Types of DC Generators

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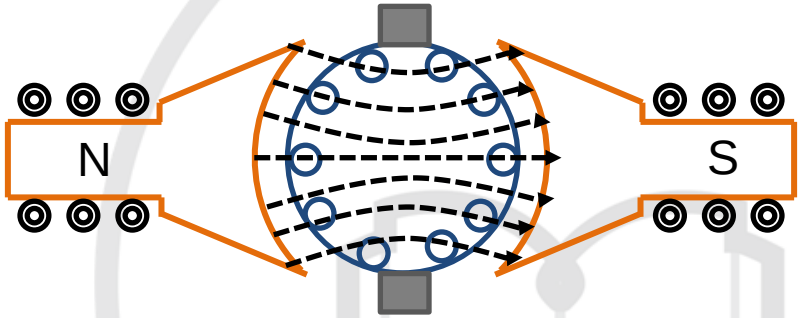
CLASSIFICATION OF DC GENERATORS:



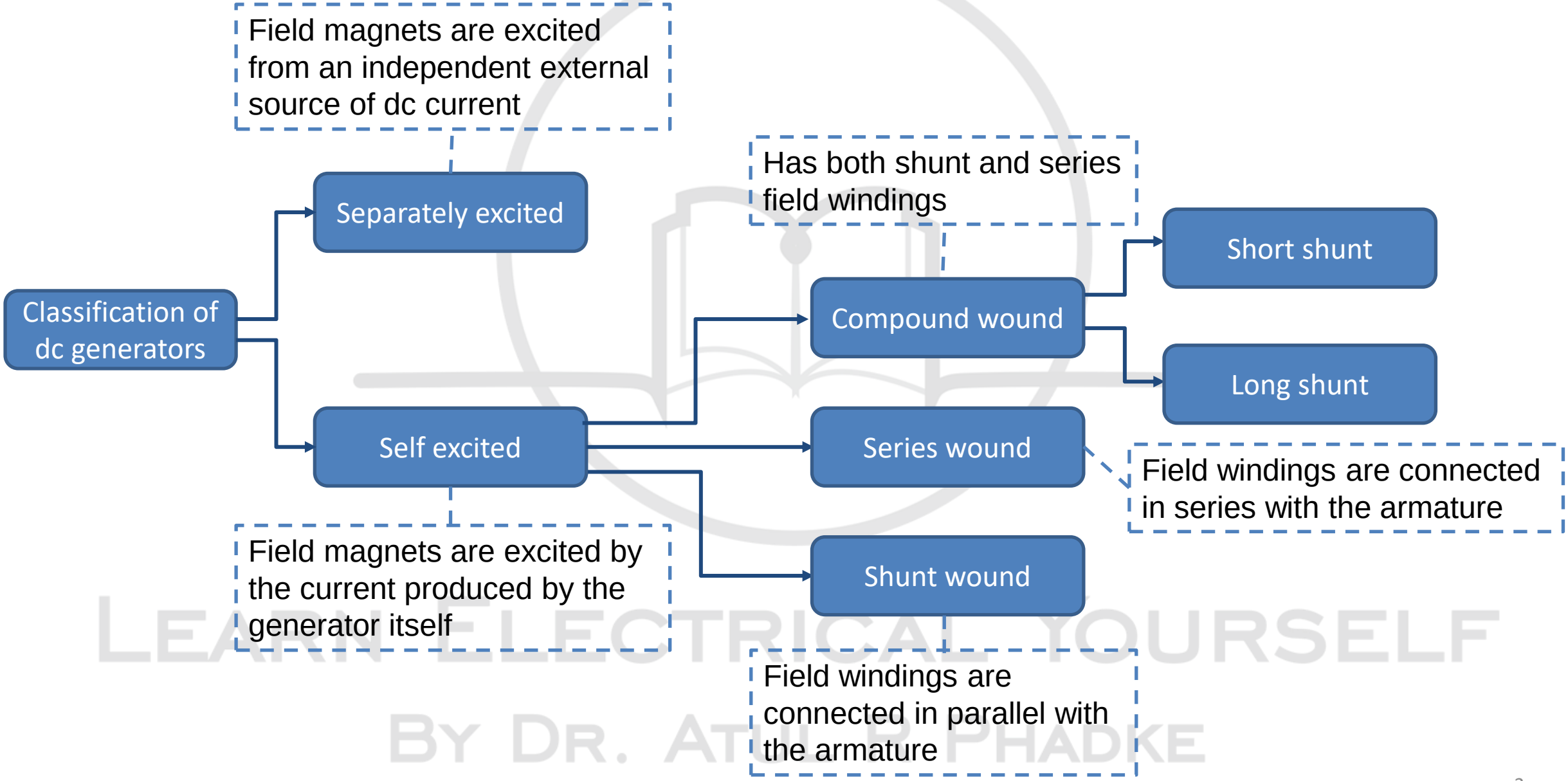
In dc machines, the required magnetic field is produced by electromagnets.

Electromagnets produce magnetic flux when a current is circulated through the field winding.

