



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore - 641 107

An Autonomous Institution

Accredited by NBA - AICTE and Accredited by NAAC - UGC with 'A' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19EE504 SPECIAL ELECTRICAL MACHINES

III YEAR / Vth SEMESTER EEE

Unit 1 - PMBLDC

By

Dr. C. Udhaya Shankar ASP / EEE & Senior Innovator / I-HUB



Fig. 5.4: Mechanical commutator and brushes arrangements

BRUSED vs BLDC MOTORS

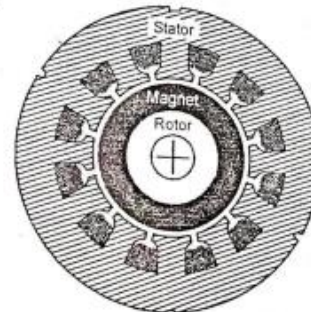
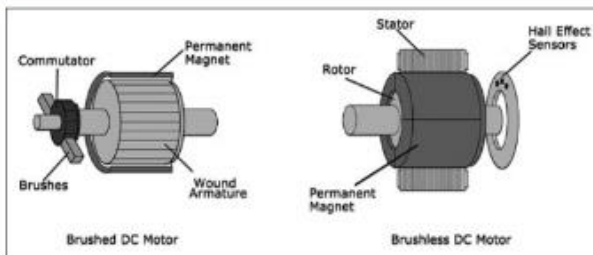


Fig. 5.1: Arrangement of permanent magnet in the rotor.

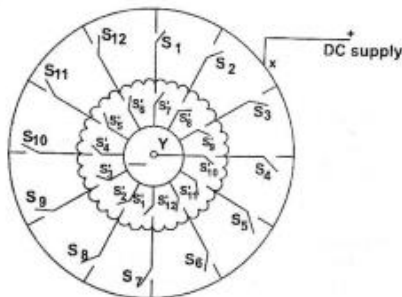


Fig. 5.5: Electronic commutator

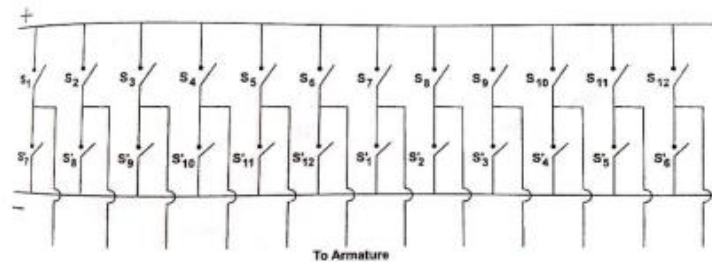


Fig. 5.6: Switching circuit of electronic commutator

BLDC MOTOR

BLDC motors have the following advantages over classical motors:

- Better speed - torque characteristics
- Faster dynamic response
- High efficiency
- Long operating life
- Noiseless operation
- Higher speed range.

TABLE 1: COMPARING A BLDC MOTOR TO A BRUSHED DC MOTOR

Feature	BLDC Motor	Brushed DC Motor
Commutation	Electronic commutation based on Hall position sensors.	Brushed commutation.
Maintenance	Less required due to absence of brushes.	Periodic maintenance is required.
Life	Longer.	Shorter.
Speed/Torque Characteristics	Flat – Enables operation at all speeds with rated load.	Moderately flat – At higher speeds, brush friction increases, thus reducing useful torque.
Efficiency	High – No voltage drop across brushes.	Moderate.
Output Power/Frame Size	High – Reduced size due to superior thermal characteristics. Because BLDC has the windings on the stator, which is connected to the case, the heat dissipation is better.	Moderate/Low – The heat produced by the armature is dissipated in the air gap, thus increasing the temperature in the air gap and limiting specs on the output power/frame size.
Rotor Inertia	Low, because it has permanent magnets on the rotor. This improves the dynamic response.	Higher rotor inertia which limits the dynamic characteristics.
Speed Range	Higher – No mechanical limitation imposed by brushes/commutator.	Lower – Mechanical limitations by the brushes.
Electric Noise Generation	Low.	Arcs in the brushes will generate noise causing EMI in the equipment nearby.
Cost of Building	Higher – Since it has permanent magnets, building costs are higher.	Low.
Control	Complex and expensive.	Simple and inexpensive.
Control Requirements	A controller is always required to keep the motor running. The same controller can be used for variable speed control.	No controller is required for fixed speed; a controller is required only if variable speed is desired.