

Prototype design of small scale wind turbine and its control



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Prototype Design of Small Scale Wind Turbine and Its Control

Submitted to the faculty of the Electrical Engineering
Department of the University of Management & Technology
Lahore, in partial fulfillment of the requirements for the Degree of
Bachelor of Science

In

Electrical Engineering

Internal Examiner External Examiner

Director Undergraduate Studies

**Electrical Engineering Department
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Declaration

We declare that the work contained in this thesis is our own, except where explicitly stated otherwise. In addition this work has not been submitted to obtain another degree or professional qualification.

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Acknowledgements

We would like to bow our head before ALLAH Almighty, the most Gracious and the most Merciful. He has been our real supporter throughout.

We are highly indebted to our families for their never ending support and encouragement, for spending their time, their resources for us and for providing us with a very comfortable and progressive work environment.. Their support took us out of the darkness and was a real source of encouragement for us.

We want to thank our project advisor, *Muhammad Atif*, who gave us the motivation for this project. He was extremely kind and supportive throughout this journey. It was due to his affectionate and cooperative facilitation that we were able to complete our project in time. His instructions, experience and tutelage will be a source of inspiration for us in times to come.

We extend our deepest regards to *Sir Jameel Ahmed, Sir Fahad Usman, Sir FarhanAwaiz Butt* and all our friends and colleagues who have been a source of encouragement and appreciation.

Moreover, we would wish to express our thanks and gratitude to Professor *Dr. SajjadShami*, chairman of Electrical Engineering department, for providing us with all the facilities that we desired in order to complete our final year project.

Abstract

We know that in the present days and in the future the wind energy is rapidly growing. In the year of 2006 the generating capacity in the world increased by 26%, a growing rate which has more or less been nonstop during the last decade. And there is no reason to believe that this growth will slow significantly in the coming years. For example, the United Kingdom's goal for installed wind turbines by 2020 is 33 GW up from 2 GW in 2006, an average annual growth rate of 23% over that world. More than half of all turbines are installed in Europe, but the United States, India and lately China are also rapidly growing markets.

Now the wind provides more than 20% of the electrical power in our systems, the industry has professionalized and has close ties with public research at universities. This focus issue is concerned with research in wind energy.

The main purposes of research in wind energy are to decrease the cost of power generated by the wind;

- increase the reliability and predictability of the energy source;
- investigate and reduce the adverse environmental impact of massive deployment of wind turbines;
- Build research based educations for wind energy engineers.

This focus issue contains contributions from several fields of research. Decreased costs cover a very wide range of activities from aerodynamics of the wind turbine blades, optimal site selection for the turbines, optimization of the electrical grid and power market for a fluctuating source, more efficient electrical generators and gears, and new materials and production techniques for turbine manufacturing. Turbines. To design such a farm optimally it is necessary to understand the chaotic and very turbulent flow downwind from a turbine, which decreases the power production and increases the mechanical loads on other nearby turbines. Also addressed within the issue is how much conventional power production can be replaced by the ceaseless wind, with the question of how Greece's target of 29% renewables by 2020 is to be met efficiently. Other topics include an innovative way to determine the power curve of a turbine experimentally more accurately, the use of fluid dynamics tools to investigate the implications of placing vortex generators on wind turbine blades (thereby possibly improving their efficiency) and a study of the perception of wind turbine noise. It turns out that a small but significant fraction of wind turbine neighbors feel that turbine generated noise impairs their ability to rest. The annoyance is correlated with a negative attitude towards the visual impact on the landscape, but what is cause and effect is too early to say.

As mentioned there is a rush for wind turbines in many countries. However, this positive development for the global climate is currently limited by practical barriers. One bottleneck is the difficulties for the sub-suppliers of gears and other parts to meet the demand.

