. Based on the data collected, changes have been made to the turbine power curve programmed into the system's inverter in order to achieve an optimal tip speed ratio for the system. At the conclusion of the project, improvement has been made although a definite configuration for the system has not yet been determined.

In addition to power performance testing, measurement of significant vibrations present in the system has been undertaken. Vibrations consistent with the turbine's rotational speed and the frequency of blade passing have been observed. Based on this data it has been found that, as well as posing a safety threat, the vibrations are detrimental to the system's performance. The manufacturer aims to significantly reduce the magnitude of these vibrations through modifications to the system's structural components.

The manufacturer has also requested that the National Small Wind Turbine Centre measure the strain in the uppermost guy wires to allow the thrust on the rotor to be calculated and an overall thrust curve for the system to be determined. This will allow the manufacturer to determine the required strength of a free standing tower for future production. As the final configuration of the system has not been determined this analysis is not yet complete however some preliminary data has been produced and the National Small Wind Turbine Centre will continue the process of determining the thrust curve for the final system configuration.

Industry and Academic Supervisor Endorsement Pro Forma

We are satisfied with the progress of this internship project and that the attached report is an accurate reflection of the work undertaken.

Signed:

Daniel Jones- Industry Supervisor

Signed:

Jonathan Whale- Academic Supervisor

Disclaimer

I declare that:

- Except where indicated, the work being submitting in this report is my own and has not been submitted for assessment in another unit.
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Signed:

Bethany Williamson

Date: 18/11/11

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Abbreviations

AU\$	Australian Dollars
BWEA	British Wind Energy Association
FFT	Fast Fourier Transform
HAWT	Horizontal Axis Wind Turbine
IEA	International Energy Agency
IEC	International Electrotechnical Commission
IEC TC88 MT2	IEC Technical Committee 88, Maintenance Team 2
IPC	Inverter Power Curve
MCS	Microgeneration Certification Scheme
NREL	National Renewable Energy Laboratory
NSWTC	National Small Wind Turbine Centre
p	British Pence
PV	Photovoltaic
REC	Renewable Energy Certificate
RET	Renewable Energy Target
RMS	Root Mean Squared
SWCC	Small Wind Certification Council
SWT	Small Wind Turbine
TSR	Tip Speed Ratio
UK	United Kingdom
US	United States (of America)
USDOE	United States Department of Energy
US\$	US Dollars
VAWT	Vertical Axis Wind Turbine