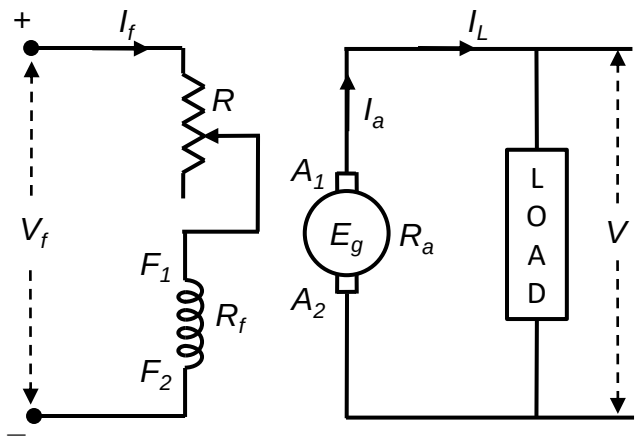
This circulation of current through the field winding of a dc generator for producing magnetic flux is called as excitation.

Generators are mainly classified according to the way in which their fields are excited.

CLASSIFICATION OF DC GENERATORS:



SEPARATELY EXCITED DC GENERATOR:



For separately excited generator,

$$I_f = \frac{V_f}{R + R_f}$$

$$I_a = I_L$$

$$E_g = V + I_a R_a + V_{brush}$$

$I_a R_a$ = voltage drop in armature

V_{brush} = brush contact drop in Volt

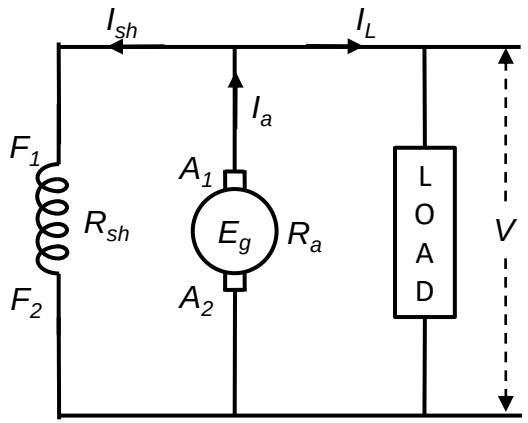
The field winding (F_1-F_2) which produces main flux is energized by and external source of voltage V_f.

The resistance of field winding is R_f and the current flowing through it is I_f.

E_g is the generated emf in armature (A_1-A_2). Resistance of armature is R_a and the current flowing through it is I_a.

Load current is I_L.

DC SHUNT GENERATOR:



For dc shunt generator,

$$I_{sh} = \frac{V}{R_{sh}}$$

$$I_a = I_{sh} + I_L$$

$$E_g = V + I_a R_a + V_{brush}$$

$I_a R_a$ = voltage drop in armature

V_{brush} = brush contact drop in Volt

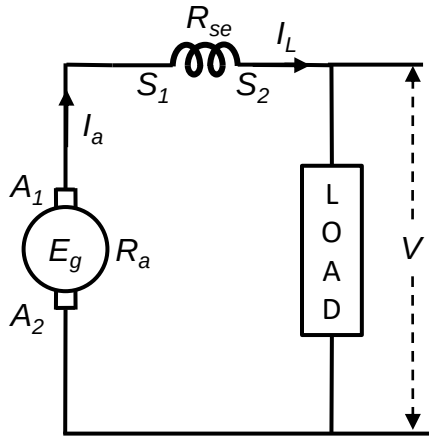
The field winding (F_1-F_2) which produces main flux is energized by connecting it in parallel to the armature. Therefore, the full generated voltage is applied across the field winding.

The resistance of field winding is R_{sh} and the current flowing through it is I_{sh}.

E_g is the generated emf in armature (A_1-A_2). Resistance of armature is R_a and the current flowing through it is I_a.

Load current is I_L.

DC SERIES GENERATOR:



For dc series generator,

$I_a = I_{se} = I_L$

$E_g = V + I_a R_a + I_a R_{se} + V_{brush}$

$I_a R_a$ = voltage drop in armature

$I_a R_{se}$ = voltage drop in series field winding

V_{brush} = brush contact drop in Volt

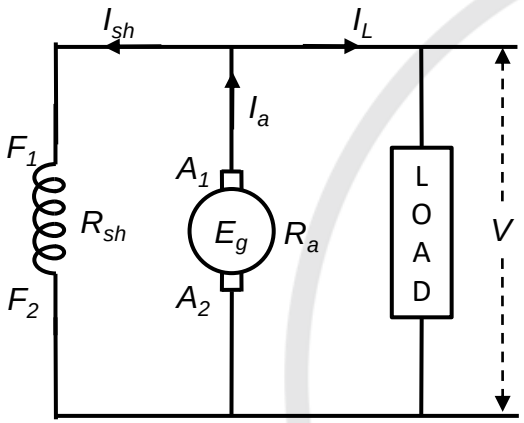
The field winding (S_1-S_2) which produces main flux is energized by connecting it in series with armature.

