DSPTMS320F2812 BASED VARIABLE FREQUENCY POWER INVERTER

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A Report Submitted In Partial Fulfillments of the Requirement of the Degree of Bachelor of Electrical Engineering (Power System)

Faculty of Electrical Engineering

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LIST OF ABBREVIATIONS

AC	Alternating Current
DC	Direct Current
PWM	Pulse Width Modulation
DSP	Digital Signal Processor
CCS V3.1	Code Composer Studio Version 3.1
IEEE	Institute of Electrical and Electronics Engineers
JTAG	Joint Test Action Group
I/O	Input / Output
CCM	Continuous Conduction Mode
DCM	Discontinuous Conduction Mode
IVA	Inductor Valley Current
PFM	Pulse Frequency Modulation
SPWM	Sine Wave Pulse Width Modulation
IGBT	Insulated-Gate Bipolar Transistor
MOSFET	Metal–Oxide–Semiconductor Field-Effect Transistor

LIST OF SYMBOLS

Sw	Switch (Mosfet)
D	Diode
R_L	Load resistor
C	Capacitor
L	Inductor
TR	Transformer
V	Voltage
I	Current

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ABSTRACT

Nowadays, variable frequency of power inverter is quite used in most application especially on solar power generation. A variable-frequency power inverter controls the operating speed of an AC motor by controlling the frequency and voltage of the power supplied to the motor. An inverter provides the controlled power based voltage and frequency. Recently, Digital Signal Processing are used as advanced control technique which confirmed high quality control based on microcontroller and provide additional real time processing throughput in an inverter operation. This study investigates the microcontroller of DSPTMS320F2812 based variable frequency power inverter. The DSPTMS320F2812 provides the variable frequency signal that controls the applied voltage on the gate drive and less harmonics of the frequency at the output of power inverter. From the result, a stable variable frequency power inverter over frequency range has been obtained and a good agreement has been found between the simulation and hardware of DSPTMS320F2812 based variable frequency power inverter.

ABSTRAK

Pada masa kini,penggunaan frekuensi boleh laras untuk penyongsang kuasa DC ke AC banyak digunakan dalam aplikasi terutama pada generasi tenaga solar. Satu kuasa penyongsang kuasa DC ke AC digunakan untuk mengawal kelajuan operasi motor AC dengan mengawal frekuensi dan voltan kuasa yang dibekalkan kepada motor. Penyongsang menyediakan voltan kuasa kawalan berasaskan frekuensi. Di saat ini , Digital Pemprosesan Isyarat digunakan sebagai teknik kawalan kelajuan yang mengesahkan kawalan kualiti tinggi berasaskan "microcontroller" dan menyediakan masa sebenar pemprosesan tambahan dalam satu operasi penyongsang. Kajian ini menyiasat DSPTMS320F2812 berasaskan frekuensi boleh laras kuasa penyongsang. DSPTMS320F2812 menyediakan isyarat frekuensi boleh laras yang mengawal voltan yang dikenakan pada pemacu pintu dan kurang berlaku harmonik frekuensi pada keluaran penyongsang kuasa.Dari pada hasilnya, frekuensi boleh laras kuasa penyongsang ini stabil pada julat frekuensi telah diperolehi dan telah ditemui di antara simulasi dan perkakasan DSPTMS320F2812 berasaskan frekuensi boleh laras kuasa penyongsang.

CHAPTER 1

INTRODUCTION

1.1 Background

In our daily life today, power inverter has become very useful for many application domains. For the example, in an alternative energy of solar power, to convert the energy from direct current (DC) to alternate current (AC) .Other example, in an uninterruptible power supply (UPS) were uses batteries to supply AC power when main power is not available. When main power is restored, a rectifier supplies DC power to recharge the batteries. The variable frequency of power inverter is design especially to control the speed of induction motor.

There are much type of inverters such as half wave inverter and full wave inverter and they are also can be three-phase inverter. The switching schemes that can be produce from full wave inverter are square wave, quasi-square wave, and modified sine wave and PWM technique.

The proposed of this project is how to develop a pulse width modulation inverter to control the speed of single phase motor. Square wave inverter has a high harmonic output, which can lead the equipment component to overheat, so no longer relevant for modern use. The modified square wave inverter is designed to have better characteristics than square wave inverter, but it is still cannot give a perfect electrical as pure sine wave. Pulse width modulation (PWM) provides a way to decrease the total harmonic distortion (THD) of load current.

In PWM, the amplitude of the output voltage can be controlled with the modulating waveforms. Reduced filter requirements to decrease harmonics and the control of the output voltage amplitude are two distinct advantages of PWM. The on and off occurrence are determined by. The pulse waves determine the frequency of the output waveform while the carrier signal determines the switching frequency of the MOSFET.

1.1 Problem Statement

Traditionally, variable speed operation of a single phase induction motor suffers from large harmonic and limited speed, therefore the system has been built using voltage control method with semiconductors power devices MOSFET and PWM techniques have been implemented to avoid the large harmonics.

1.2 Objective

The main objective of this project is:

i. To generate PWM with variable frequency from DSPTMS320F2812 by Texas Instrument power inverter.

1.3 Scope of Project

The scope of this project is to generate Pulse Width Modulation (PWM) from DSPTMS320F2812 with variable frequency by controlling duty cycle for inverter. This project used a buck converter as a DC link before sending the input to inverter. The theory is to convert voltage in Direct Current (DC) mode to voltage Alternate Current (AC) mode. Code Composer Studio (CCS 3.1) is used to generate the programming controlled variable frequency.

1.4 Outline of Thesis

Chapter I consists of the overview of the project, which includes background of project, the problem statement, objectives and scope.

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