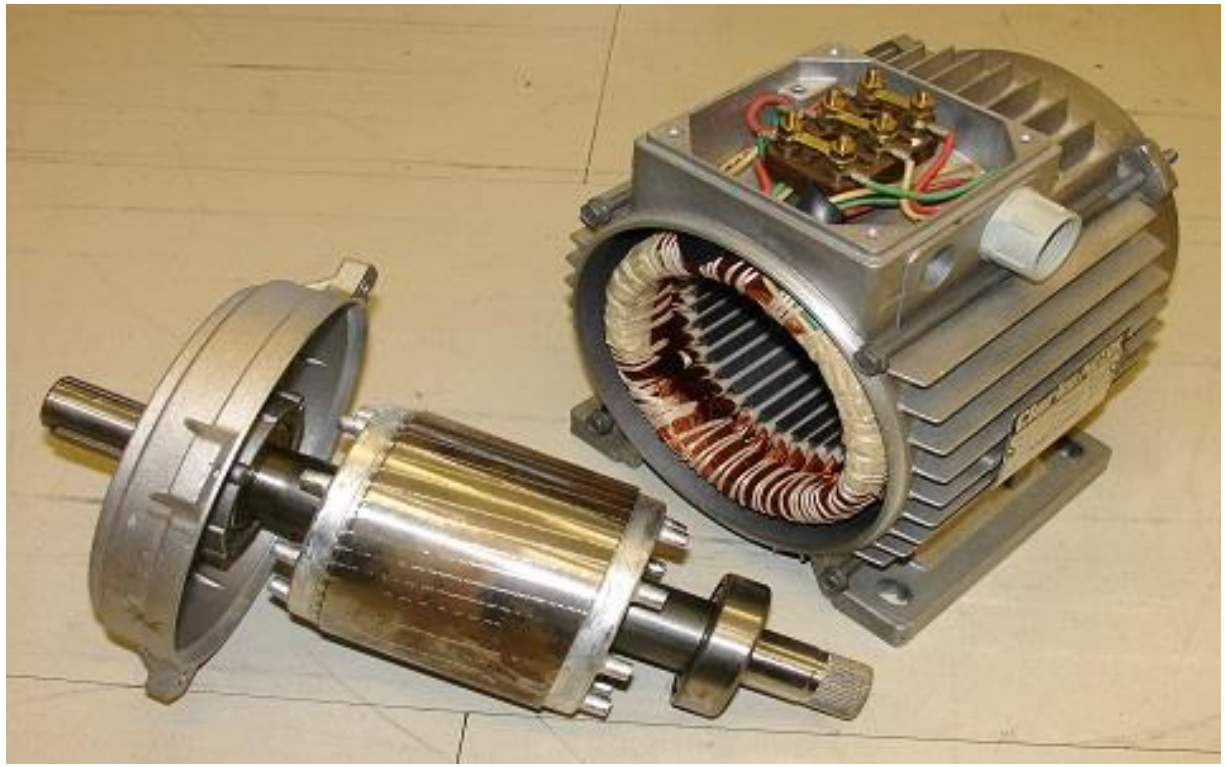
Course Code - EEE-401
Course Title – Energy Conversion and Special Machine
Lecture- Hysteresis Motor

Hysteresis Motor

Hysteresis Motor

- A Hysteresis motor is a type of synchronous motor in which the rotor consists of a central nonmagnetic core upon which rings of magnetically hard material are mounted**.**
- The operation of hysteresis motor depends upon effect of hysteresis.
- The rotor magnetic field lags behind by the stator magnetizing force in this motor.



