

Electric Motor



Vishal
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Electric Motors

The electric motor is a device which converts electrical energy to mechanical energy.

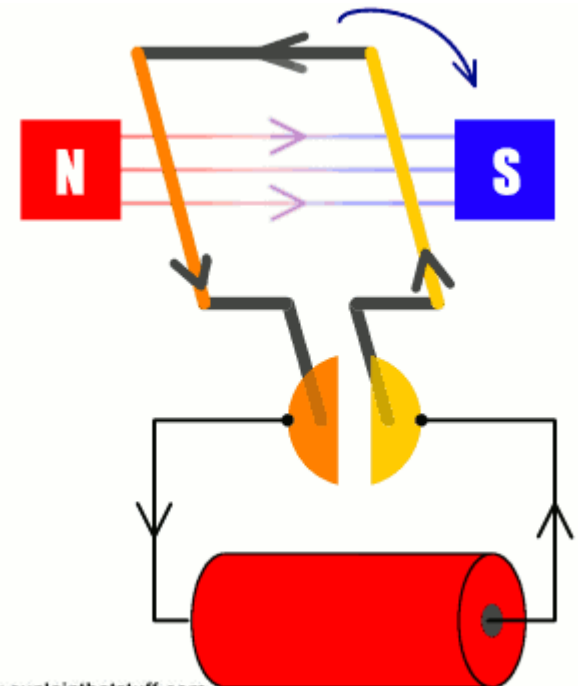
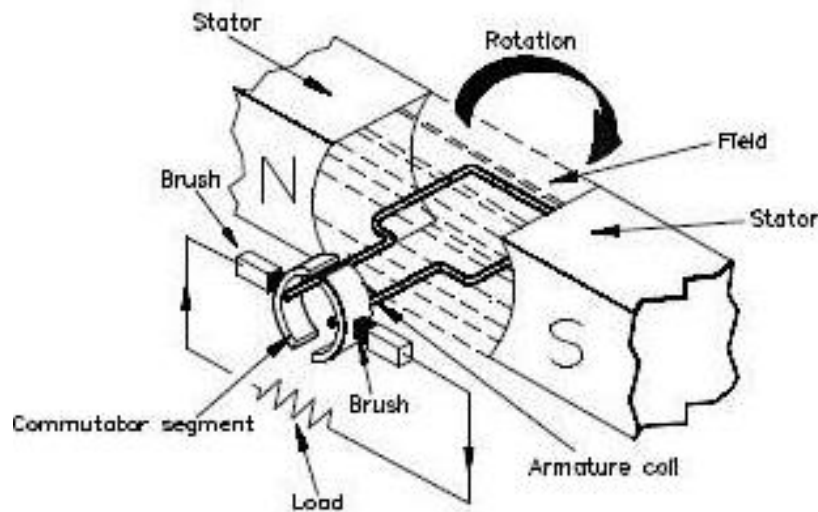
All of the electric motor mainly works on the interaction of magnetic field with electric current.

There are mainly three types of electric motor.

