DESIGN OF TRANSFORMER H-BRIDGE MOSFET AS A SWITCHING DEVICE

MUHAMMAD RAFIQ BIN MUHAMAD AMIN

This thesis is submitted as partial fulfillment of the requirements for the award of the Bachelor of Electrical Engineering (Power Systems)

Faculty of Electrical & Electronics Engineering
Universiti Malaysia Pahang

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LIST OF SYMBOLS

APPENDIX	TITE	PAGE
I	Ampere	
V	Voltage	
DC	Direct Current	
AC	Alternating Current	
PIC	Peripheral Interface Controller	
I/O	Input/output	
VDD	Supply Voltage	

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ABSTRACT

This thesis presents the performance of efficiency of and low the cost of transformerless inverter which is convert high voltage DC into pure sine wave 220Vac, 50Hz power. A microcontroller is used to generate pulse width modulation technique for a greater efficiency. The four MOSFETs switching components with configuration of 'H' shape (H-bridge) were chosen to handling a maximum of 500 Watts

ABSTRAK

Tesis ini membentangkan prestasi kecekapan dan kos rendah penyongsang pengubah yang menukarkan DC voltan tinggi ke sinus gelombang tulen 220VAC, 50Hz kuasa. Mikropengawal adalah digunakan untuk menjana lebar denyut teknik modulasi untuk kecekapan yang lebih besar. Empat MOSFET menukar komponen dengan konfigurasi 'H' bentuk (H-*bridge*) telah dipilih untuk mengendalikan maksimum 500 Watts.

CHAPTER 1

INTRODUCTION

1.1 Background

The purpose of this report were to describe the design and prototype testing (simulation) of the inverter which more effectively by not using transformers. By using a low DC voltage (12 Vdc) convert to a high AC voltage (220 Vrms, 50Hz) with approximately 500 Watts of power.

As said before, this project converts from a low DC voltage value it can switch to a high AC voltage which is maintained by two processes. The first process is, multiplied DC voltage to be higher using the boost converter to get a higher voltage. High voltage value is then converted to an AC signal with pulse width modulation technique applied. Other methods commonly used in addition to this are to use a transformer to double the AC signal to a higher level. Conventional methods applied to the inverter.

1.2 Problem Statement

In Malaysia, not all receive power grid especially in the rural areas. This is a considerable problem which is supported by specific reasons. Among them are in the medical field where the power grid is very important for doctors who need to see and monitor their patient during surgery. Then, many companies nowadays grab this opportunities to create an inverter with high efficiency or even better on purpose of

solving the problem by providing low-cost devices that are capable of supplying the power grid in particular range. In addition, the importance of backup power supply from inverter that changes from DC source (batteries) to AC output which is necessary to operate electronic components like television, blander, electrical driller etc

1.3 Objective

i. To design the inverter without transformer (with DC chopper) to increase efficiency of the inverter.

ii. Generating PWM using analog components, the output will be a clean sinusoid, with very little switching noise

1.4 Scope Of Project

i. Design an inverter circuit using electronic switching

ii. Using PIC as controller to boost up the voltage by controlling the Pulse Width Modulation (PWM) at the MOSFET's gate.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The literature review is to describe in general and theoretically on all parts of the inverter transforemerless. Literature review also evidence to support the research topic and make it easier to understand both in general or specific and also to complete the project successfully. All journal articles and conference papers and useful resources are described briefly in this literature review.

2.2 Direct Current Versus Alternating Current.

In everyday life, there are only two forms of electrical current that is direct current (DC) and alternating current (AC) which both have advantages and disadvantages. DC power is simply the application of a constant voltage across a load resulting in a constant current. Battery is the most common power source of power DC and many other forms of power sources along its generation. It is now used extensively in all digital circuitry shown in form of digit which represent the basic 1 (high) and 0 (low) bits that used by computer[1]. In transmission line in the late 19th, electrical energy is started to distribute with direct current (DC) and it was unfortunately lack of efficiency due to power loss in conductors and the voltage cannot be stepped up for transmission of power at high voltages. Thus, AC source was found to be more efficient can be generated at high voltages while the voltage can be stepped up or stepped down by transformers with ease and efficiency. [2]This

REFERENCES.

[1] R. Oliver, C.William. " Three-Level PWM DC/AC Inverter Using a Microcontroller." M.A. thesis 2012, NECAMSID, United State of America, USA,2012.

[2] D.M. Larruskain1, I. Zamora, A.J. Mazón1, O. Abarrategui, J. Monasterio. "Transmission and Distribution Network: AC versus DC,M.A. thesis, University of the Basque Country of Bilbao, Spain, 2005

[3] M. Syed Tahmid, "DC Motor With PIC16F877A- Practical example of PIC PWM," PIC : edaboard.com, Nov. 23,2012 [Dec.10.2012]

[4] PennWell Corporation. " What You Need To Know About Solar Design" Internet : http://www.elp.com/articles/powergrid_international/print/volume-17/issue-1/features.html. Jan.1,2012 [Dec.20,2012]

[5]"H-Bridges- The Basics, Introduction." Internet : www.modularcircuits.tantosonline.com. Apr.10,2011 [Nov.20, 2012]

[6]]"IR2110 International Rectifier"Internet : http://www.irf.com/product-info/datasheets.Mar. 24,2005 [Oct.20,2012]

[7] Z. Salam. Class Lecturer, Topic : " DC to AC Conversion (Inverter)" Faculty of Electrical and Electronic Engineering, Universiti Teknologi Malaysia, Johor, Malaysia,Jan.1,2002.

[8]W.Hart Daniel. *Power Electronics.*Valparaiso,Indiana: Mc Graw Hill,2011,pp.211-216

[9]"Boost Converter Intro with Arduino" Internet : http://www.ReiBot.org. Aug 7,2011 [May.15,2013]

[10]"Boost Converter" Internet : http://www.wikipedia.com/boost-converter. Dec.10,2012 [Nov.10, 2012]

[11]M. Ron, P.Richard. (2001.Mar. "Application Report." *Sine-Wave Oscillator.*[Online], pp.3-19. Available http://www.ti.com/lit/an/sloa060/sloa060.pdf. [Apr. 3,2013]

[12]" RS Components" Internet : http://www.malaysia.rs-online.com. Oct.10,2010 [Jan.13, 2013]

[13]"Jaycar Electronics" Internet : http://www1.jaycar.com.au/images_uploaded/optocoup.pdf Feb.7,2011 [Jan.20, 2013]

[14]"IR2110 International Rectifier Application Note AN-978 "Internet : http://www.irf.com/technical-info/appnotes/an-978.pdf. Nov.10,2006 [Feb.20,2013]