SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19EC309 ELECTRICAL MACHINES AND POWER SYSTEMS

II YEAR / 03 SEMESTER MECH & MCT

Unit 4 – SPECIAL MACHINES

AC Series Motor

AC Series Motor

- Due to the desirable Torque-speed characteristics, the series motor is exclusively used in traction applications.

- DC series motor satisfy all requirements for this kind of work and services but the transmission of ac power is more economical than dc. This has lead to the development of the **AC series motor**.

- This motor is a kind of motor which construction is done to work on both DC and AC single-phase supply.

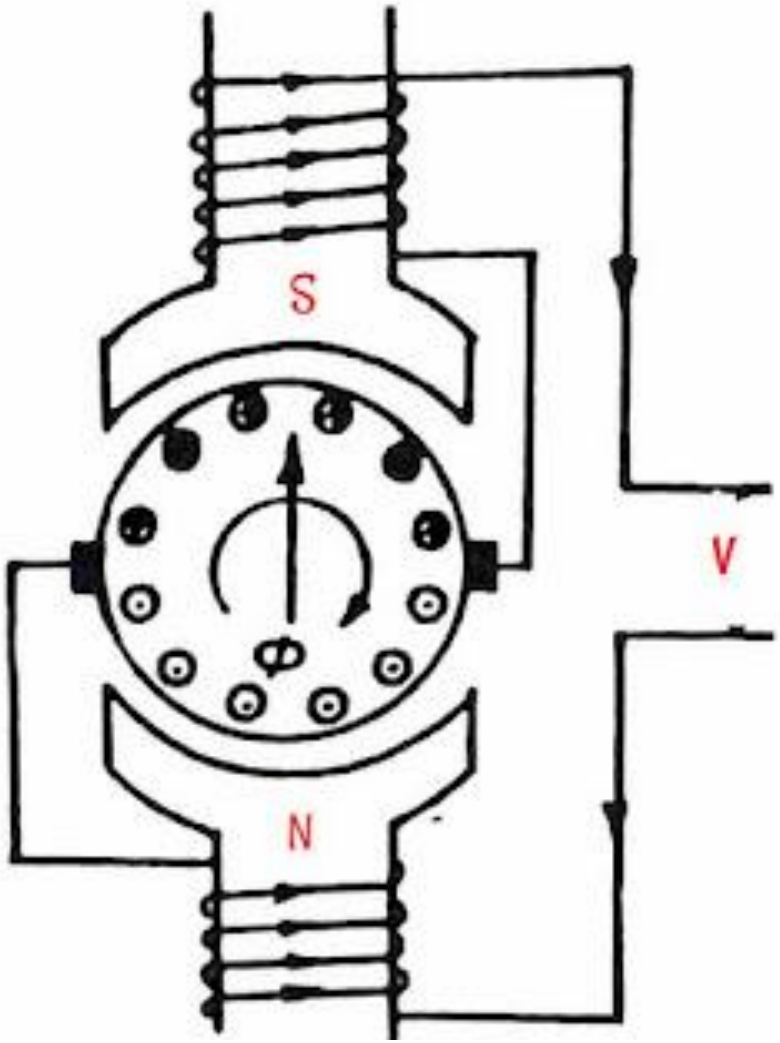
- The working principle is the same as the DC series motor and has advantages of the dc series motor like high torque.

- The DC motor which runs on alternating supply called an **Ac series motor.** However, some changes must be made in the DC series motor that is to operate satisfactorily on alternating supply.

Construction of AC series Motor

The construction of the ac series motor is very identical to the dc series motor except for some changes,

- ✓The magnetic circuit must be laminated to reduce eddy current losses.
- ✓Field circuit must be designed for much lower reactance than dc motor field in order to reduce the reactance voltage drop of field and improve power factor.
- ✓Distributed compensation winding is required to minimize the reactance of armature winding.
- ✓
- ✓The compensating winding may be connected in series with the field and armature winding called conductively compensated and conductively compensation required armature which is designed to operate on ac and dc voltage.
- ✓If compensation winding short-circuited to itself and received excitation voltage by transformer action called inductively coupled.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Working Principle of AC Series motor

- ✓It is same as the dc series motor. When the ac series motor connected to the AC supply the alternating current start flowing through the field and armature winding.
- ✓The field winding produces an alternating flux Φ that reacts with current flowing in armature winding to produce a torque.
- ✓Since both armature and field current reverse simultaneously, the torque always produced in the same direction.

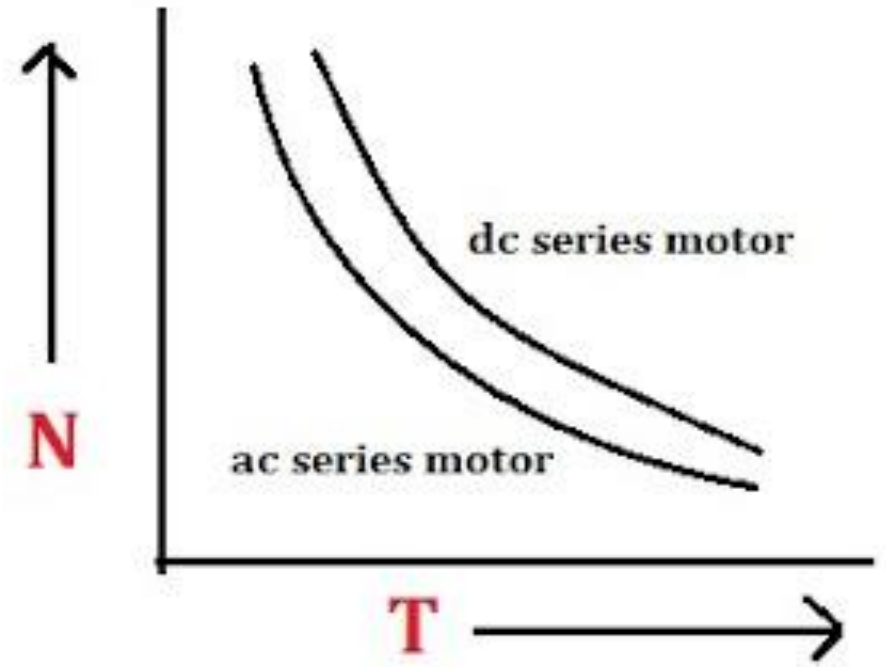
Motor particularly designed to run on DC power suffers following drawbacks when it started on a single-phase ac supply.

- Its efficiency is low due to hysteresis and eddy current losses.
- Its Power factor is low due to the large reactance of field and armature winding.
- Sparking at the brushes is more.

To run efficiently on ac supply following constructional modifications are done.

- Field core is constructed using a material that has low hysteresis losses and it laminated to reduced eddy current.
- The field winding is constructed with small numbers of turns due to this pole area increase and flux density decreases this reduced iron losses and reactive voltage drop.
- The number of armature conductors increases to achieve the required torque with low flux.
- Compensation winding is used to reduced armature reaction and increase commutation.

Characteristics



Application

- High-speed vacuum cleaner
- Sewing machines
- Used in drills and power tools
- Electric shavers