Types of Hysteresis Motor

- Cylindrical hysteresis motors
- Disk hysteresis motors
- Circumferential-Field hysteresis motor
- Axial-Field hysteresis motor

Construction of Hysteresis Motor

Construction of Hysteresis Motor

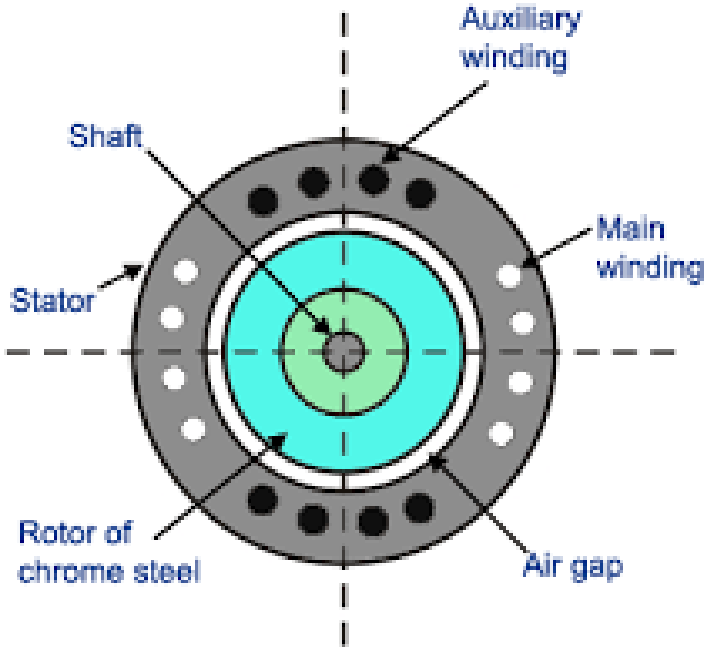
- It’s stator has two windings(main winding and auxiliary winding) which remain connected to the single-phase supply continuously both at starting as well as during the running of the motor.
- These two winding generate rotating magnetic field due to single phase supply.

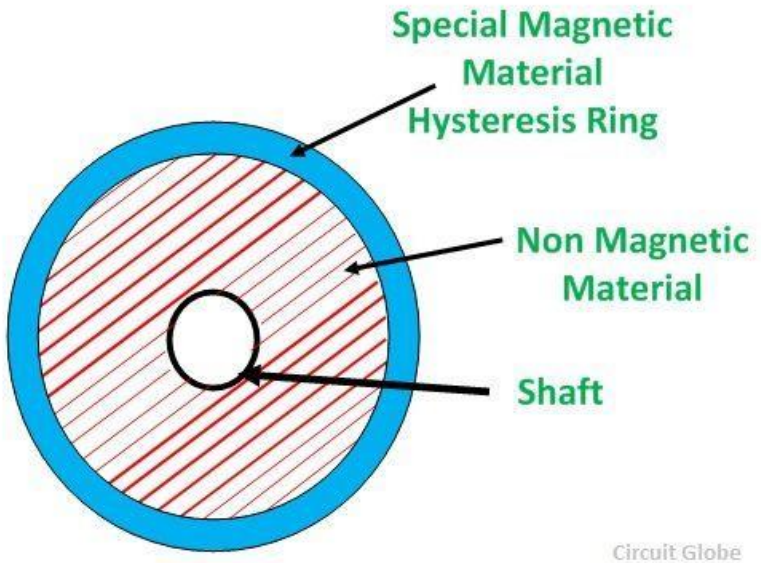
- The rotor is a smooth chrome-steel cylinder having high retentivity so that the hysteresis loss is high. It has no winding.

- Because of high retentivity of the rotor material, it is very difficult to change the magnetic polarities once they are induced in the rotor by the revolving flux.

- The rotor revolves synchronously because the rotor poles magnetically lock up with the revolving stator poles of opposite polarity.

- It consists of two or more rings at outer side and cross bars.
- However, the rotor poles always lag behind the stator poles by an angle α.