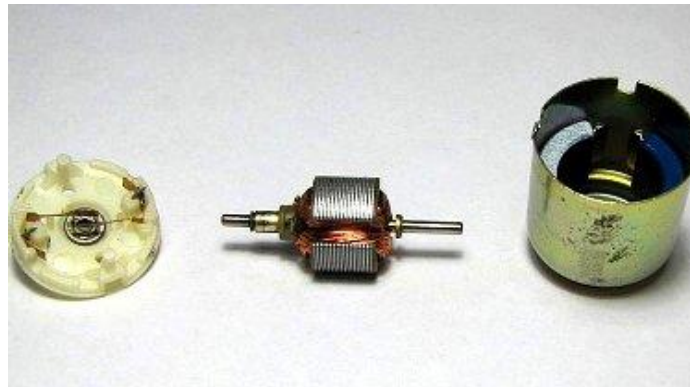
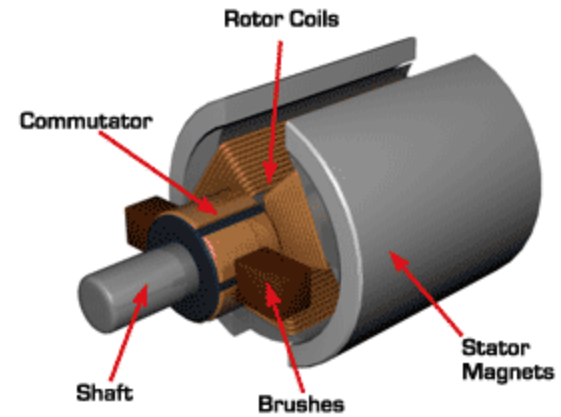
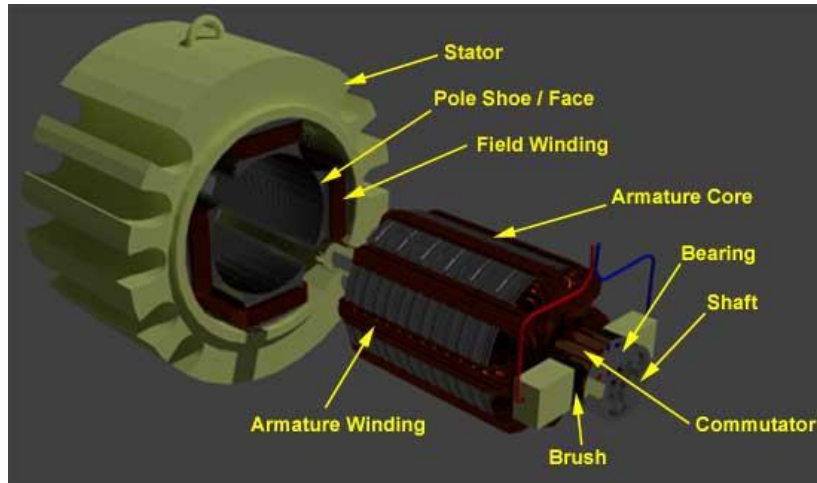
1. DC Motor.
2. Induction Motor.
3. Synchronous Motor.

Working of a DC motor

With the brushed motor, rotation is achieved by controlling the magnetic fields generated by the coils on the rotor, while the magnetic field generated by the stationary magnets remains fixed.

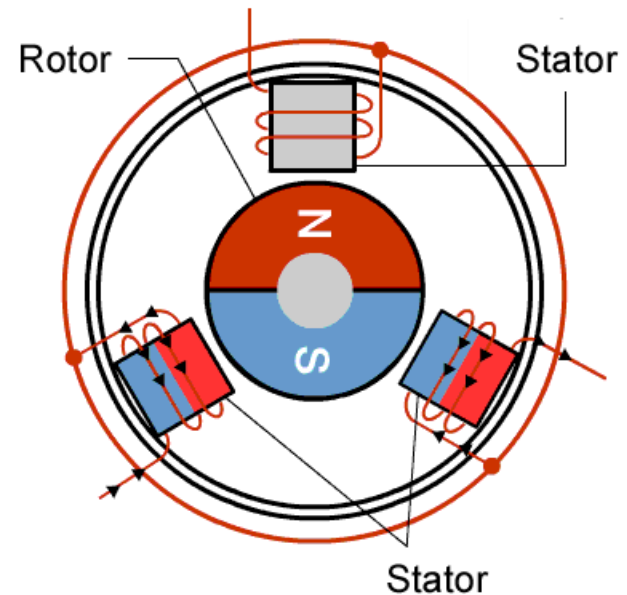
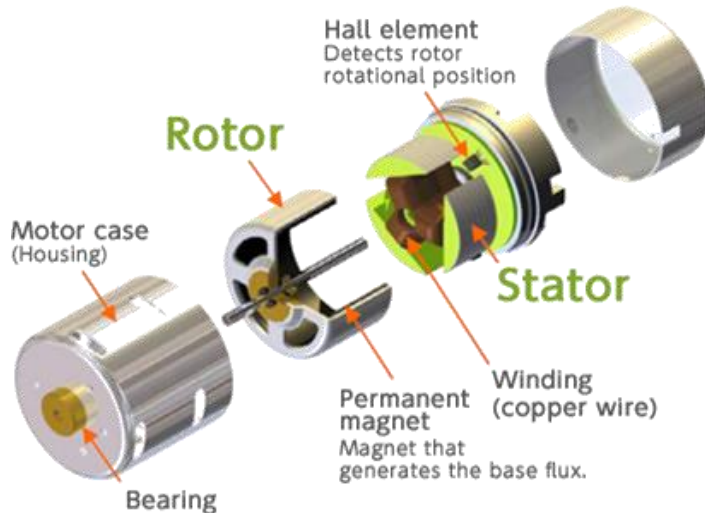


Design of DC motor



Brushless DC Motor

1. With a BLDC motor, it is the permanent magnet that rotates; rotation is achieved by changing the direction of the magnetic fields generated by the surrounding stationary coils.
2. The rotation is controlled by adjusting the magnitude, frequency and direction of the current into these coils.

