SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME: 23EEB210 / Electrical Machines and Drives

II YEAR / IV SEMESTER

Unit II – ELECTRICAL MOTORS

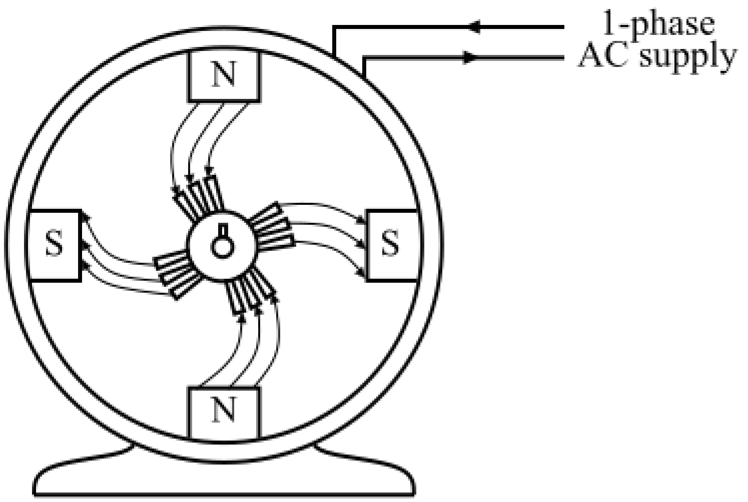
Topic : RELUCTANCE MOTOR

RELUCTANCE MOTOR

- The reluctance motor is a 1-phase synchronous motor which does not require DC excitation to the rotor.
- Principle –"When a piece of ferromagnetic material is located in a magnetic field, a force is acted upon the material that tending to align the material to the magnetic field so that the reluctance of the magnetic path is minimum."

CONSTRUCTION

- The reluctance motor consists of a stator and a squirrel-cage rotor.
- The stator is carrying a 1-phase main winding along with an auxiliary winding to produce a synchronously revolving magnetic field.
- The rotor has an unsymmetrical magnetic construction. The unsymmetrical construction of the rotor is achieved by removing some of the teeth from the squirrel-cage rotor to produce salient poles on the rotor.



WORKING

- The rotor is the rotating part of the synchronous motor. It has a cylindrical shape and holds the field winding.
- When a single-phase AC supply is fed to the stator winding, a synchronously revolving magnetic field is produced and the motor starts as a standard squirrel-cage induction motor and will accelerate to near the synchronous speed.
- When the rotor approaches the synchronous speed, the rotating magnetic field of the stator will exert reluctance torque on the salient poles of the rotor which tends to align the salient-pole axis with the axis of the rotating magnetic field.
- At some position, the salient poles of the rotor lock with the poles of the revolving magnetic field. As a result, the motor will continue to run at the synchronous speed.

WORKING

- When a mechanical load is applied to the motor, the poles of the rotor fall slightly behind the poles of the stator, while continuing to run at synchronous speed.
- With the increase in the load on the motor, the mechanical angle between the rotor and stator poles increases progressively. Nevertheless, the magnetic attraction keeps the rotor locked with the rotating magnetic field of the stator.
- If the load on the motor shaft is increased beyond the amount under which the reluctance torque can maintain synchronous speed, then the rotor drops out of the step with revolving magnetic field and hence, the speed of the motor drops to some value at which the slip is sufficient to develop the necessary torque to drive the load by the induction motor action.

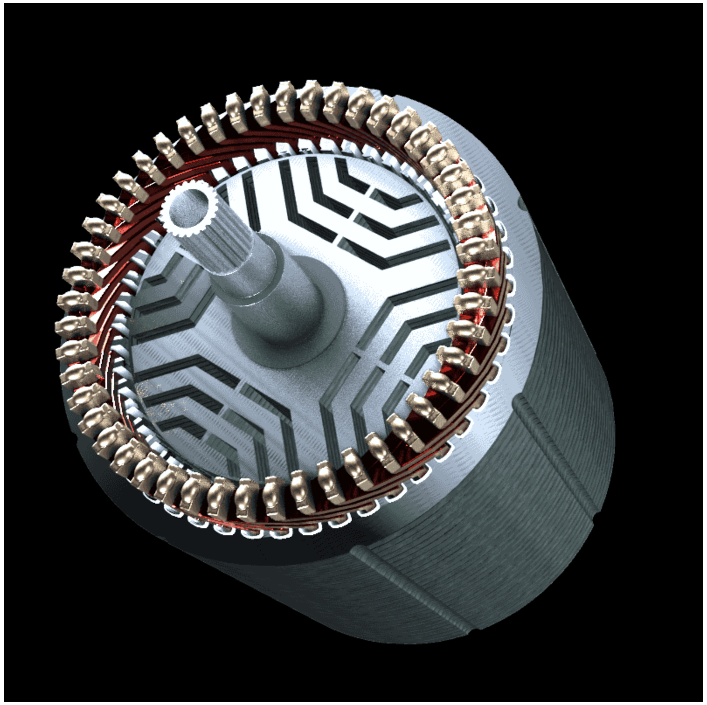
CHARACTERISTICS

- Reluctance motors have poor efficiency and torque.
- Reluctance motors have low power factor.
- Reluctance motors cannot accelerate high inertia loads to the synchronous speed.
- Reluctance motors are cheaper than any other kind of synchronous motors.

TYPES - Switched Reluctance Motor

- The stator and the rotor of the switched reluctance motor consist of salient poles.
- The stator has a concentrated winding, which means that each tooth carries one winding.
- As a rule, the number of poles in the stator is greater than that of the rotor. A typical combination is 6/4, i.e. 6 stator poles and 4 rotor poles.
- These motor phase windings are isolated electrically with each other and result in higher fault tolerance as compared with AC induction motor driven by an inverter.

TYPES - Synchronous Reluctance Motor



- These motors run precisely at synchronous speed and this can be achieved with the help of a three-phase stator winding as well as a rotor to implement salient rotor poles & inner magnetic flux walls.
- The rotor frequently executes a modified squirrel cage in the region of salient poles, so that it helps from the effect of induction to turn into self-starting.
- Once the motor activates, it is moved near to synchronous speeds through induction, after that it locks into synchronization through the reluctance torque.

APPLICATIONS

- Signaling Devices
- Control Devices
- Automatic regulators
- Recording Devices
- Clocks
- Tele printers
- Gramophones
- Analog electric meters
- Electric vehicles
- Power tools like drill lathes, band saws & presses

ADVANTAGES

- It doesn’t require DC supply.
- Stable characteristics
- Maintenance is less
- Less heat
- No magnets
- Speed control

DISADVANTAGES

- Efficiency is less
- Power factor is poor
- Frequency control
- The capacity of these motors is less to drive the loads
- Less inertia rotor is required.

KEEP LEARNING.

Thank u

SEE YOU IN NEXT CLASS