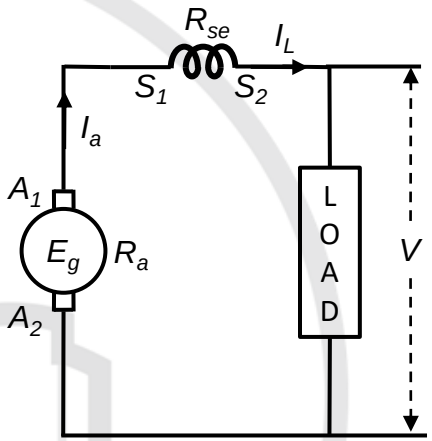
The resistance of field winding is R_{se} and the current flowing through it is the armature current I_a .

E_g is the generated emf in armature (A_1-A_2). Resistance of armature is R_a and the current flowing through it is I_a.

Load current is I_L.

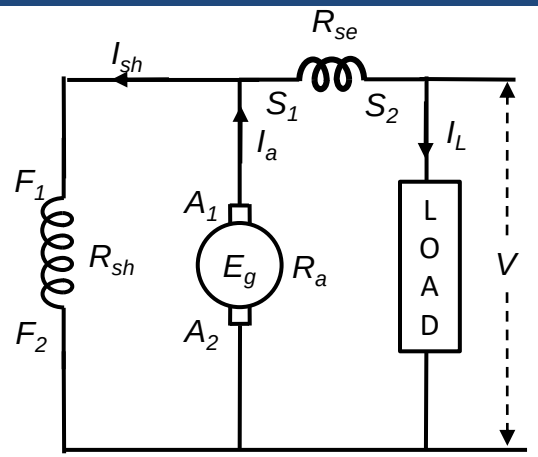
DIFFERENCE BETWEEN SHUNT AND SERIES GENERATORS:





	DC Shunt Generator	DC Series Generator

SHORT SHUNT TYPE COMPOUND GENERATOR:



For short shunt compound generator,

$I_a = I_{sh} + I_L$

$I_{sh} = \frac{V'}{R_{sh}}$ where $V' = V + I_a R_{se}$

$E_g = V + I_a R_a + I_a R_{se} + V_{brush}$

$I_a R_a$ = voltage drop in armature

$I_a R_{se}$ = voltage drop in series field winding

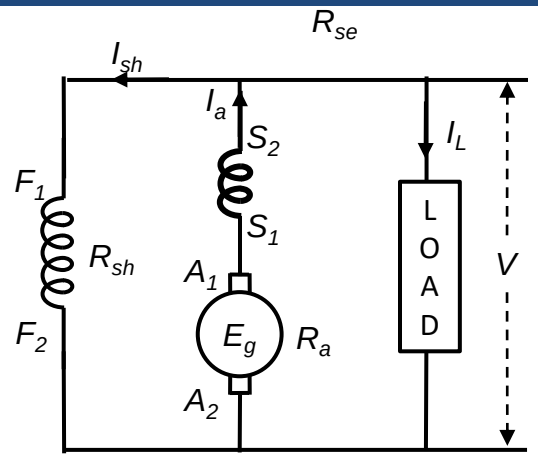
V_{brush} = brush contact drop in Volt

In short shunt type compound generator, the shunt field winding (F_1-F_2) is connected only across armature.

The series field winding (S_1-S_2) is connected in series with the parallel combination of the armature and shunt field winding.

The current in series field winding is equal to the load current I_L

LONG SHUNT TYPE COMPOUND GENERATOR:



For long shunt compound generator,

$$I_a = I_{sh} + I_L$$

$$I_{sh} = \frac{V}{R_{sh}}$$

$$E_g = V + I_a R_a + I_a R_{se} + V_{brush}$$

$I_a R_a$ = voltage drop in armature

$I_a R_{se}$ = voltage drop in series field winding

V_{brush} = brush contact drop in Volt

In long shunt type compound generator, the series field winding (S_1-S_2) is connected in series with the armature.

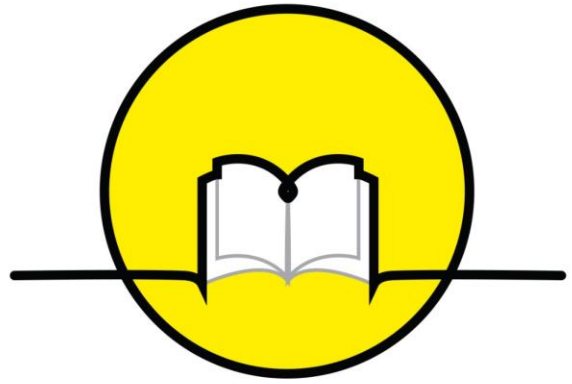
The shunt field winding (F_1-F_2) is connected across the series combination of armature and series field winding.

CUMULATIVE AND DIFFERENTIAL COMPOUND GENERATORS:

In compound generators, generally the shunt field is stronger than the series field.

If the series field and shunt field are in the same direction or additive to each other, then the generator is said to be cumulatively compounded.

On the other hand if the series field opposes the shunt field, the generator is said to be differentially compounded.



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