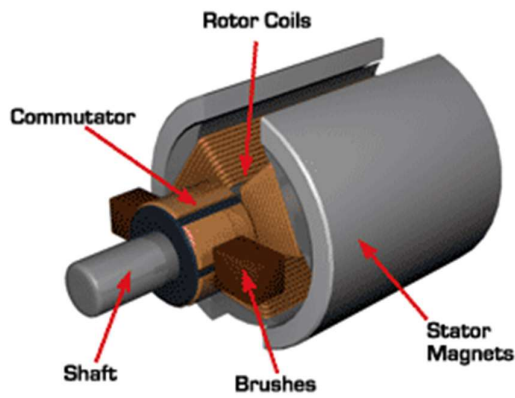


Permanent Magnet DC Motors

A **Permanent Magnet DC motor (PMDC motor)** is a type of DC motor that uses a permanent magnet to create the magnetic field required for the operation of a DC motor.



Construction of Permanent Magnet DC Motor or PMDC Motor

As it is indicated in name of permanent magnet DC motor, the field poles of this motor are essentially made of permanent magnet.

A **PMDC motor** mainly consists of two parts. A stator and an armature. Here the stator which is a steel cylinder. The magnets are mounted in the inner periphery of this cylinder.

The rotor of a PMDC motor is similar to other DC motors. The rotor or armature of a permanent magnet DC motor also consists of a core, windings, and commutator. Armature core is made of a number of varnishes insulated, slotted circular lamination of steel sheets.

By fixing these circular steel sheets one by one, a cylindrical shaped slotted armature core is formed. The varnish insulated laminated steel sheets are used to reduce eddy current loss in armature of permanent magnet DC motor. These slots on the outer periphery of the armature core are used for housing armature conductors in them. The armature conductors are connected in a suitable manner which gives rise to armature winding.

Working Principle of Permanent Magnet DC Motor or PMDC Motor

The working principle of PMDC motor is just similar to the general working principle of DC motor. That is when a carrying conductor comes inside a magnetic field, a mechanical force will be experienced by the conductor and the direction of this force is governed by Fleming's left hand rule.

As in a permanent magnet DC motor, the armature is placed inside the magnetic field of a permanent magnet; the armature rotates in the direction of the generated force.

Each conductor of the armature experiences a force and the compilation of those forces produces a torque, which tends to rotate the armature.

As the magnetic field strength of a permanent magnet is fixed it cannot be controlled externally, field control of this type of DC motor cannot be possible.

Advantages of Permanent Magnet DC Motor or PMDC Motor

The advantages of a PMDC motor are:

1. No need of field excitation arrangement.
2. No input power is consumed for excitation which improves efficiency of DC motor.
3. No field coil hence space for field coil is saved which reduces the overall size of the motor.
4. Cheaper and economical for fractional kW rated applications.

Disadvantages of Permanent Magnet DC Motor or PMDC Motor

The disadvantages of a PMDC motor are:

1. The armature reaction of DC motor cannot be compensated hence the magnetic strength of the field may get weak due to the demagnetizing effect of the armature reaction.
2. There is a chance of getting the poles permanently demagnetized (partial) due to excessive armature current during the starting, reversal, and overloading conditions of the motor.
3. The field in the air gap is fixed and limited – it cannot be controlled externally. This makes it difficult for this type of motor to achieve efficient speed control of DC motor in this type of motor is difficult.

Applications of Permanent Magnet DC Motor or PMDC Motor

They are commonly used as a starter motor in automobiles, windshield wipers, washers, blowers used in heaters and air conditioners, to raise and lower windows – and they are extensively used in toys.