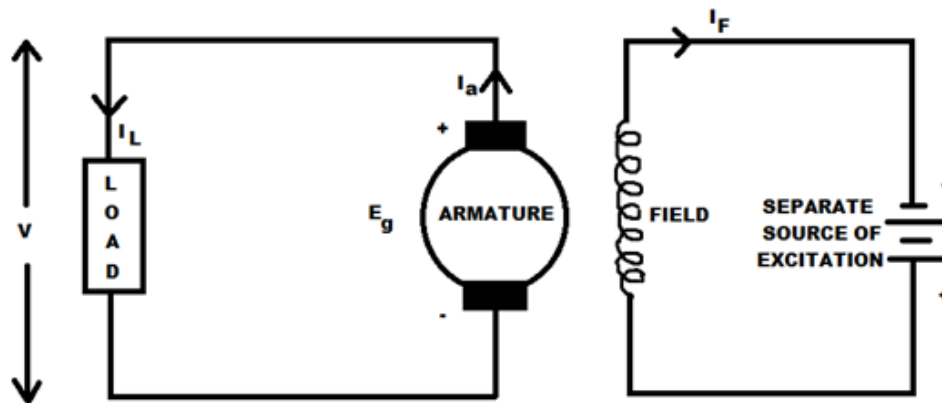


Separately Excited DC Generator

These are the generators whose field magnets are energized by an external dc source such as battery.

This type of DC generators is generally more expensive than self-excited DC generators because of their requirement of separate excitation source. Because of that their applications are restricted. They are generally used where the use of self-excited generators is unsatisfactory.

1. Because of their ability of giving wide range of voltage output, they are generally used for testing purpose in the laboratories.
2. Separately excited generators operate in a stable condition with any variation in field excitation. Because of this property they are used as supply source of DC motors, whose speeds are to be controlled for various applications. Example- Ward Leonard Systems of speed control.



Separately excited DC generator

Equations for separately excited DC generator:

$$I_a = I_L = I \text{ (for the output).}$$

So, the load voltage will be:

$$V = I \cdot R_a$$

Voltage Equation:

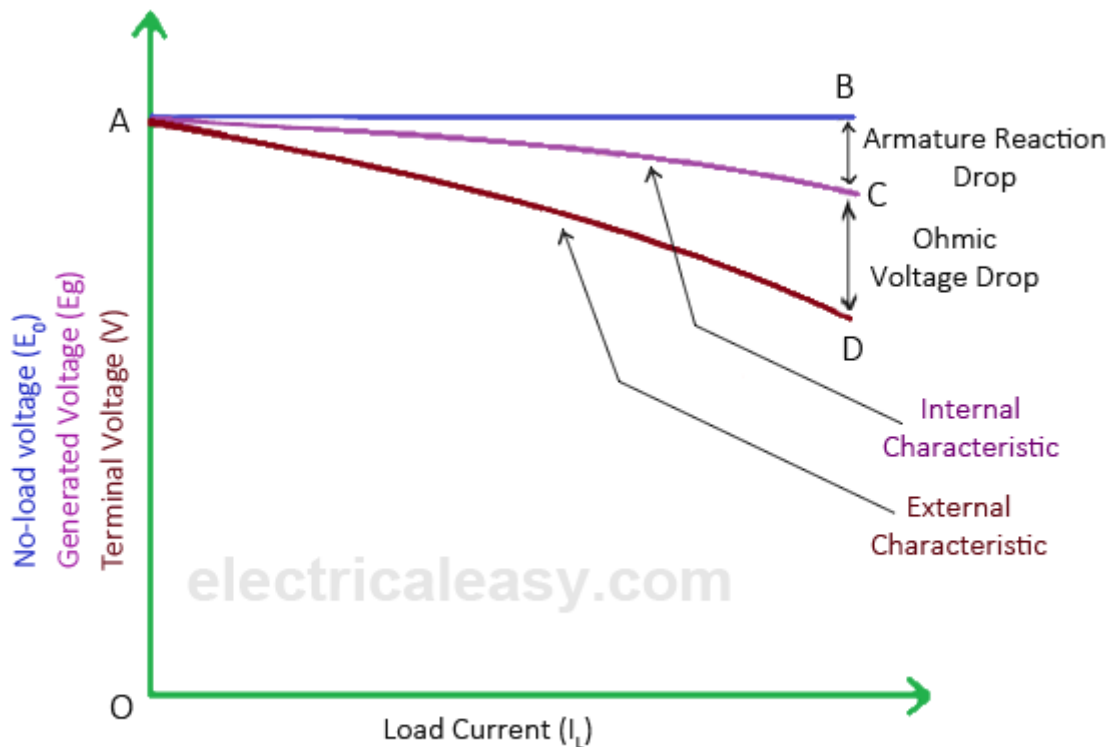
$$E_g = V + I_a R_a$$

And the generated power:

$$P_g = E_g \cdot I$$

So, the power delivered to the load:

$$P_{\text{load}} = V \cdot I$$



Characteristics of separately excited DC generator

If there is no armature reaction and armature voltage drop, the voltage will remain constant for any load current. Thus, the straight-line AB in above figure represents the no-load voltage vs. load current I_L . Due to the demagnetizing effect of [armature reaction](#), the on-load generated emf is less than the no-load voltage. The curve AC represents the on-load generated emf E_g vs. load current I_L . or internal characteristic (as $I_a = I_L$ for a separately excited dc generator). Also, the terminal voltage is lesser due to ohmic drop occurring in the armature and brushes. The curve AD represents the terminal voltage vs. load current or external characteristic.

Advantages/Disadvantages:

Separately excited DC generators have distinct advantages over self-excited DC generators. It can operate in stable condition with any field excitation and gives wide range of output voltage.

The main disadvantage of these kinds of generators is that it is more expensive to provide a separate excitation source.