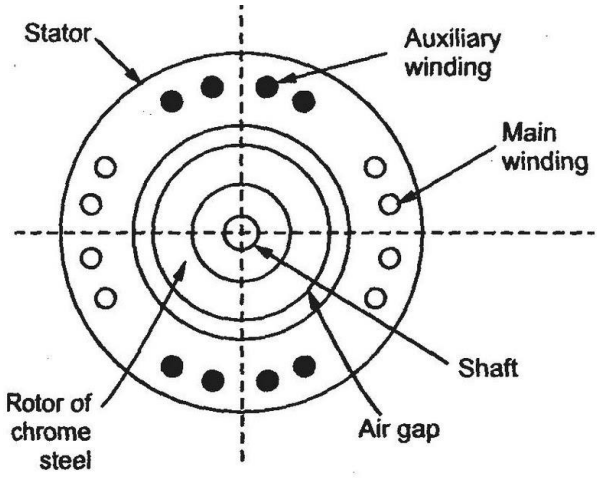


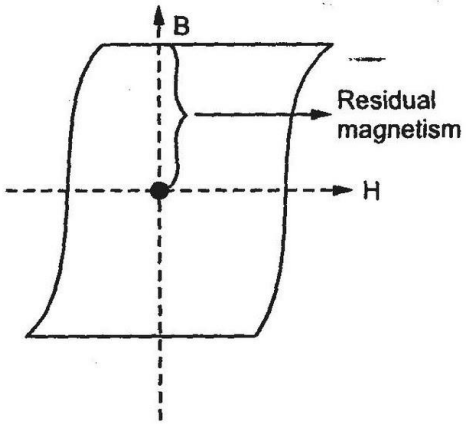


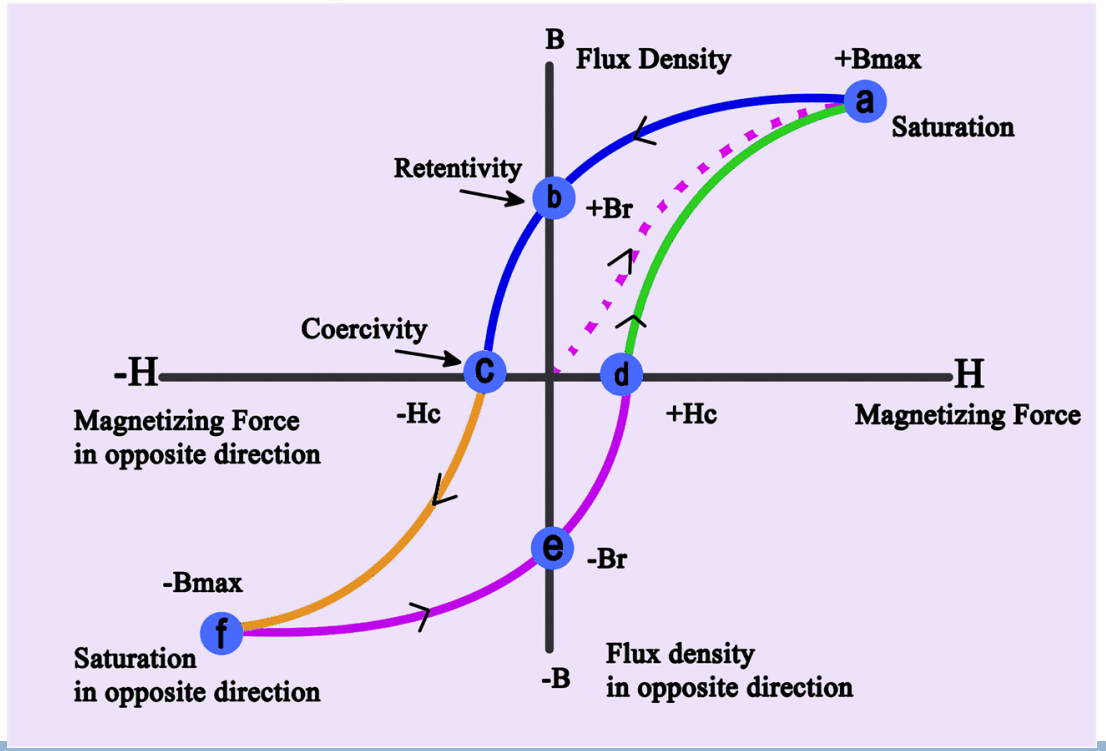
Working principle of Hysteresis Motor

Working principle of Hysteresis Motor At the Starting Condition

- When stator is energized with single phase AC supply, rotating magnetic field is produced in stator.
- To maintain the rotating magnetic field the main and auxiliary windings must be supplied continuously at start as well as in running conditions.
- At the starting, by induction phenomenon, secondary voltage is induced in the rotor by stator rotating magnetic field.
- Thus eddy current torque is developed along with the hysteresis torque in the rotor. Hysteresis torque in the rotor develops as the rotor magnetic material is with high hysteresis loss property and high retentivity.
- So it can be said that when the rotor starts to rotate with the help of these eddy current torque due to induction phenomenon, it behalves like a single phase induction motor.







Working principle of Hysteresis Motor

Working principle of Hysteresis Motor
At Steady State Running Condition

1. When the speed of the rotor reaches near about the synchronous speed, the relative motion between stator field and rotor field vanishes. Hence no eddy current to generate in the rotor Thus the torque due to eddy-currents vanishes.

