

**CONTROL OF POWER ELECTRONICS CIRCUITS  
FOR HYDROGEN GENERATION SYSTEM USING SOLAR POWER**

**THESIS**

**ELECTRICAL ENGINEERING  
CONCENTRATION ELECTRICAL POWER SYSTEM**

Declared qualified to obtain  
a Master degree in Engineering



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**M A L A N G**

**2017**



# THESIS

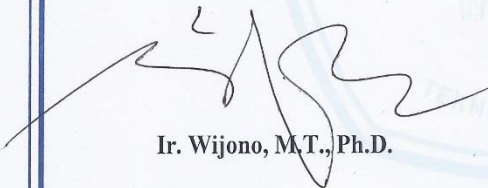
## CONTROL OF POWER ELECTRONICS CIRCUITS FOR HYDROGEN GENERATION SYSTEM USING SOLAR POWER

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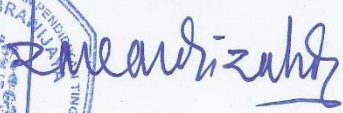
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## CURRICULUM VITAE



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## ACKNOWLEDGEMENT

Many people give their contributions and supports for this thesis book. Deeply inside my heart, I would like to give my gratitude to:

- My family. Father and Mother who always give encouragement to me so that I get motivated in pursuing higher education degree. Older brother and Older sister, who inspire me through their words and action.
- The Head of Double Degree Program. Prof. Chikashi Deguchi, Prof. Keisuke Murakami, Prof. Liliek Sulistyowati, and Prof. Agus Suharianto. They arrange all things so that the program is well conducted.
- Financial support in Indonesia, Biro Perencanaan dan Kerja Sama Luar Negeri (BPKLN), and in Japan, Japan Student Services Organization (JASSO).
- Prof. Ichijo Hodaka as my supervisor in University of Miyazaki. Dr. Wijono and Dr. Rini Nur Hasanah as my supervisor in University of Brawijaya.
- My teachers from University of Miyazaki, Prof. Ichijo Hodaka, Prof. Koichi Tanno, Prof. Hiroki Tamura, Prof. Thi Thi Zin, Prof. Kawasue Kikuhito, Prof. Kunihiro Yamamori, and Prof. Takao Ito. My teachers from University of Brawijaya, Dr. Wijono, Dr. Rini Nur Hasanah, Dr. Hadi Suyono, Dr. Onny Setyawati, and Dr. Erni Yudaningtyas.
- Laboratory members, Eko Setiawan, Cheikh Fall, Morita Shigefumi, Ito, Mayu Suzuki, Kazuma Kodani, and Hayashi Masatoshi. Former member, Alfius Pagawak, Hirata Takuya, Jun Yashiki, Mashairo Ienaga, and Yuta Yamamoto.
- All Indonesian Student Association members and my International Friends.

Miyazaki, August 30, 2017

Author



## PREFACE

In the name of *Allah Subhanahu wa ta'ala*, The Most Beneficent and The Most Merciful. Peace be upon *Muhammad Shallallahu 'alaihi wasallam*. There are no power and strength except from The God. Finally, the thesis book “Control of Power Electronics Circuits for Hydrogen Generation System Using Solar Power” is finished. At last, I hope this book gives merits especially engineering students. In general, this book gives benefits for all community.

