DECLARATION

We hereby declare that, the work presented in this thesis has been done by us and has not previously been submitted to any other University / College / Organization for any academic qualification / certificate / diploma / degree or award. We strongly ensure that our work does not void any copyright

_____
M. M. Mozammel Hossain
(ID- EEE 02705177)

_____
Syed Serajus Salehin
(ID- EEE 02705180)

_____
Golam Rahman
(ID- EEE 02705207)

_____
Sojib Kumar Banik
(ID- EEE 02705213)

Certification

The thesis entitled **Study of Effectiveness of Using Wind Turbine in Power Generation** submitted by M. M. Mozammel Hossain (ID- EEE 02705177), Syed Serajus Salehin (ID- EEE 02705180), Golam Rahman (ID- EEE 02705207) and Sojib Kumar Banik (ID- EEE 02705213) to the following members of the board of examiners of the Department of Electrical and Electronic Engineering in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering on July 2009 and has been accepted as satisfactory.

Signature of the Thesis Supervisor

Dr. Enamul Basher
Professor and Dean
Faculty of EEE, BUET

Signature of the Head of the Department

Prof. A. M. Rezaul Karim Talukder
Chairman
Department of EEE, Stamford University

Table of Contents

ACKNOWLEDGEMENT

At first we present our due regards to the Almighty, who have provided us the brilliant opportunity to build and complete this thesis successfully with good health & sound mind.

We offer deeply from our sense of gratitude, sincere appreciation and great indebtedness to our respectable teacher **Dr. Enamul Basher**, Professor and Head, Department of Electrical and Electronic Engineering, BUET, Dhaka for this energetic directions, valuable suggestions, cordial inspiration, unceasing encouragement throughout project work. He spared his valuable time in giving all necessary guidance and constructive advice time to time keeping his equanimity without which it would be very strenuous to carry on this thesis. He also gives us the opportunity to visit the **Wind Battery Hybrid Power Project at Kutubdia Island, Cox's Bazar District (Bay of Bengal)** and **Grid Connected Wind Energy Project at Muhuri Dam, Sonagaji, Feni.**

We would also like to thank all of those people especially our friends who helped us providing their valuable information promptly.

We also thank to our families and relatives who have guided us to this stage in our life and who have always supported us all the time.

Above all, we would like to thank the Almighty for blessing us with his blessings because of which we could complete this thesis in a healthy mind.

ABSTRACT

Design and successful operation of Wind Energy Conversion systems (WECs) is a very complex task and requires the skills of many interdisciplinary skills, e.g., civil, mechanical, electrical and electronics, geography, aerospace, environmental etc. Performance of WECs depends upon subsystems like wind turbine (aerodynamic), gears (mechanical), generator (electrical); whereas the availability of wind resources are governed by the climatic conditions of the region concerned for which wind survey is extremely important to exploit wind energy. This paper presents a number of issues related to the power generation from WECs e.g. factors affecting wind power, their classification, choice of generators, main design considerations in wind turbine design, problems related with grid connections, wind-diesel autonomous hybrid power systems, reactive power control of wind system, environmental aspects of power generation, economics of wind power generation, and latest trend of wind power generation from off shore sites.

List of Figures

List of Tables

List of Symbols

P	Power in watts (746 watts = 1 hp) (1,000 watts = 1 kilowatt)
ρ	Density of air (about 1.225 kg/m^3 at sea level, less higher up)
C_p	Power coefficient
A	Rotor swept area (m^2)
U	The wind speed or velocity of wind (m/s) (meter = 3.281 feet = 39.37 inches)
a	Axial induction factor
γ	Solidity of the rotor
β	Pitch angle
U_1	Wind speed far away upstream from the rotor
U_2	Wind speed at the rotor
U_4	Introduced wind velocity
φ	Local inflow angle
C_n	Coefficient of normal force
C_t	Coefficient of tangential force
a'	Tangential component of the induced flow
N	Number of blades
R	Outer radius
r	Local radius
F	Prandtl tip loss factor

a_c Linear curve fitting

m Mass (kg) (1 kg = 2.2 pounds)

N_g Transmission efficiency from the rotor to the generator i.e., generator efficiency (50% for car alternator, 80% or possibly more for a permanent magnet generator or grid-connected induction generator)

N_b Energy conversion efficiency of the generator i.e., gearbox/bearings efficiency (depends, could be as high as 95% if good)

h Height of tower

h_{ref} Reference heght, i.e. $10\,m$

V_z Average wind velocity at height h in meter

V_{ref} Average reference wind velocity at a reference height of h_{ref} above the ground

C Constant (here, 8.47)

HQ Volume-Head product (m^4/day)

Q Water requirement per day (m^3/day)

H Water tank height (m)

D Diameter of the rotor (m)

ω Angular velocity (rad/s)

π 'Pi' a constant valued 3.1416

λ Tip speed ratio