

# DESIGN OF CURRENT CONTROL MODE FOR WIND TURBINE APPLICATION

SITI MAHERAH BT HUSSIN

A project report submitted in partial fulfilment of the  
requirements for the award of a degree of  
Master of Engineering (Electrical-Power)

Faculty of Electrical Engineering  
Universiti Teknologi Malaysia

MAY 2011

*Special for:*

*My late father and my mother ...*

***Hussin b. Yusoff***

***&***

***Rahimah bt Hj.Ghazali***

*also to my brothers and sisters...*

*and not forgotten to my friends*

***Muhamad Amzar b. Ahmad***

***Nor Alhuda bt Mohammad Ishak***

*In thankful appreciation for support and encouragement to*

*my supervisor...*

***Assoc Prof Md Shah b. Majid***

## ACKNOWLEDGEMENT

In the name of ALLAH, thanks for His blessing to make this project successful although the uneasiness and hardship which I have to face. Thank you for the strengths and the spirits.

I am deeply indebted to my supervisor Assoc Prof Md Shah bin Majid for the help, stimulating suggestions and encouragement during the research, and from the beginning till the end of this thesis.

Furthermore, I would like to express my special gratitude to Muhamad Amzar b. Ahmad for his valuable advice and friendly help. His extensive discussions throughout my work and the interesting explorations have been very helpful for this study.

Thanks also to all my friends who have been involved directly or indirectly during the completion of this project. Their help and ideas are much appreciated.

For my last dedication, I would like to give my thankful heart to my mother, brother and sisters for their never ending support and understanding throughout my master study.

## **ABSTRACT**

Stochastic nature of the wind speed is the main reason that leads to variability of output power of wind farm. Thus high penetration of the wind farm will cause power fluctuation and voltage variation in grid system. Current control method was designed to control power flow in the grid system hence the occurrence of fluctuant power can be eliminated in the network. A new technique using mathematical modeling was developed in designing the control system. The block diagram of this control system was built based on the dynamic analysis of the circuit by assuming the steady state condition. Some parameters for instance proportional and integral gain were determined based on the assumption of the values of line inductance, resistance and time constant . MATLAB/simulink tool was used to scrutinize the performance of the designed model. The performance of the designed control system is investigated by comparing the results between with and without control system and the results were also investigated in fault condition. The results show that the current control method has high potential in control power leveling in the grid system.

## ABSTRAK

Sifat semulajadi kelajuan angin yang tidak menentu merupakan punca utama keluaran kuasa tenaga angin berubah dari semasa ke semasa. Penggunaan tenaga angin yang berleluasa akan menyebabkan kuasa dan voltan sistem grid juga turut berubah-ubah. Kaedah kawalan arus di reka khas untuk mengawal pengaliran kuasa dalam sistem grid seterusnya kepelbagaian kuasa dalam sistem rangkaian dapat dielakkan. Pendekatan baru telah diperkenalkan yang mana persamaan matematik dijadikan asas dalam pembinaan model tersebut. Blok diagram bagi model kawalan arus direka berdasarkan analisis dinamik terhadap litar dengan menganggap bahawa sistem tersebut dalam keadaan stabil dan beberapa parameter ditentukan berdasarkan nilai peraruh, rintangan, dan pemalar masa. Perisian MATLAB telah digunakan sebagai ukuran pencapaian bagi model tersebut. Pencapaian diukur dengan membandingkan keputusan ujian dalam dua keadaan iaitu tanpa dan dengan kawalan arus dan seterusnya ujian turut dijalankan dalam keadaan kerosakan. Keputusan mengesahkan bahawa sistem kawalan arus berpotensi tinggi dalam mengawal pengaliran kuasa dalam sistem grid.