DC MOTOR CONTROL USING PERIPHERAL INTERFACE CONTROLLER (PIC)

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ABSTRACT

This paper discusses the development of a speed controller system for DC motors. The half-controlled single-phase bridge rectifier using MPlab software is use to designed the controller. PIC is used to control the thyristors, where it switches sequentially during positive cycle of the input voltage. To vary the speed of the DC motor, the firing angle (α) of the thyristors is varied by using external data (using 8-bit DIP switch). This will vary the firing angles (α) such to control the output of half controlled single-phase bridge rectifier. The DC voltage produce at the output can be maximum voltage (for high speed) or low voltage (for minimum speed) for the DC motor.

In order to make the controlling of the output of certain system via a rectifier easier, it is possible to control the input signal through it. Since the input signals is fed from the half controlled single phase bridge rectifier, there are several interface circuit must be connected to merge the operational of rectifier.

When the complete circuit is operating, the input signal setting can be controlled by varying the firing angles (α). Once it controlled, it produces the output voltage as expected. The observation can be made through the shape of waveform where it is represented by mean voltage.

As a result, it shows that by using the PIC, the output of rectifier is now having the controlled output where it is suitable to connect with any load such as DC motor to control its speed.

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CHAPTER 1

BACKGROUND OF THESIS

1.0 Introduction

There are numerous applications where control of speed is required, as in rolling mills, cranes, hoists, elevators, machines tools, and transit system and locomotive drives. DC motors are extensively used in many of this application. Control of the speed of DC motors below and above the base (or rated) speed can easily be archived. Besides, the methods of control are simpler and less expensive than those applicable to AC motor. Recently, solid-state converters have been used for this purpose [1, 2].

Standard shunt motors are classified as either constant speed or adjustable speed motors. Adjustable speed motors may be operated over a wide speed range by controlling armature voltage and/or field excitation. The speed below the base speed can be controlled by armature voltage control method and field control method is used for speeds above the base speed. For the last thirty years, the development of various solid state switching devices in the Thyristor / Transistor families along with varieties of analog/digital chips used in control/firing circuits, has made an impact in the area of DC drives.

A rectifier circuit is one which links an AC supply to a DC load, that is, it converts an alternating voltage supply to a direct voltage. The direct voltage so obtained is not normally level, as from a battery, but contains an alternating ripple component superimposed on the mean (DC) level. This project use half controlled single-phase bridge rectifier to control the speed of DC motor, where the switching device used is thyristors.