RAMA UNIVERSITY

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FACULTY OF ENGINEERING & TECHNOLOGY

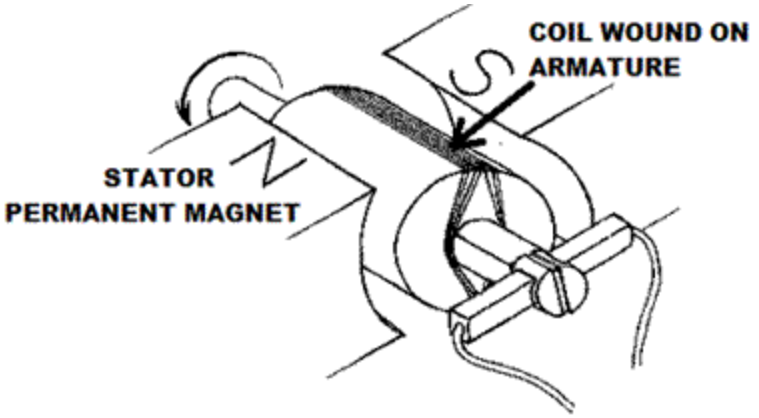
Electrical Machine-1

Amit Kumar Singh

Permanent Magnet DC Generator

When the flux in the magnetic circuit is created through the use of permanent magnets, then it is known as a Permanent magnet DC generator.

It consists of an armature and one or several permanent magnets situated around the armature. This type of DC generator generates does not generate much power.



PERMANENT MAGNET DC GENERATOR

Separately Excited DC Generator

These are the generators whose field magnets are energized by some external DC source, such as a battery.

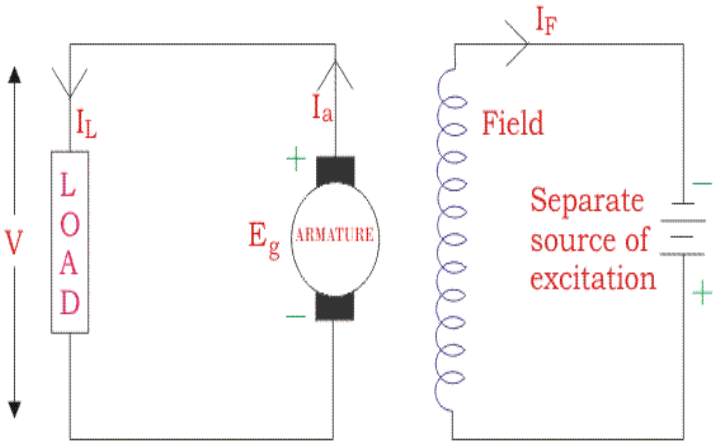
A circuit diagram of separately excited DC generator is shown in the figure below. The symbols below are:

I_a = Armature current

I_L = Load current

V = Terminal voltage

E_g = Generated EMF (Electromagnetic Force)



Separately Excited DC Generator

Voltage drop in the armature = $I_a \times R_a$ (R/sub>a is the armature resistance)

Let, $$I_a = I_L = I\ (say)$$

Then, $$voltage\ across\ the\ load, V = IR_a$$

Power generated is equal to $$P_g = E_g \times I$$

And power delivered to the external load is equal to $$P_L = V \times I$$

Self Excited DC Generators

According to the position of the field coils, self-excited DC generators may be classified as:

Series Wound Generators

Shunt Wound Generators

Compound Wound Generators

Series Wound Generator

In these type of generators, the field windings are connected in series with armature conductors, as shown in the figure below.

Whole current flows through the field coils as well as the load. As series field winding carries full load current it is designed with relatively few turns of thick wire. The electrical resistance of series field winding is therefore very low (nearly 0.5Ω).

Here:

R_{sc} = Series winding resistance

I_{sc} = Current flowing through the series field

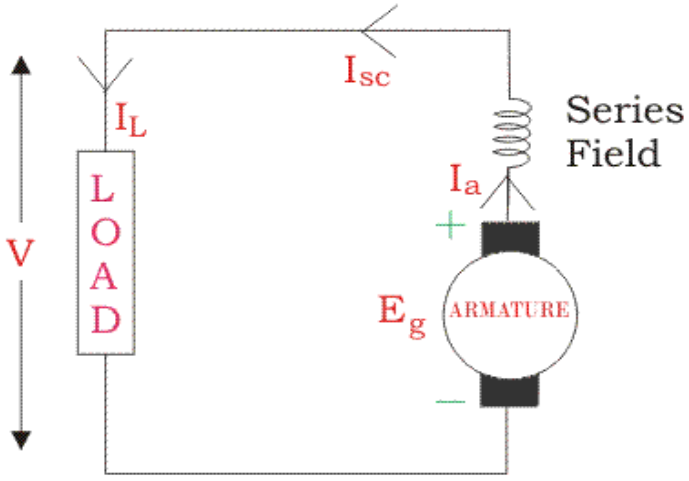
R_a = Armature resistance

I_a = Armature current

I_L = Load current

V = Terminal voltage

E_g = Generated EMF



Series Wound Generator

$$I_a = I_{sc} = I_L = I\ (say)$$

Voltage across the load is equal to,

$$V = E_g - I(I_a \times R_a)$$

Power generated is equal to,

$$P_g = E_g \times I$$

Power delivered to the load is equal to,

$$P_L = V \times I$$