

# Chapter 2

## Principle of DC Generator

### ABSTRACT

*In this chapter, the authors discuss about principles of DC generator, variation of voltage induced in the conductor with the position of conductor. After that the authors discuss frequency of induced voltage, magnitude of induced voltage. This chapter ends with discussion of the main parts and construction of a DC machine.*

### 2.1 PRINCIPLE OF D.C. GENERATOR

Faraday's 2<sup>nd</sup> law of electro-magnetic induction states that whenever, there is a relative motion between a conductor and a magnetic field, a voltage is induced in the conductor. Now there are two possibilities:

- Field is stationary and conductor is moving.
- Field is revolving and conductor is stationary.

The first is the principle of D.C. generator and the second is the principle of a transformer. As is obvious from the principle of DC generator that two things are needed

#### Magenetic Field

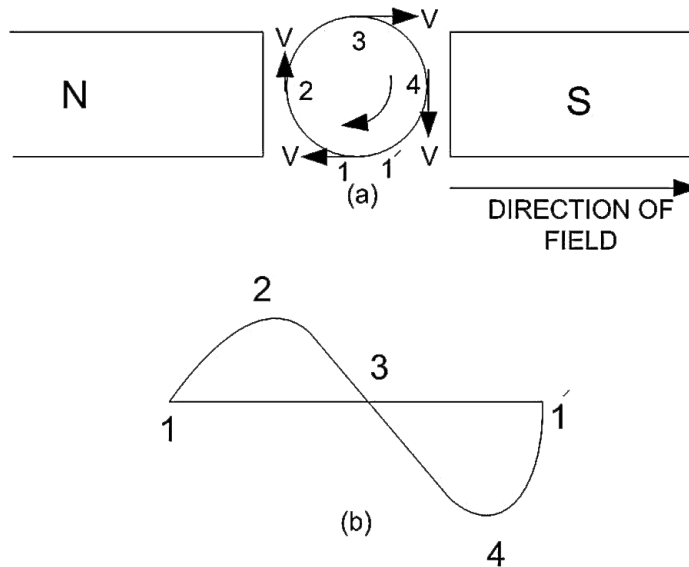
This is produced by a permanent magnet or electromagnet. The electromagnet consists of silicon steel core and copper windings.

#### Rotating Armature

It consists of armature made of silicon steel having slots and teeth. Copper windings are placed in the slots of rotating armature

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Figure 1.



The voltage induced is given by

$$e = Blv \sin \theta$$

where B is flux density

l is length of conductor

$\theta$  is the angle between direction of magnetic field and direction of motion of conductor.

See Figure 1.

The angles between field and direction of motion of conductor at various points is

180° at point 1

90° at point 2

0° at point 3

-90° at point 4

## 2.2 VARIATION OF VOLTAGE INDUCED IN THE CONDUCTOR WITH THE POSITION OF CONDUCTOR

Let us consider an elementary two pole generator as shown in Figure 1. A conductor starts moving in the direction shown from position 1. It is under the influence of North Pole up to position 3 and generates a positive half cycle. Similarly under the influence of South Pole a negative half cycle is generated. So we see that for a two pole machine corresponding to 360° mechanical, a complete full cycle is generated. One electrical cycle corresponds to 360° electrical. Similarly for a four pole machine corresponding to 360° mechanical rotation, two complete electrical cycles i.e. 720° are generated, so we can write down following relation:

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