

Speed Control of DC Motor by Using Pulse Width Modulation Technique

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Abstract— Speed control of DC motor has a wide range of application in today's world in this project 5HP dc shunt motor circuitry is design and develop using pulse width modulation technique this project the PWM generation is done using timer IC. The order of better loop speed control demand the varies frequently such that traction system and other operations controlled manually in the industry PWM is most efficient and cheap speed control method for a DC drive this project purpose is the real time working Project.

Keywords: DC Motor, PWM

I. INTRODUCTION

In current situation industry is demanding the process automation in all sectors speed controllers of a DC motor are very useful for controlling the robotic Motion and automation system in industry automation gives the result to industries into better quality increase production and reduce cost there are different techniques available for the speed control of DC motor the phase control method is widely adopted in which AC to DC converter are used to supply the DC motor but has certain limitation mainly it generated the Harmonics on the power line and it will also has a poor power factor when the motor operated at the lower speed and the second useful method is the PWM techniques which is get better advantages over the phase control the aim of the project is to develop Prototype for future application.

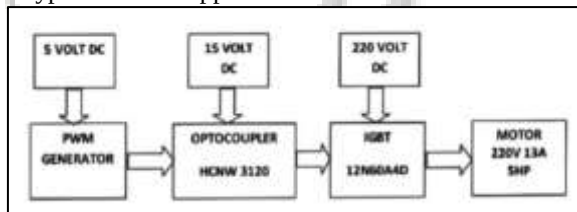


Fig. 1: Block diagram of DC motor speed control using PWM

II. LITERATURE REVIEW

Throughout the study of paper on IEEE we found that the dc motor control has been used for mainly two parts for variable speed and position application. Speed of dc motor can be controlled by armature control method. In this method the speed of dc motor can ne be controlled by controlling armature resistance to control the voltage drop across armature controller generates the pulse of 5 volts dc the generated pulse is nothing but PWM signal. This method of speed control of DC motor can be made to be used in industrial applications and other places where speed control plays an important role

The operation of first component of the project that is 555 IC we need DC supply of 4.5 to 15 V here use 5 V in operation and then get actable operation through 555 timer IC

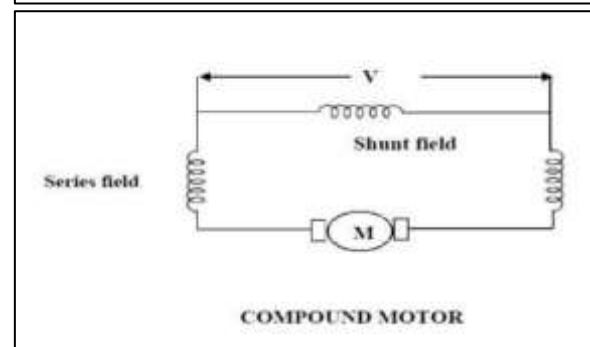
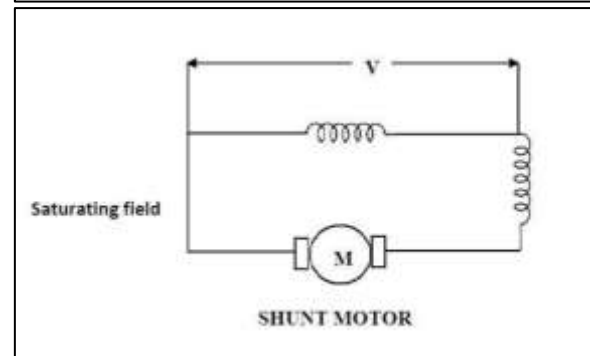
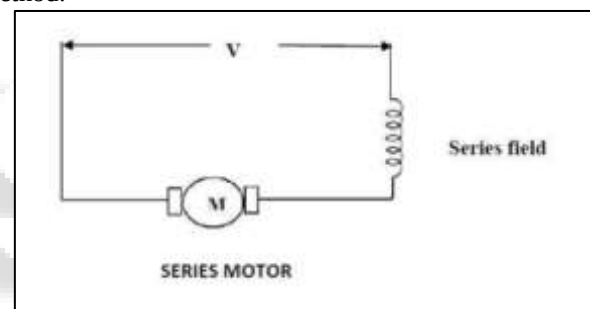
Now when the positive voltage of PWM wave is passed through this IGBT based it conducts and for that duration of time collector and emitter get shorted which means complete the circuit of DC motor to the supply for that duration which is called ton time.

Here we look from the initially when we have done all the Connection properly and given the rated supply all components and motor we will set pot initial position at zero and then gradually vary the speed by changing position of pot up to rated speed.

III. METHODOLOGY

A. DC Motor:-

The DC motor are classified into three types depending upon the way their Field winding are excited Speed control method.



B. Flux control method

The flux of DC motor can be changed by changing I_{sh} with help of a shunt field rheostat.

C. Armature or rheostat control method

This method is used when speed below the no-load speed are required.

