reduces the risk of accidents to operator.

Disadvantage:

* Initial cost is high.

(c) Multi Motor Drive:

Here a separate motors are used for operating different parts of the same mechanism. e.g. in case of an overhead crane, different motors are used for hoisting (lift), long travel motion and cross travel motion.

* It's also essential in complicated metal cutting machine tools, paper making machines, rolling mills.

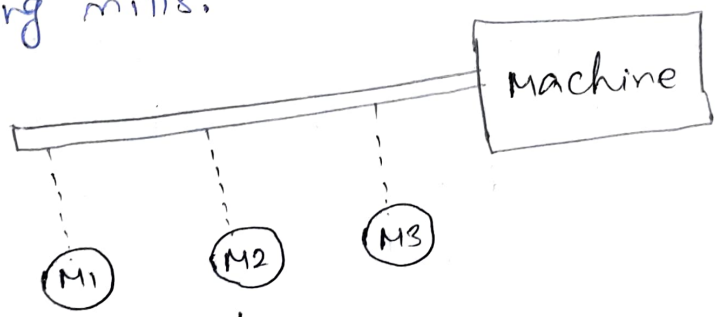


Fig: Multimotor Drive

⇒ Factors Influencing the choice of Drive:

Choice of Motors:

* In various designs the electric motors are available for the different application.
* If a reliable and efficiency motor is to be chosen the conditions of service must be exactly known.

The various factors are,

(i) Nature of electric supply
(ii) Type of drive
(iii) Nature of load
(iv) Electrical characteristics
  (a) Running characteristics
  (b) Starting characteristics
  (c) Speed control
  (d) Braking characteristics
(v) Mechanical considerations
  (a) Type of enclosures
  (b) Methods employed for transmission of power
  (c) Type of cooling
  (d) Noise level
  (e) Type of bearing
(vi) Service capability and rating
  (a) continuous, intermittent or variable load cycle.
  (b) over-load capacity and maximum torque
(vii) Cost
  (a) capital (or) Initial cost
  (b) Running cost. Power factor, losses, maintanance and depreciation etc
(viii) Appearance

<u>(i) Nature of electric supply.</u>

* The electric supply available may be 3φ AC (or) 1φ AC (or) DC.
* In case 3φ AC, Poly phase induction motors, squirrel cage type for small ratings and

(iii) Types of load.

The loads may be classified according to the speed-torque characteristics

(a) Loads requires constant torque at all speeds, as horizontal line I in Fig.

* Eg. cranes during hoisting, hoist winches, conveyers etc.

(b) Loads requires torque which may increase in direct proportion to the speed by straight line II

(c) Loads requires torque, which may increase with the square of speed by curve III. Eg. Blowers, Fans.

(d) Loads requires torque which may decrease with the increase in the speed by curve IV. eg lathes, boring machines, milling machines.

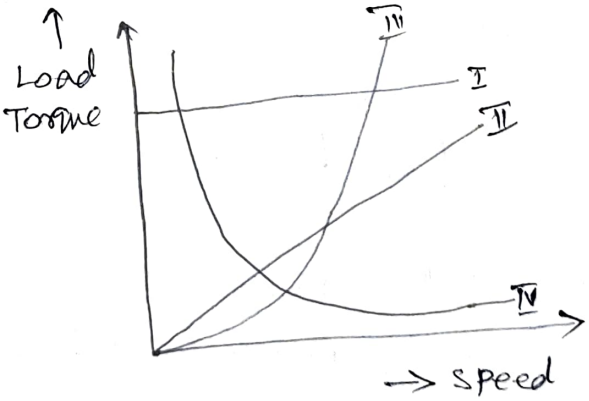


Fig: Torque with speed for different case.

(iii) Electrical characteristics-

(a) Running characteristics: (DC shunt Motor)

* If the applied voltage is kept constant, the field current will remain constant hence flux is maximum at No load but will decrease slightly due to armature reaction as the load in

* The speed of the DC motor is directly proportional to back emf and inversely proportional to the flux $\left[N \propto \frac{E_b}{\phi} = \frac{V - I_a R_a}{\phi}\right]$
* The Flux as considered as constant, with the increase in load current the speed slightly falls due to increase in voltage drop in armature.
* Voltage drop in the armature at full load is very small compared to applied voltage.
* The drop in speed from no load to full load is very small so it's constant speed motor.

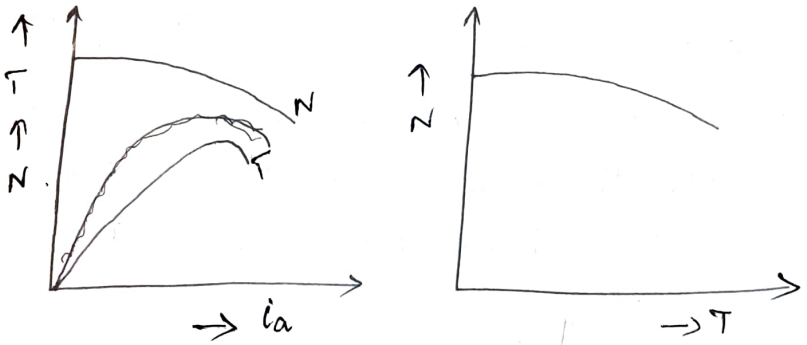
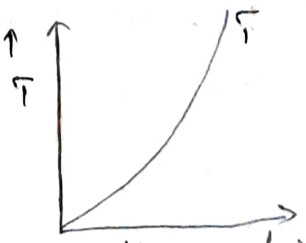


Fig:

(b) starting characteristics:

* In DC Motors, especially in series motor the torque is directly proportional to ϕI_a [i.e $T \propto \phi I_a$].
* Since the flux also changes proportional to the armature current (i.e $\phi \propto I_a$)
* so that the torque is proportional to the square of the armature current i.e $T \propto I_a^2$.
* Hence there will be a high starting torque for DC series motors.



(c) Braking characteristics

* If the load is removed from an electric motor and supply to it be disconnected, then motor will rotate for some time due to inertia.
* Infact, quick stopping of motor is more essential than quick starting.
* A delay in stopping a motor may result in heavy damage to equipment and even the loss of human life.

The braking system should be reliable and quick in it's action. There are two types of Braking,

(1) Mechanical Braking
(2) Electric Braking

(1) Mechanical Braking.

Here the stored energy is dissipated as heat by a brake shoe (or) brake lining which rubs against a brake drum.

(2) Electric Braking.

Here the stored energy of rotating part is converted into electrical energy and dissipated by the resistance in the form of heat or returned to the supply.

(ii) Mechanical considerations:

(a) Types of enclosures.

The different types of enclosures are.

* open type
* Screen protected type
* Drip. Proof type
* splash - Proof type

* Frame
* Totally enclosed type
* Pipe - Ventilated type

(b) Methods employed for transmission of Power.

The ways of transmitting mechanical Power developed by a motor to a mechanism

Direct Drive - Motor is directly coupled with driven mechanism. It's 100% efficient and Protected.

Belt Drive - Flat belts are used for line shaft drives and can transmit a max power of about 250kW.

Rope Drive - It's used where the power is beyond the scope of belt drive.

Chain drive - This is expensive but more efficient and capable of transmitting larger amounts of power.

gear drive - It's used when a high speed motor is to drive low speed machine. The coupling is done by suitable ratio gear box

(c) Type of cooling -

There are two types of coolings.

(i) Natural cooling

(ii) Artificial cooling

* Air artificial cooling
* Oil artificial cooling

(d) Motor capacity and rating.

Continuous Rating - The output of a motor which can be delivered continuously for long periods without exceeding the