A shunt dc motor has a feedback mechanism that controls its speed. As armature rotates in a magnetic field, it induces electricity. This EMF is generated in reverse direction, thus limiting the armature current. So the current through the armature decreased and the speed of the motor is self-regulated. The shunt winding can't bear high current at starting like a series motor because of its fine wire build. So shunt motor are used to handle small load shaft load that only need low torque initially.

Motor speed

Speed is totally dependent on shaft load in series motors. In series motor, the load is inversely proportional to speed of armature. If the load is high, the armature will rotate at high speed. If the load is less, armature speed will increase. The speed of armature is infinity or uncontrolled with no load.

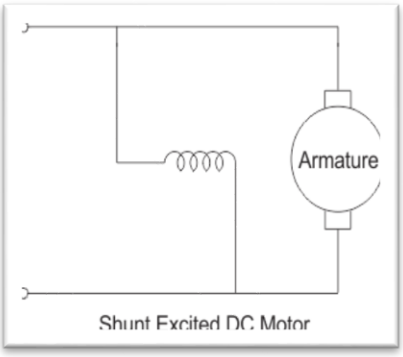
Unlike series motor, the speed of shunt motor is independent of shaft load. As the load to the motor increases, the speed of motor slows down instantaneously. Slowing down the speed reduces back EMF, which in turn increases the current in armature branch. This results in the increase of the motor speed. On the other hand, if the load is decreased, then motor speed will rise instantaneously. This in turn will increase the counter EMF, thus reducing the current to the motor. Gradually the motor will reduces its speed. As a result, the dc shunt motor is capable of maintaining a constant speed irrespective of load changes. Because of this feature, this motor is used for automotive and industrial purpose where fine precision of motor speed is required

Motor speed control

One can control the speed of motor in two ways

1) By varying the current supplied to the rotor
2) By varying the current supplied to the stator

Graph:



No Load to Loaded Condition:

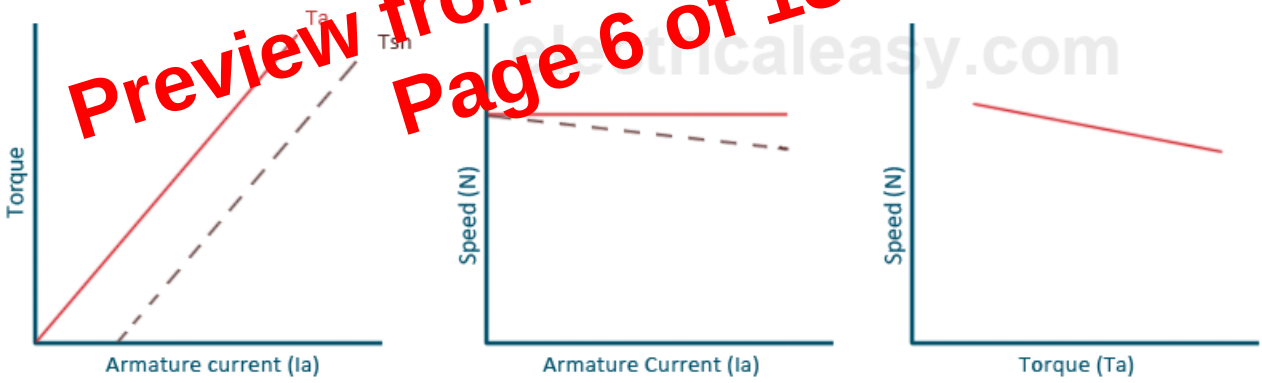
Characteristics of DC Shunt Motors

Torque vs. Armature Current (T_a-I_a)

In case of DC shunt motors we can assume the field flux Φ to be constant. Though at heavy loads, Φ decreases in a small amount due to increased armature reaction. But as we are neglecting the change in the flux Φ, we can say that torque is proportional to armature current. Hence the Ta-Ia characteristic for a dc shunt motor will be a straight line through origin. Since, heavy starting load needs heavy starting current, **shunt motor should never be started on a heavy load**.

Speed vs. Armature Current (N-I_a)

As flux Φ is assumed constant, we can say N α E_b. But, back EMF is also almost constant, the speed remains constant. But practically, Φ as well as E_b decreases with increase in load. But, the E_b decreases slightly more than Φ, and hence the speed decreases slightly. Generally, the speed decreases by 5 to 15% of full load speed only. And hence, **a shunt motor can be assumed as a constant speed motor**.



Characteristics of DC shunt motor

Application

This motor is used for automotive and industrial purpose where fine precision of motor speed and torque is required.