



What is a Brushless Motor?

A brushless motor is an electric motor powered by direct current (DC). Though more expensive than the standard electric or brushed motor, it has considerable advantages over its predecessor. Most notably, a brushless motor boasts better performance and suffers less wear than brushed motors of similar size.

To understand the advantages of the brushless motor, a basic understanding of the brushed motor is required. In a brushed motor, an electromagnet is mounted on a spinning arm, called an armature or rotor. The armature sits between two magnets set in a horseshoe configuration, collectively called the stator. When power is fed to the electromagnet, the arm moves, aligning the north and south poles of the electromagnet with the opposing poles of the stator.

The electromagnet would remain frozen in this position if it could not change polarity. To keep the motor turning, the direction of the electric current must be switched. Changing the current flips the poles of the electromagnet, causing the armature to continue its spin until it realigns with the stator. Polarity must change back and forth rapidly in order to create constant spin.

A change of current is accomplished by brushes, which are mounted on the armature near the axle. As the armature spins, the brushes alternately connect with a contact point on the axle. This contact point is connected to a power source. By spinning the brushes around the contact point, the current rapidly changes direction, switching the polarity of the electromagnet.

Brushed motors are cheap to produce, but they do have their limitations. The brushes wear out from rubbing against the contact point and axle. Friction from this contact also impedes performance.

The brushless motor turns this design inside out. Magnets are placed on the armature and are surrounded by one or more electromagnets. The current switch is controlled by computer, turning electromagnets off and on by switching the current; the computer can also factor in the motor's current speed to optimize efficiency, all without the need for brushes.

All of this makes the brushless motor considerably more powerful than brushed motors of a similar size. Brushless motors have superior control, precision, and efficiency; also, brushless motors are quieter. In larger models where overheating may be an issue, they are easier to cool and there are no brushes to wear out.

Apart from industrial applications, home electronics and computers use brushless motors, as well as electric and hybrid vehicles. The brushless motor is also popular among remote control (RC) racing enthusiasts. The motors are, however, much more expensive than brushed motors and tend to be used only where advantage outweighs cost.