Miyazaki, August 30, 2017

Author



## TABLE OF CONTENTS

	Page
<b>PREFACE</b> .....	i
<b>TABLE OF CONTENTS</b> .....	iii
<b>LIST OF TABLES</b> .....	v
<b>LIST OF FIGURES</b> .....	vii
<b>LIST OF ATTACHMENTS</b> .....	ix
<b>LIST OF ABBREVIATIONS</b> .....	xi
<b>RINGKASAN</b> .....	xiii
<b>SUMMARY</b> .....	xv
<b>CHAPTER 1</b> .....	1
<b>INTRODUCTION</b> .....	1
1.1 Background .....	1
1.2 Objectives .....	2
1.3 Problem Statement .....	3
1.4 Scope of Research .....	3
<b>CHAPTER 2</b> .....	5
<b>STUDY LITERACY</b> .....	5
2.1 WPT .....	5
2.1.1 Biot-Savart Law .....	5
2.1.2 Magnetic Field Vector in Circular Current Carrying Conductor .....	6
2.1.3 Magnetic Field in the Z-Axes .....	7
2.1.4 Magnetic Field Generated by N-Turns of Two Coils .....	8
2.1.5 Inductive Voltage in a Pair of Coils .....	8
2.1.6 Self and Mutual Inductance in a Pair of Coils .....	10
2.1.7 Ohm's Law in WPT Circuit .....	12
2.1.8 State Space Equation .....	13
2.1.9 Steady State Solution .....	14
2.1.10 Transfer Function .....	14
2.1.11 Bode Plot Diagram .....	15
2.1.12 Average Power Input and Output .....	16
2.1.13 Efficiency of the WPT .....	17
2.2 Solar Cell .....	17
2.3 Fuel Cell .....	18
2.4 Power Electronic Control Circuit .....	19
2.5 Simulation and Mathematics Software .....	21
<b>CHAPTER 3</b> .....	23
<b>RESEARCH METHODOLOGY</b> .....	23
3.1 Defining Wireless Power Initial Parameters .....	24
3.2 Calculating Circuit Components .....	24
3.3 Measurement of Power .....	24

3.4 Frequency Analysis .....	25
<b>CHAPTER 4</b> .....	<b>27</b>
<b>RESULT AND DISCUSSION</b> .....	<b>27</b>
4.1 Self and Mutual Inductances .....	27
4.2 Power Input and Output .....	28
4.3 Efficiency .....	30
4.4 Resonance Frequency .....	30
<b>CHAPTER 5</b> .....	<b>33</b>
<b>CONCLUSION</b> .....	<b>33</b>
5.1 Conclusion .....	33
5.2 Future Work .....	34
REFERENCES .....	35
ATTACHMENT 1 .....	37
ATTACHMENT 2 .....	43



## LIST OF TABLES

No.	Title	Page
Table 4. 1	Calculation Result of Self and Mutual Inductances.....	28
Table 5. 1	Value of Coil's Parameters .....	33
Table 5. 2	WPT's Parameters.....	33



## LIST OF FIGURES

No.	Title	Page
Figure 1. 1	Solar-hydrogen generation via wpt.....	2
Figure 2. 1	Magnetic field around a current-carrying conductor .....	5
Figure 2. 2	Magnetic field on a circular current-carrying conductor .....	6
Figure 2. 3	Magnetic field of two coils in the z-axis .....	7
Figure 2. 4	Inductive voltage in a pair of two coils .....	9
Figure 2. 5	Inductive voltage with n-turns coils.....	10
Figure 2. 6	WPT's circuit diagram .....	12
Figure 2. 7	Block diagram of a system.....	16
Figure 2. 8	ELY-800 polarisation curves for a) cold and b) warm start-up system temperature .....	19
Figure 2. 9	Equivalent circuit for a) two coupled inductor and b) sepic with coupled inductor.....	20
Figure 3. 1	Simple diagram of wpt.....	23
Figure 3. 2	Flow chart of methodology.....	23
Figure 4. 1	A pair of 9-turns coils .....	27
Figure 4. 2	Mathematica's steady state waveform of a) voltages and b) currents .....	29
Figure 4. 3	Voltages and currents with LT-Spice simulation.....	30
Figure 4. 4	Mathematica's bode plot of the wpt system .....	31
Figure 4. 5	LT-Spice's bode plot of the wpt system .....	32
Figure 4. 6	Power output and efficiency of the wpt .....	32