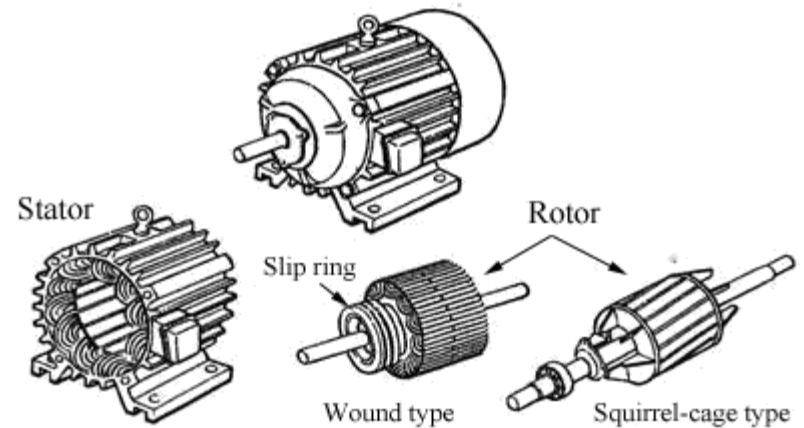
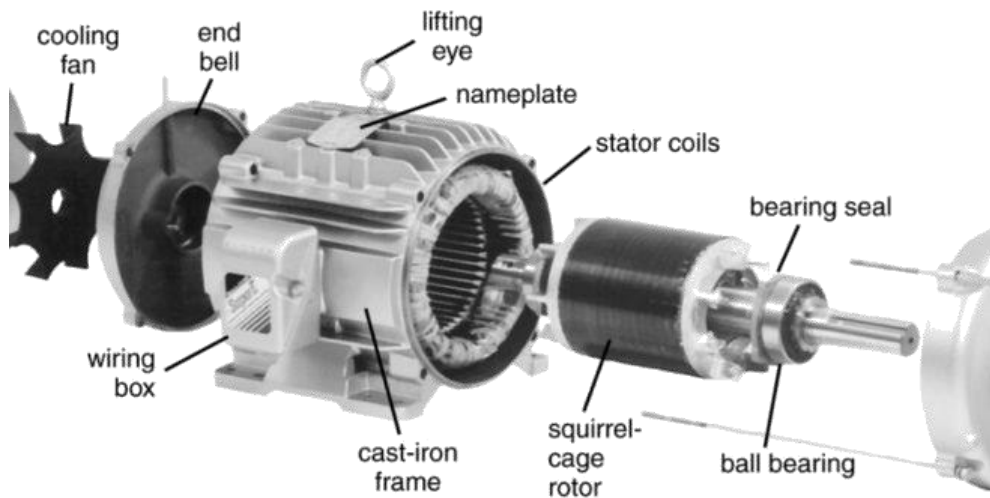


