

Student Revision Notes (age 14 – 16): Generators

When a wire is moved between the poles of a magnet a current will flow in the wire. This effect is used in electrical generators. An a.c generator is shown in Figure 1.

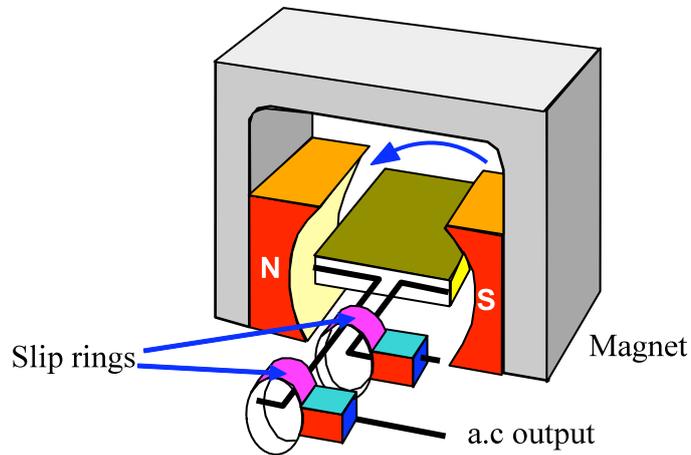


Figure 1

As the coil rotates between the poles of the magnet, the sides of the coil cut through the magnetic field and so a current flows in the coil. The current flows out from both sides of the coil through the slip rings.

The faster the coil rotates the faster will it cut the magnetic field and the bigger will be the output voltage.

Figure 1 shows a coil with only one turn, in a real generator there would be lots of turns.

The output voltage of a generator can be increased by rotating it faster, increasing the number of turns on the coil or using stronger magnets.

The output of the ac. generator is shown in Figure 2.

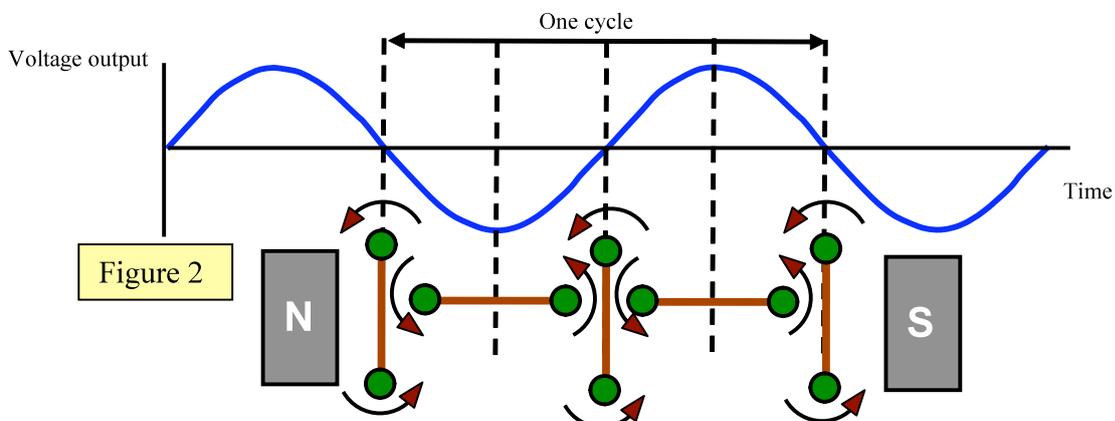


Figure 2

As one side of the coil cuts down through the field, the output from that side will be positive and as it goes up it will be negative; an ac. output is produced. The maximum output voltage will be when the coil is parallel to the field, and is also shown in Figure 2. This happens because the coil is cutting the field lines at the greatest rate at this point.

The d.c. generator is similar to the ac. version but there are one or two important differences (See Figure 3).

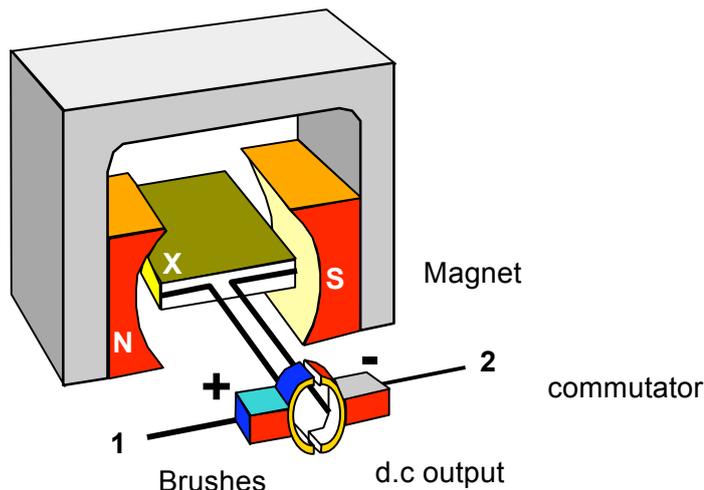


Figure 3

There is still a coil that rotates between the poles of a magnet but this time the two ends of the coil are connected to a split ring - a half circle of metal that is in contact with the stationary brushes. If you look at the diagram you can see how this arrangement will produce d.c.

As the coil rotates the side of it that is cutting downwards through the field (marked X on the diagram) is always in contact with brush 1. That means that brush 1 is always positive. In the same way the side of the coil that is going up is in contact with brush 2. The device that ensures that the two brushes always have the same polarity is called a **COMMUTATOR**.

The output of the d.c. generator is shown in the Figure 4. The output is not steady but is always in the same direction. As with the ac. generator the maximum output voltage occurs when the coil is horizontal and is cutting the field at right angles and at maximum rate.

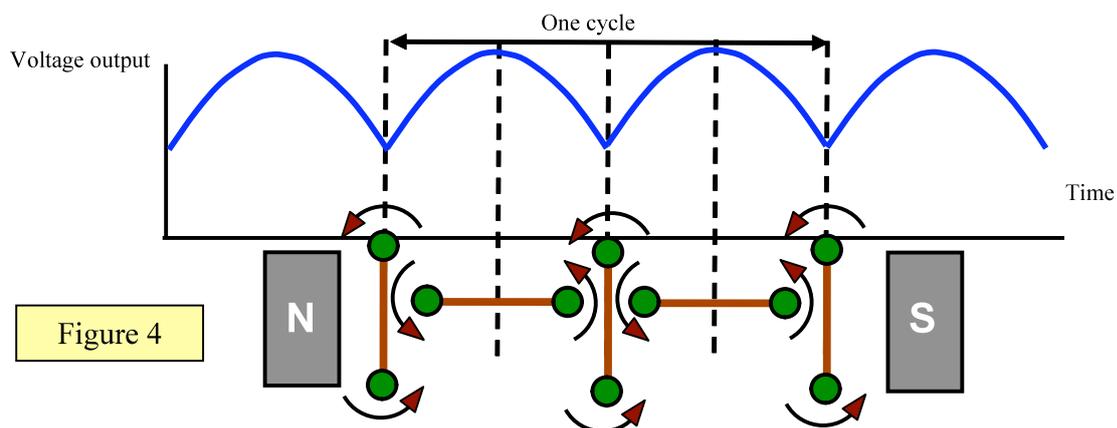


Figure 4

In commercial generators the performance of both types (ac and dc) is improved by having:

- (a) A radial magnetic field produced by electromagnets with multiple coils; and
- (b) A large number of coils on the rotor

Linked Resources

www.twothirtyvolts.org:

Generators (14-16) Student Quiz