

## Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method

Starting and speed control of a DC shunt motor can be achieved using two different methods: field flux control method and armature voltage control method. These methods provide precise control over the motor's starting and operating speeds, allowing for efficient and reliable operation in various applications.

### I. Field Flux Control Method:

In the field flux control method, the starting and speed control of a DC shunt motor is achieved by varying the field flux produced by the shunt field winding. By changing the field flux, the back electromotive force (EMF) induced in the armature can be adjusted, which in turn affects the motor's speed.

To understand the process, let's consider the starting procedure of a DC shunt motor using field flux control:

#### Starting:

When the motor is initially at rest, a high resistance is connected in series with the shunt field winding. This limits the current flowing through the field winding, resulting in a weak magnetic field. As a result, the back EMF induced in the armature is low, allowing a higher current to flow through it. This high armature current produces a strong torque, enabling the motor to start.

#### Speed Control:

Once the motor starts, the field resistance is gradually reduced to increase the field current and strengthen the magnetic field produced by the field winding. As the field flux increases, the back EMF in the armature also increases. Consequently, the armature current decreases, reducing the torque and hence, the speed of the motor. By adjusting the field current, the motor's speed can be controlled within a desired range.

#### Advantages of Field Flux Control Method:

Smooth starting: The gradual increase in field flux allows for a smooth and controlled starting of the motor, preventing any sudden mechanical stress.

Good speed regulation: The field flux control method provides excellent speed regulation over a wide range, making it suitable for applications requiring precise speed control.

High efficiency: As the field current is adjusted to control the motor speed, the overall efficiency of the motor remains high.

## II. Armature Voltage Control Method:

In the armature voltage control method, the starting and speed control of a DC shunt motor is achieved by varying the voltage applied to the motor's armature. By changing the armature voltage, the back EMF induced in the armature can be controlled, allowing for speed regulation.

Let's explore the starting procedure and speed control using the armature voltage control method:

### Starting:

During the starting process, a high resistance is connected in series with the armature to limit the current. This results in a low armature current and, consequently, a low back EMF. With a low back EMF, the motor experiences a high starting torque, enabling it to start rotating.

### Speed Control:

Once the motor starts, the resistance in series with the armature is gradually reduced, allowing a higher armature current to flow. As the armature current increases, the back EMF also increases, reducing the voltage drop across the armature resistance. The increased back EMF counteracts the applied voltage, leading to a decrease in the armature current and, consequently, the motor speed. By adjusting the armature voltage, the speed of the motor can be accurately controlled.

### Advantages of Armature Voltage Control Method:

Simple control mechanism: The armature voltage control method is relatively simple and involves adjusting the applied voltage to control the motor speed.

Wide speed range: This method allows for a wide range of speed control, making it suitable for applications requiring variable speed operation.

Cost-effective: The armature voltage control method does not require complex additional equipment, making it a cost-effective solution for speed control.

In conclusion, both the field flux control method and the armature voltage control method provide effective means of starting and controlling the speed of a DC shunt motor. While the field flux control method offers smooth starting and excellent speed regulation, the armature voltage control method provides a simple and cost-effective solution with a wide speed range. The choice between these methods depends on the specific application requirements and the desired level of control and efficiency.