# Chapter 11
# DC Servo Motor


## ABSTRACT

*In this chapter, the authors discuss the DC servo motor. They first described the basic definition of DC servo motor and how it is different from other types of motors. Then they discuss armature controlled DC servo motor, and field controlled servo motor. Modelling of DC servo motor is then discussed. At the end of the chapter, performance analysis from the transfer function and applications in control is discussed.*


The goal of this chapter is to discuss about DC Servo motor, its construction, working principal, and applications.

A Servo motor is essentially an assembly of four things:

1. DC motor
2. Gear reduction unit
3. Position sensing device, which may be potentiometer
4. Control circuit

The function of servo motor is to receive a control signal representing the desired position of the servo shaft and then apply it to DC motor unit. Then its shaft turns to desired position. Its shaft do not turn continuously like DC motor, but it runs through certain degrees up to 200° back and forth.

The DC motors used in servo system are:

1. Separately excited DC motors
2. Permanent magnet DC motors

A separately excited DC motor can be represented as shown in Figure 1.

The speed is usually controlled by armature voltage. The armature is designed to have large resistance so that torque-speed X-tics are linear and have negative slope as shown in Figure 2. Its armature field and main field are at right angle to each other, so a maximum torque is produced. The negative slope servo motors provided viscous damping for servo drive system.

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*Figure 1. Separately excited DC motor*

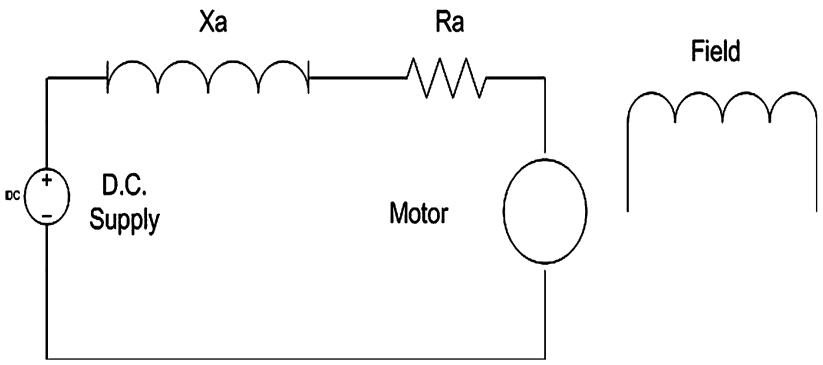
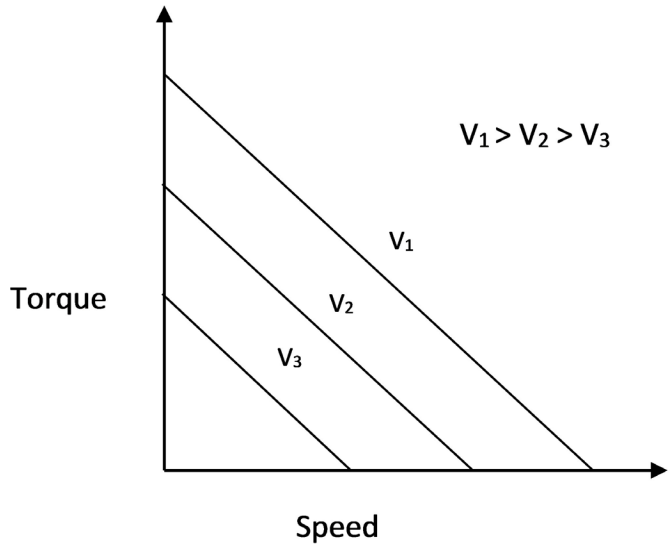



*Figure 2. Torque-Speed relationship at armature of DC motor*




DC servo motors vary in size from 0.05 up to 1000 hp. The fundamental characteristics of a DC motor are:

1. The motor output torque which is proportional to control voltage
2. The direction of torque is determined by the polarity of applied control voltage

We now discuss the types of servo motor.

## 11.1 TYPES OF SERVO MOTORS

There are two types of Servo Motor.