Experiment F: Electromagnet Induction (age 14 – 16) – Generators

Experiment Objective:

The demonstration experiment is a useful aid to students understanding the effective of rotational speed of the AC generator on induced Voltage.

Classroom Activity:

As the coil rotates it cuts through the lines of magnetic flux producing an induced current, the variation of which with time is shown by Figure 1(a). A much smoother output is obtained by having a number of coils wound on an iron core which is laminated to reduce eddy currents. The output of such a generator is shown in Figure 1(b).

In generators where the output current may be very large, as in a power station, it is the magnet that rotates while the coil remains at rest. A simplified version of this is shown in Figure 1(c). The advantage of this is that the slip rings and brushes have to carry only the small current needed to magnetise the rotating electromagnet while the current produced the static field coils may be many hundreds of amps. In modern alternators installed in a power station the voltage generated will be some 25 kV and the current produced over 1000 A!

Figure 1(a)

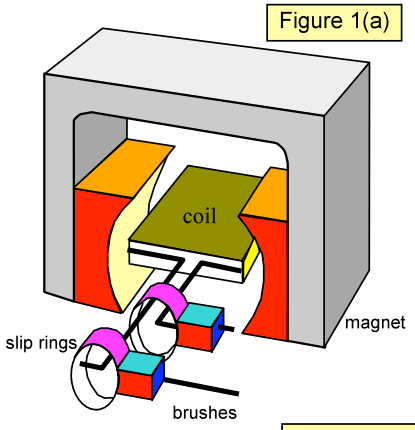
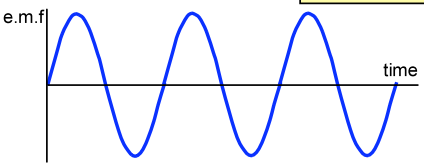


Figure 1(b)



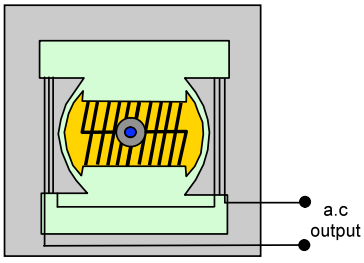
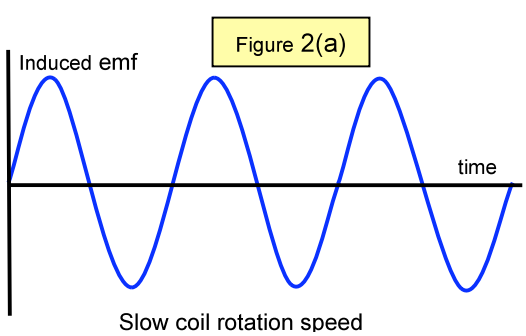
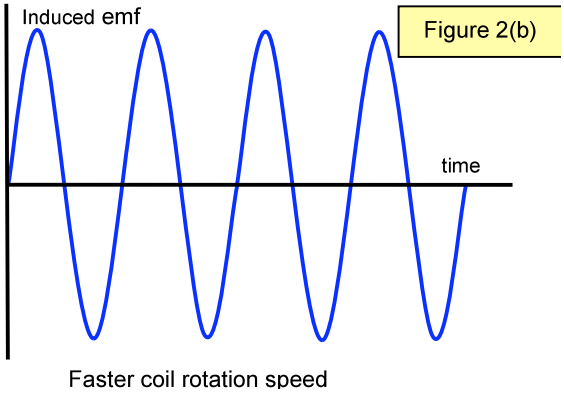


Figure 1(c)

If the speed of rotation of the coil is changed two things happen (See Figures 2(a) and 2(b):
(a) since the rate of cutting of magnetic flux is increased the output emf will be increased also in line with Faraday's law
(b) the frequency of the output emf will be increased as well since the coil makes a revolution in a shorter time





Resource materials needed:

AC generator and oscilloscope or equivalent.

Expected outcomes:

Students understand the effective of rotational speed on induced voltage and the reasons for this.

Linked Resources

www.twothirtyvolts.org

Generators Student Revision Notes
Generators Revision Quiz
Generators Lesson Plan