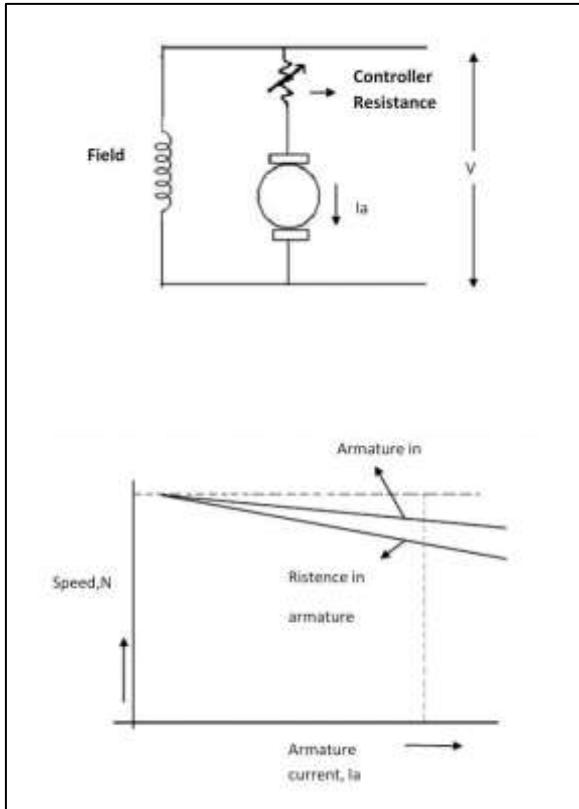


Fig. 2: Rheostat control method and characteristic

D. Voltage control method

1) Multiple control voltage

In this method shunt field of the motor is connected permanently to a fixed exciting voltage but the armature is supplied with different Voltage by connecting it across one at the several different voltage by means of suitable switchgear.

2) WARD LEONARD system

This System is used where any unusually wide and very sensitive speed control is required.

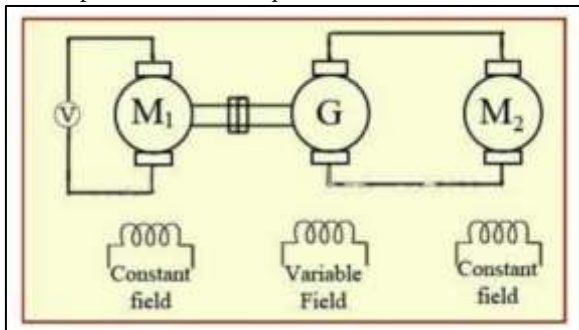


Fig. 3: Structural arrangement of WARD LEONARD system

E. Pulse width modulation (PWM):-

Pulse width modulation control works by switching the power supply to the motor on and off very rapidly the DC voltage is converted to a square wave signal alternating between fully on and zero giving the motor a series of power kicks this method work on a low frequency so lower frequency is better than higher frequency the end result of the PWM is that power is send to the motor and it can adjust from 0% to 100% duty cycle with stable control and high efficiency.

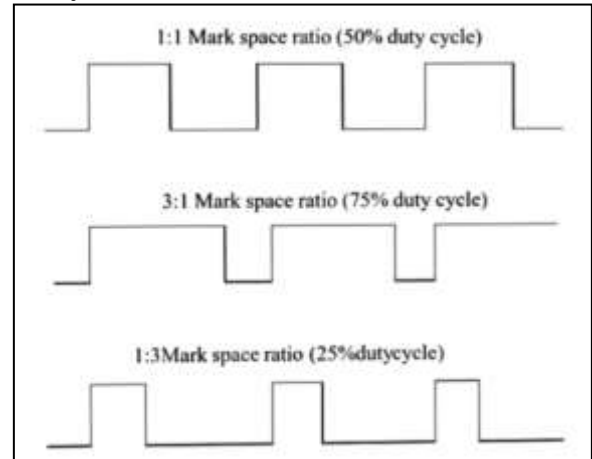


Fig. 4: Pulse width modulation waveform

The PWM signal can be generated in a number of ways there are some methods

- 1) Analogue meter
- 2) Digital method
- 3) Discrete IC
- 1) Power supply

it is the main source to operate any electronic base circuit power supply Is a primary requirement for the project the required DC power supply is 0 to 30 V and 0- 5 V available from the DC power supply.

2) 555 timers IC

555 timers IC is an integrated circuit chip used in a variety of Timer pulse generation and oscillator application.

IV. FUTURE SCOPE

This project use modulating technique it is a modern technology in solid-state field and it provides smooth speed control of motor again modernize this project using PWM.

V. RESULT

The speed control method is very cheap and efficient speed control method where all component give reliable operation speed control of DC motor is very critical in application where required speed is precision And correcting signal representing and to operate motor at constant speed so used PWM method which are fulfill all the requirements to speed control of DC motor.

VI. CONCLUSION

In this project Concluded that the speed control of DC motor by using PWM techniques the speed pulse train will be based on required input speed this circuit is useful to operate the DC motor at required speed with very low losses and low cost the

designed circuit response time fast this method already employed in traction system and has a good scope ahead Change hence the speed control of DC motor is achieved using PWM technique.

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