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

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KEYWORDS :- [BLDC MOTOR, MICROCONTROLLER , LINEAR MOTION ASSEMBLY, TACHOMETER,
SOLENOID, DAC IC, BUCK CONVERTERS, CIRCUIT BOX, FRAME AND POWER SUPPLY UNIT]

1) **ABSTRACT :-** The dc motor is deficient in many aspects that require attention to be focused .The is turn give risk to some other alternative type of the dc motor design,which negotiates the problem like lack of periodic maintenance, mechanical wear outs,acoustics noise ,sparking and brush effect, thus result in less defect in dc motor.Various emphatic studies has been made on synchronous dc motor with brushless commutator. Now days researchers are confined towards the development of brushless dc motors as it is providing superior to the conventional dc motor type.

I. INTRODUCTION

BLDC motors have gradually replaced DC motors since industrial applications require more powerful actuators in small size. The advantage of using a BLDC motor is that it can be controlled to have speed-torque characteristics similar to those of a permanent magnet DC motor. In addition the BLDC motor has low inertia, a large power-to volume ratio, and low noise are compared with a permanent magnet DC servomotor having the same output ration.[2,3] But its disadvantages are the high coast and a more complex controller caused by the non-linear characteristics.[4,5].

Variable Structure Control (VSC) has successfully been applied to a wide variety of systems having uncertainties in the representative system models. The philosophy of the control strategy is simple, being based on two goals. First, the system is forced towards a desired dynamics; second, the system is maintained on that differential geometry. In the literature, the former dynamics is named the reaching mode, while the latter is called the sliding mode. The control strategy borrows its name from the latter dynamic behavior, and is called Sliding Mode Control (SMC). VSS techniques lead to the design of fast dynamics robust regulators easily implementable with very simple "custom" hardware.

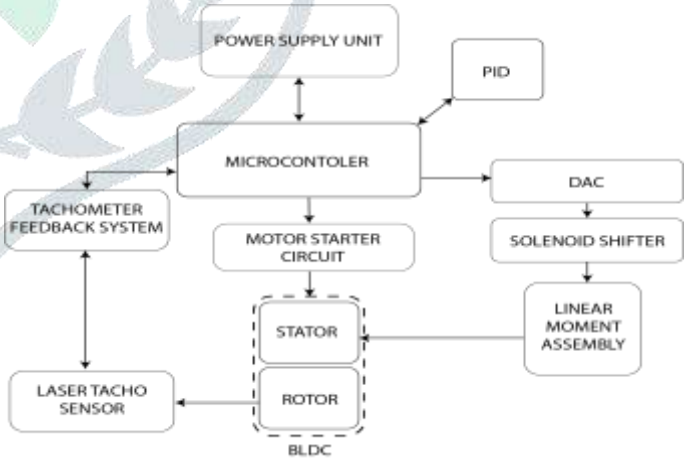
II. APPLICATION

- For latest type of electric vehicles which utilizes BLDC HUB Motor
- BLDC Motor Special for Outrunners.
- BLDC Motor with stator size greater than 20050 (200 mm Diameter, 50mm height).
- Robotics arms in production industry (car, bike, instruments, etc.).

III. 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

IV. BLOCK DIAGRAM



BLDC
types of bldc
For the speed control, bldc will match to the motor speed and give feedback to the command speed which has given and program. If there any error PID system will send signal to digital to analog converter which will in turn control the position of solenoid shaft connected to the linear moment assembly and hence stator start moving in and out to change the magnetic flux linkage and interchange speed and torque of bldc motor as per the command
BLDC diagram
This the bldc block diagram and project design for our proposed system as onthe left we can see the pictorial representation of our idea how our project look like which shows the front view

of bldc motor construction, and on the left side shows the different part of bldc motor including stator core that is placed inside main core, outer side we can see rotor body with some red dash which are highly powered special kind of permanent magnets.

The complete assembly is the rotor which we can see on the outer side hence it is called as outer runner BLDC motor

On next pictorial design of our project side view is present where we can have the side how can green colour shows the solenoid are attached to the stator.

Different methods for controlling the speed of brushless DC motor are:-

1. Sensor based control method
2. Sensor less control method
3. Digital control method
4. Genetic based proportional

V. 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.

VI. Conclusion

- The proposed system deals with completely designing a drive which will have automatic self-maintenance and cleaning system with better vapor cooling system. The designed motor gives easy axis in case of manual work to be done on motor as well as it has self-maintenance system run by microcontroller & sensor based automatic system. The IM will be equipped with advanced copper-based vapor cooling chamber with option of liquid coolant-based cooling system for optimal cooling. It also has automizers based high pressure cleaning and coating system itself placed on stator parts covering both rotor and stator winding for cleaning and coating while under operation. It also provides smart graphite based lubricant lubrication system for bearings and bushes which are controlled automatically by microcontroller and lubricates time to time as per load conditions and time of run. The system is completely program under Arduino IDE with microcontroller AT-Mega 328p.

VII. REFERENCES

- [1] “Speed Control Implementation of BLDC Motor using Sliding Mode Two-Steps LMI Design”, 2017 3rd International Conference on Science in Information Technology (ICSI Tech).(IEEE)
- [2] “Hung, J. Y., W. Gao and J. C. Hung, “Variable Structure Control: A Survey,” IEEE Trans. on Industrial Electronics, v.40, no.1, pp.2-22, February 1993IEEE)
- [3] “Speed Control of BLDC Motor Using Neural Network Controller and PID Controller”, Electrical Engineering Department Zeal College of Engineering and Research Pune, India 2019.(IEEE)
- [4] Hung, J. Y., W. Gao and J. C. Hung, “Variable Structure Control: A Survey,” IEEE Trans. on Industrial Electronics, v.40, no.1, pp.2-22, February 1993.(IEEE)
- [5] Gao, W., J. C. Hung, “Variable Structure Control of Nonlinear Systems: A New Approach,” IEEE Trans. on Industrial Electronics, v.40, no.1, pp.45-55, February 1993.(IEEE)
- [6] “Hung, J. Y., W. Gao and J. C. Hung, “Variable Structure Control: A Survey,” IEEE Trans. on Industrial Electronics, v.40, no.1, pp.2-22, February 1993IEEE)