SPEED AND TORQUE CONTROL OF BLDC MOTOR BY USING METHOD OF SLIDING MOVEMENT OF STATOR FIELD

Chandrakant Sharma(Asst.Professor) [1]

Samruddhi Dhopte[2], Nikhita Hinge[3], Nidhi Chavhan [4,]

Professor of Department Of Electrical Engineering, KDK College of Engineering, Nagpur

Abstract: The development of electric motors is now growing rapidly. Demands to deliver a reliable and easy to drive in motor control causes Brushless Direct Current (BLDC) motor becomes a potential candidate. A BLDC motor drive is a potential option for an electric drive since it has a high reliability, simple design, and ability to work at high rotation per minute (RPM). This project aims for speed control of BLDC motor using change of position of stator field with respect to rotor in linear motion by sliding action controlled by solenoids and also has a inbuilt closed loop feedback system to adjust the speed accurately as compared to power semiconductor based electronic speed controllers which are costly and injects harmonics in the system..

Keywords: about four key words separated by commas

1. INTRODUCTION

- BLDC motors are currently widely used in industry, especially in the automotive field. The development of electric vehicles for several decades brought the need for reliable electric motor actuators.
- The considerations of BLDC motors as actuators electric vehicle because this motor has a high resistance, the simple design and the ability to work at high speed.
- Old system uses power semiconductors-based bridges which is supplied with PWM signal, from a signal generator and a programed microcontroller.
- These systems are complex, costly, inefficient and injects harmonics.
- Mechanically sliding the stator field in a liner motion using a liner motion-based assembly designed for movement of stator within the outrunner rotor.
- This movement changes the magnetic flux linkages of stator field with respect to rotor which in turn controls speed and torque of BLDC motor.
- Use of closed loop feedback system taking feedback from laser-based tachometer to sense ongoing revolution per minute of motor and feeds back to microcontroller.
- The feedback is processed with PID system to adjust the speed precisely to speed demanded by adjusting position of stator field.
- Solenoids are used to move the stator and lock it in position in linear manner.

2. OBJECTIVES

- We are controlling the speed of BLDC motor by varrying the startor position by linear motion assembly.
- Minimum harmonic injuction.
- Accurate control of speed using feedback system.

3. HARDWARE

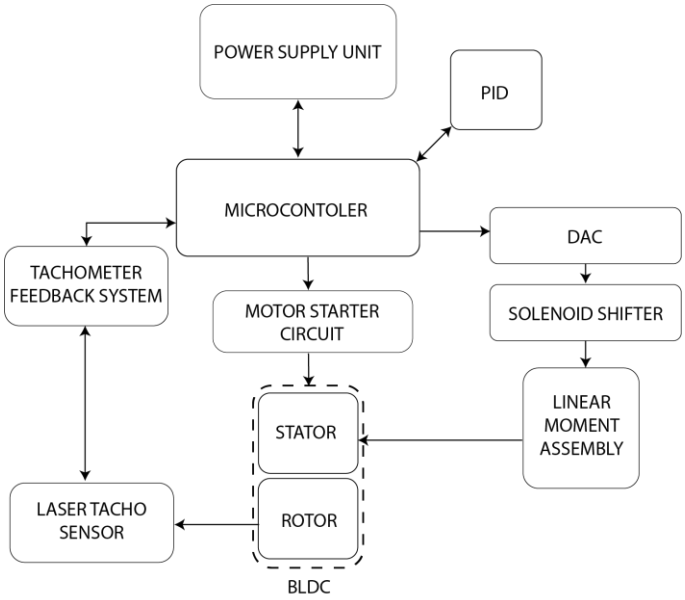
- 500-1000 W BLDC Motor, 36/48V, 360kV, 10/15A
- BLDC Motor Starter (Sensor/Sensor less) 500/1000 W, 36/48V
- Linear Motion Assembly
- Solenoid 12V, 3A
- DAC IC
- Laser Emitter 0.01mW, 3.3V
- Photo Diode
- BUCK Converters
- Microcontroller AT-Mega 2560
- Circuit BOX & Frame
- Power Supply Unit

METHODOLOGY

- Selection of suitable BLDC Motor with motor starter.
- Design & Fabrication of Main Circuit.
- Design & Fabrication of custom motor housing.
- Design & Fabrication of Stator & Rotor Bracket.
- Design & Fabrication of Linear Motion Assembly with Solenoid.
- Design & Fabrication of Mounting Frame.

- Assembly of BLDC Shaft with Tachometer System.
- Programming complete system.
- Complete assembly and the testing of Speed Control of BLDC Stator Position Vary.
- Rectifying errors if any & finding areas of improvement.

BLOCK DIAGRAM



CONCLUSION

The new design of our project dose not utilizes the traditional method of speed control of brushless direct current Motor by using PWM and Power Semiconductor devise but by mechanically sliding the stator field in a liner motion using a liner motion-based assembly designed for movement of stator within the outrunner rotor. This movement changes the magnetic flux linkages of stator field with respect to rotor which in turn controls speed and torque of BLDC motor. To make the speed control accurate the system is also equipped with a closed loop feedback system, taking feedback from laser-based tachometer to sense ongoing revolution per minute of motor and feeds back to microcontroller. The feedback is then processed with PID system to adjust the speed precisely to speed demanded by adjusting position of stator field. Solenoids are used to move the stator and lock it in position in linear manner.

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