## LIST OF ATTACHMENTS

No.	Title	Page
	Attachment 1. Mathematica Result .....	37
	Attachment 2. Software Code.....	43



## **LIST OF ABBREVIATIONS**

Wireless Power Transfer (WPT)

Electromagnetic (EM)

Proton Exchange Membrane (PEM)

Photovoltaic (PV)





## RINGKASAN

**Muhammad Afnan Habibi**, Teknik Elektro, Fakultas Teknik, Universitas Brawijaya, Agustus 2017, *Control of Power Electronics Circuits for Hydrogen Generation System using Solar Power*, Dosen Pembimbing: Wijono dan Rini Nur Hasanah

Manusia membuat mesin-mesin untuk membantu mereka di banyak bidang. Mesin-mesin mengubah sebuah energi menjadi energi lain yang berguna dalam pekerjaan. Mereka membuat mesin-mesin bakar. Motor bakar meninggalkan panas dan polusi sebagai limbahnya. Motor tersebut mengkonsumsi energi dari bahan bakar fosil yang dapat habis di kemudian hari.

Para peneliti telah melakukan pembelajaran untuk menggunakan jenis-jenis energi lain yang bersih, aman, dan tersedia di hari esok. Mereka mempelajari tentang energi listrik yang mempunyai kemampuan berubah dari atau menjadi energi ke bentuk yang lain, seperti gerak, panas, cahaya, tekanan, dan lain-lain. Salah satu tema riset yang hangat adalah *solar-hydrogen generator* yang sangat berguna untuk suplai listrik.

Penelitian ini memberikan metode pengiriman daya listrik melalui medan *electro magnetic* disebut dengan *wireless power transfer*. Metode ini sangat berguna untuk mengontrol rangkaian dari proses pembuatan hidrogen. Karena hidrogen mungkin dapat meledak, maka lebih baik untuk memisah antara pembangkit listrik dengan pembangkit hidrogen. Keuntungan lain adalah pembangkit hidrogen dapat beroperasi di dalam ruang, saat *solar cell* menghasilkan listrik di luar.

Setelah melakukan banyak simulasi, parameter lilitan diperoleh. Frekuensi resonansi juga dapat ditentukan dimana sistem *wireless* mengirim daya keluar yang tinggi. Daya masuk dari *solar cell* cukup untuk membangkitkan hidrogen dalam jumlah kecil selama tersedia sinar matahari.

Kata kunci: *hydrogen generator, wireless power transfer, resonance frequency, electromagnetic waves*



## SUMMARY

**Muhammad Afnan Habibi**, Electrical Engineering, Faculty of Engineering, University of Brawijaya, August 2017, *Control of Power Electronics Circuits for Hydrogen Generation System using Solar Power*, Academic Supervisor: Wijono and Rini Nur Hasanah

Human built machines for helping them in many fields. Machines converts an amount of energy into other energy which usable for human works. They built the fuel combustion machines. Motor fuel leaves heat and pollution as its waste. It also consumes fuel energy from fossil fuel which might be exhausted some day.

Researchers has been studying for using other kinds of energy which clean, safe, available in future. They learned about electrical energy which has flexibility conversion from or into some kinds of other energy, like motion, heat, light, pressure, etc. One of popular research field is Solar-hydrogen generator which is very useful to supply electricity.

This research provides the methods sending electric power via EM field known as WPT (WPT). WPT is very useful for controlling circuit of hydrogen production process. Since hydrogen might be exploded, it is better to separate electricity generation and hydrogen generation. Another benefit is hydrogen generation operates inside house, while solar cell produces electricity outside.

After doing many simulations, coils parameters can be obtained. Resonance frequency can also be decided at where WPT produce high power output. Power input from solar cell should be enough as long as there is sun light at any moment. Power output should be adequate to generate small amount of hydrogen.

*Keywords:* hydrogen generator, wireless power transfer, resonance frequency, electromagnetic waves

