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Zone4info - Brief Explanation on Faraday's Law

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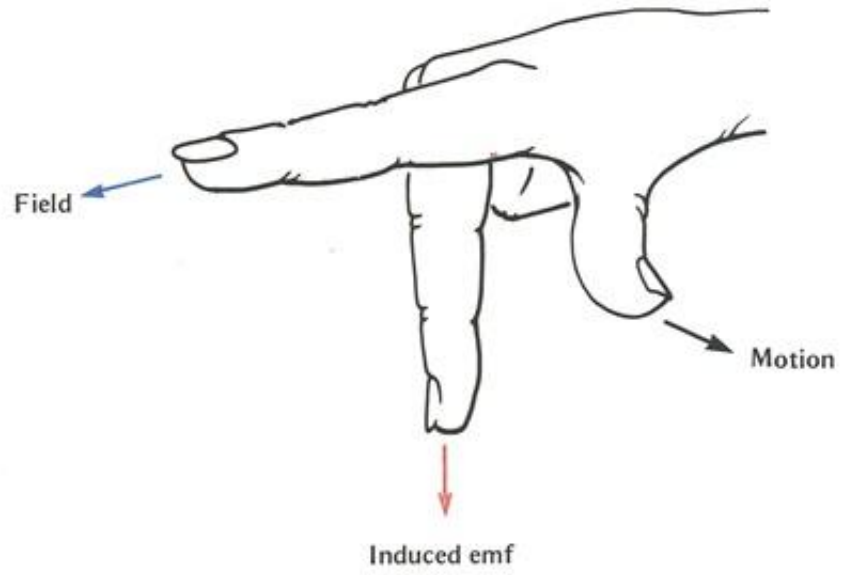
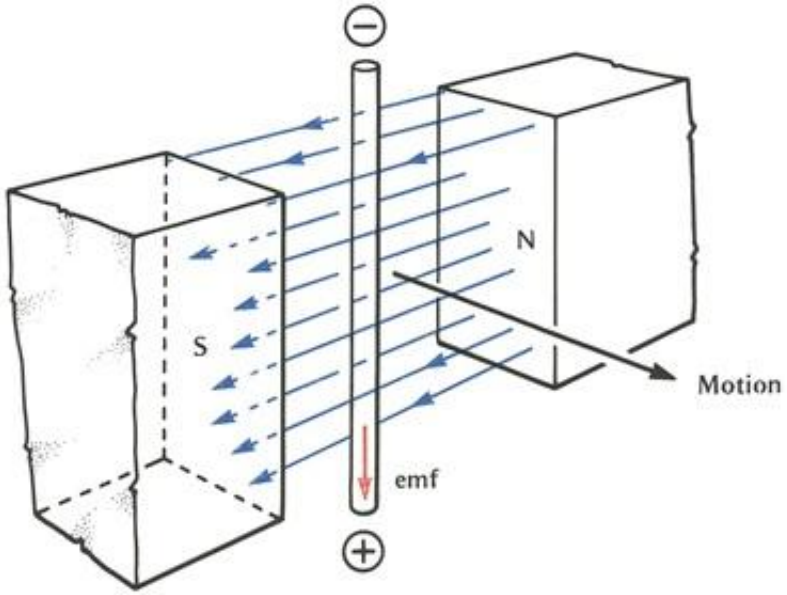
Posted by Hameedullah Ekhlas Mon at 6:59 AM



One day in 1837 Michael Faraday was working in his laboratory when by accident he dropped a magnet into a coil of wire which happened to be connected to a galvanometer. He noticed, to his surprise, that the galvanometer needle gave a kick when this happened. He was even more surprised to see, when he took the magnet out, that the needle kicked the other way.

This started a train of thought which finally led to a monumental discovery which was to become the whole basis of modern electrical engineering: it was the theory of 'Electromagnetic Induction'.

FLEMING'S RIGHT-HAND RULE FOR GENERATORS



ELECTROMAGNETIC INDUCTION

These are heavy words, but in short they mean that, if a conductor is moved in a magnetic field, then an 'electromotive force' (emf) - that is, a voltage - is induced in that conductor. This is shown in Figure 6.1. It follows that, if the ends of the conductor are connected to a load, then an electric current, driven by that voltage, will flow from the conductor, through the load and back again.

Whereas Oersted had shown that an electric current moving in a wire gives rise to an artificial magnetic field, Faraday showed the opposite - that if a wire moves in a magnetic field an artificial charge, or voltage, will be created in that wire. Electricity and magnetism were now firmly tied together by these two great discoveries.

Here then is the basis of electrical power generation. We start with a magnetic field, either a natural magnet or an artificial electromagnet of Oersted's type, and cause a conductor or a number of conductors to move past it, from which the current can be extracted as they are moving. How this is done in practice is shown in the manual 'Fundamentals of Electricity 2', but first look at one other rule which determines how the directions of field, voltage and movement are related.

Figure shows 'Fleming's Right-hand Rule for Generators'. If the right hand is held with the thumb, forefinger and centre finger extended mutually at right angles as shown in the figure, then, with the magnetic field in the direction (North to South) pointed by the forefinger and the motion of the conductor in the direction indicated by the thumb, the centre finger will point in the direction in which the emf (i.e. voltage) is induced in that conductor (and in which current will flow when connected to a load).

The magnitude of the voltage induced in the moving conductor depends on the strength of the magnetic field and the speed of movement, and on nothing else.

Reference:

FUNDAMENTALS OF ELECTRICITY 1