Contents

Acknowledgements	4
Abstract	5
Chapter No. 1	9
Introduction	9
1.1 Wind Energy Technology:	Error! Bookmark not defined.
1.2 Description of Wind Turbine Generator:	Error! Bookmark not defined.
1.3 Horizontal Wind Turbine:	Error! Bookmark not defined.
1.4 Vertical Axis Wind Turbine:	Error! Bookmark not defined.
Chapter No 2	Error! Bookmark not defined.
Literature Review	Error! Bookmark not defined.
2.1 Wind Turbine Designing:	Error! Bookmark not defined.
2.2 Rotor:	Error! Bookmark not defined.
2.3 Drive Train:	Error! Bookmark not defined.
2.4 Generator:	Error! Bookmark not defined.
2.5 Nacelle and Yaw System:	Error! Bookmark not defined.
2.6 Tower and Foundation:	Error! Bookmark not defined.
2.7 Controls:	Error! Bookmark not defined.
2.8 Balanced of Electrical Systems:	Error! Bookmark not defined.
2.9 P-V curve of Wind Turbine System:	Error! Bookmark not defined.
2.10 Distributions used in P-V curve:	Error! Bookmark not defined.
2.11 Anemometers:	Error! Bookmark not defined.
Chapter 3:	Error! Bookmark not defined.
Problem Statement	Error! Bookmark not defined.
3.1 Environmental Problems:	Error! Bookmark not defined.
3.2 Damage to Wild life:	Error! Bookmark not defined.
3.3 Economical Problems:	Error! Bookmark not defined.
3.4 Technical Problem:	Error! Bookmark not defined.
Chapter 4:	Error! Bookmark not defined.
Design and Implementation	Error! Bookmark not defined.
4.1 Blade Design:	Error! Bookmark not defined.
4.2 Hub design:	Error! Bookmark not defined.
4.3: Gear wheel design:	Error! Bookmark not defined.
4.4: Brakes	Error! Bookmark not defined.
4.5 Impact of Tower Height:	Error! Bookmark not defined.
4.6 Maximum Rotor Efficiency:	Error! Bookmark not defined.

4.7 Generators: **Error! Bookmark not defined.**
4.6 TOWER **Error! Bookmark not defined.**
Chapter 5 **Error! Bookmark not defined.**
Proposed Hardware for Wind Turbines **Error! Bookmark not defined.**
CHAPTER 6 **Error! Bookmark not defined.**
References **Error! Bookmark not defined.**

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- Figure 1 Modern Utility Scale Wind Turbine**
- Figure 2 Small Wind Turbine Components**
- Figure 3 Type 1 Generator**
- Figure 4 Type 2 Generator**
- Figure 5 Type 3 Generator**
- Figure 6 Type 4 Generator**
- Figure 7 Horizontal Axis Wind Turbine**
- Figure 8 Vertical Axis Wind Turbine**
- Figure 9 Main Components of HAWT**
- Figure 10 Power to Winds speed curve**
- Figure 11 Rayleigh Distribution Graph**
- Figure 12 Weibull Distribution Graph**
- Figure 13 Cup Anemometer**
- Figure 14 Blades Design Criteria**
- Figure 15 Hub Design Criteria**
- Figure 16 inside Hub Design Criteria**
- Figure 17 Gear Wheel for Wind Turbine**

- Table 1 Wind Power classes table**
- Table 2 Aerodynamics of blades table**
- Table 3 Gear Wheel Parameter table**
- Table 4 Friction Coefficient table**

- Equation 1 Kinetic Energy of Wind**
- Equation 2 Power Delivered**
- Equation 3 Power of Wind**

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Equation 4 Rayleigh Distribution Equation
Equation 5 Rayleigh Function
Equation 6 Weibull Distribution Equation
Equation 7 Weibull Function
Equation 8 Tower Height Formula
Equation 9 Power of Wind
Equation 10 Rotor Efficiency

Chapter No. 1

Introduction

The Re-emergence of wind as the source of the World's Energy must rank as one of the significant developments of late 20th century. In fact, by the mid 1950's that appeared to be what had already happened. Wind Energy outshines all other renewable energy resources due to the recent Technologies improvements. Electrical Power Generation from Wind Power has increased rapidly and due to the increase interest many studies on efficient wind turbine design have been performed.