⇒ Conventional Speed control of DC Drives:-

A single motor can be used for different speeds for different works. Smooth speed control is possible in DC shunt motor.

The speed of DC motor is

$$N \propto \frac{E_b}{\phi} \text{ (or) } N \propto \frac{V - I_a R_a}{\phi}$$

$$N = \frac{K[V - I_a R_a]}{\phi}$$

⇒ Conventional Methods for DC Motor Speed Control:

The conventional Methods are

(i) Armature control Method:

By changing the resistance in the armature by using rheostat control is called Armature control method.

(ii) Field (or) Flux control method:

By changing the field flux (ϕ) is called the field (or) Flux control method.

(iii) Voltage control method

By varying the applied voltage is called voltage control method.

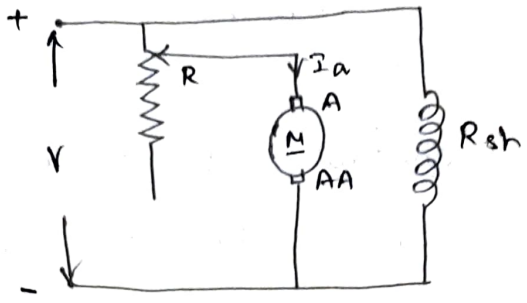
⇒ Speed control of DC shunt Motors:-

The methods are

(i) Armature control method
(ii) Field control method
(iii) Voltage control Method.

(6b)

(i) Armature control Method:



* A variable resistance 'R' is connected in series with armature circuit.
* Here the input voltage 'V' is constant.
* The speed of the motor can be controlled by varying the resistor.

The speed equation is

$$N \propto \frac{V - I_a(R_a + R)}{\phi}$$

* By increasing the controller resistance R, the Potential drop across the armature is decreased (because Ia decreases).
* Therefore the motor speed also decreases.
* This method of speed control is applicable only for speed less than No load speed (base speed) ∴ If N≤ the speed is dangerous

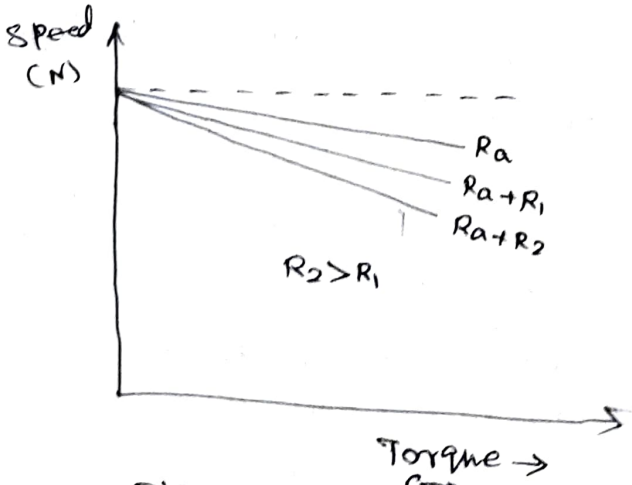


Fig: Speed.

* ~~B~~

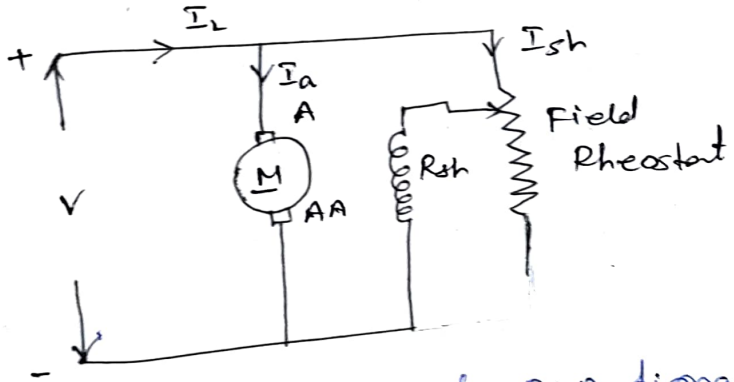
Advantages:

* simple method of speed control.

Disadvantages:

* Here, the input power is not charged (V*I). i.e input is constant. The output power is 'Eb.Ia'. It becomes less, ∴ for lower speeds more and more power is wasted in this controller resistance Hence this method of speed control is highly inefficient.
* charge in speed with the charge in load becomes large.

(ii) Field (or) Flux control Method:

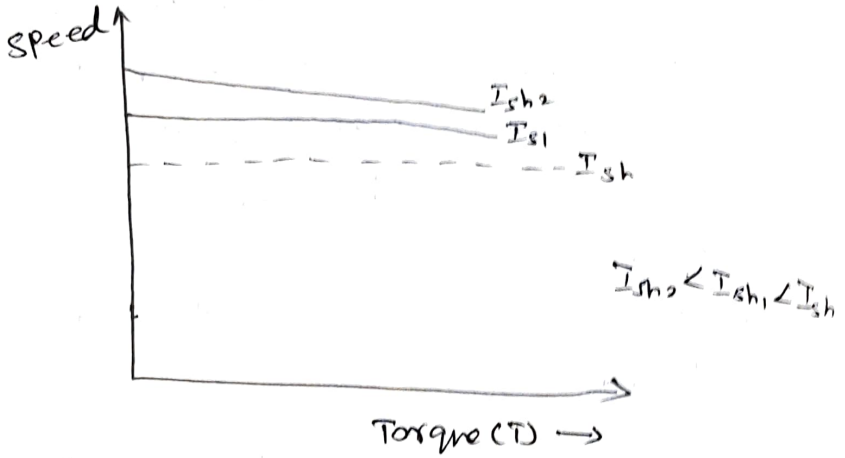


* The speed is inversely proportional to flux i.e

$$N \propto \frac{1}{\phi}$$

* By varying the flux, the motor speed can be varied.
* The flux of a DC motor can be changed by changing the field current (I_{sh}). It's obtained by a variable resistance connected in series with shunt field winding. $I_{sh} = \frac{V}{(R_{sh}+R)}$
* By varying the field circuit resistance, the shunt field current can only be decreased. i.e the flux will be decreased.

* Thus motor speed can be increased by decreasing the flux.
* This method of speed control can be used for increasing the speed of the motor above it's rated speed (based speed).



* Here, the field current I_{sh} is less. ∴ the shunt field rheostat has to carry only a small current and I^2R loss is also less.
* But this method of speed control can not be used to obtain large variations of speed.
* The main reasons is, the deterioration in commutation conditions that take place with increase in speed.

Advantages:

* Convenient and easy method
* little power is wasted as heat.
* speed is independent of load

Disadvantages:

* only speeds higher than the rated speed can be obtained.