Advantage

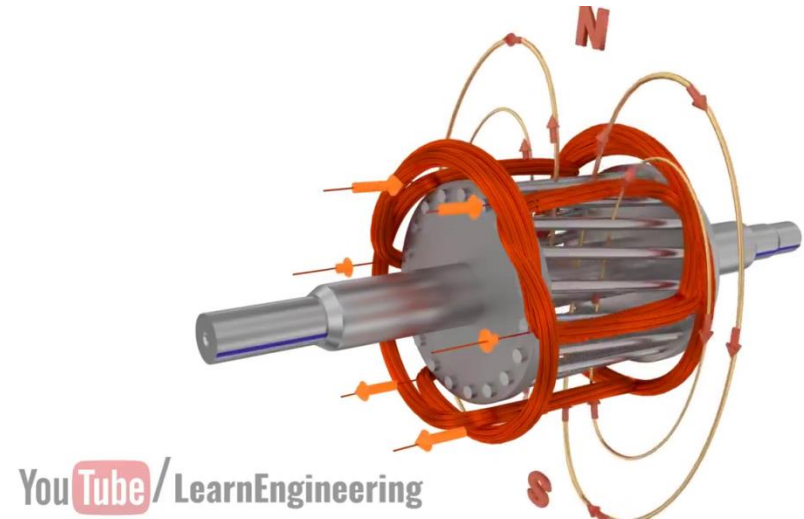
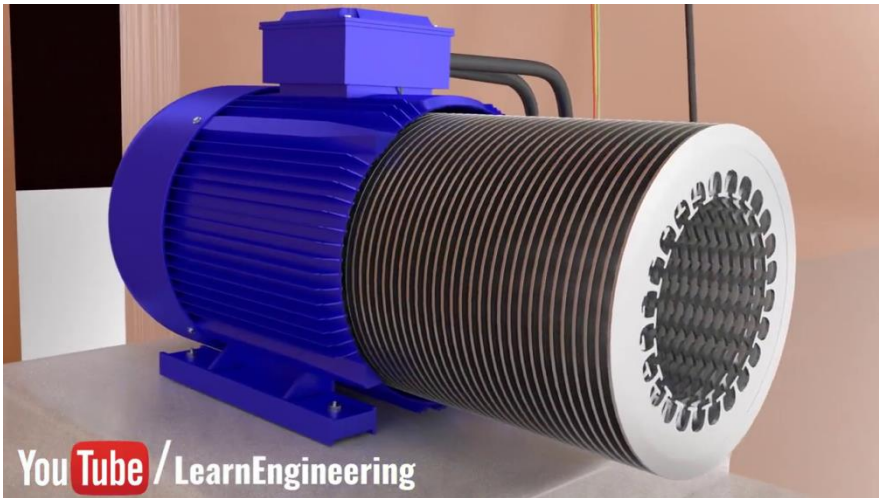
1. Can work continuously at maximum rotational force (torque).
For a brushed motor to deliver the same torque as a brushless model, it would need to use larger magnets.
2. Controllability - BLDC motors can be controlled, using feedback mechanisms, to delivery precisely the desired torque and rotation speed.
3. BLDC motors also offer high durability and low electric noise generation, thanks to the lack of brushes.
4. Ideal for vacuum machines, washing machines, air conditioners and are also being used to spin hard disc drivers.

Induction Motor

1. An induction motor is a commonly used AC electric motor.
2. In an induction motor, the electric current in the rotor produces torque obtained via electromagnetic induction from the rotating magnetic field of the stator winding.



Induction Motor Structure - Stator & Rotor

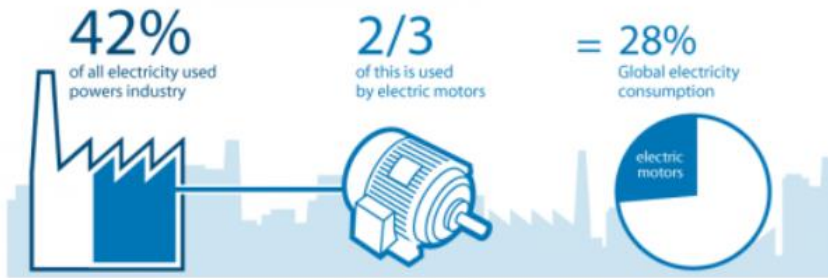


Advantage

1. No permanent magnets.
2. No Brushes
3. No Commutator rings
4. High efficiency – which can go as high as 97%.

The main disadvantage of an induction motor is that the speed of the motor varies with the applied load.

Much of this electricity is used to power industrial electric motors



However, using technology already available today we can make millions of motor systems more efficient

Energy efficiency measures can reduce consumption by up to: 60%



300'000'000 industrial electric motors are currently installed worldwide. This figure increases by 10% each year. Approximately 50% of these motors are installed in the US, EU and China.

50%

of all electric motors
are installed in:



Opportunities for efficiency

Smart motor control systems (called variable speed drives) use only as much electricity as is necessary to do a job, saving enormous amounts of power

Smart motor control
systems alone could save
1,718
billion KWh

=

power output of
286
nuclear reactors



Improved design can
also increase efficiency
of individual motors by
up to



30% ⚡

What does this number really mean?

135 billion KWh =