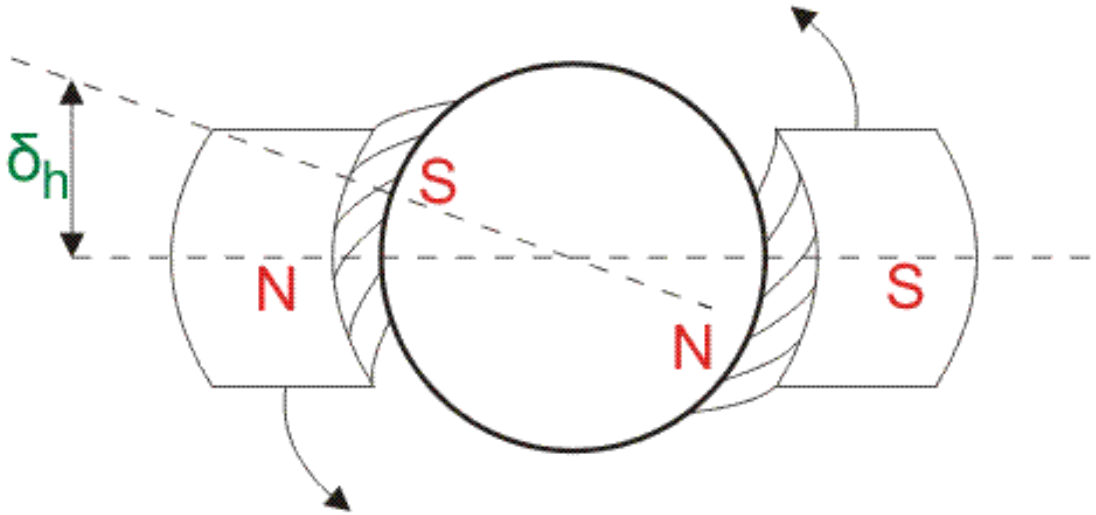
2. At the time stator produces poles on the rotor by induction thus rotor behaves as a permanent magnet.

3. So the induced rotor pole axis lags the rotating magnetic field axis of the stator at an angle δh.

4. The high retentivity enables the continuous magnetic locking between stator and rotor and thus the motor rotates at synchronous speed.

5. The rotor poles are attracted towards the moving stator poles and runs at synchronous speed.

6. As there is no slip at steady state running condition, only hysteresis torque is present to keep the rotor running at synchronous speed



Advantages, disadvantages and application of Hysteresis Motor

Advantages

- As no teeth and no winding in rotor, no mechanical vibrations take place during its operation.
- Its operation is quiet and noiseless as there is no vibration.
- It is suitable to accelerate inertia loads.
- Multi-speed operation can be achieved by employing gear train.

Disadvantages

- Hysteresis motor has poor output that is one-quarter of output of an induction motor with same dimension.
- Low efficiency
- Low torque.
- Low power factor
- This type of motor is available in very small size only.

Application of Hysteresis Motor

- Sound producing equipment
- Sound recording instruments
- High quality record players
- Timing devices
- Electric clocks
- Teleprinters