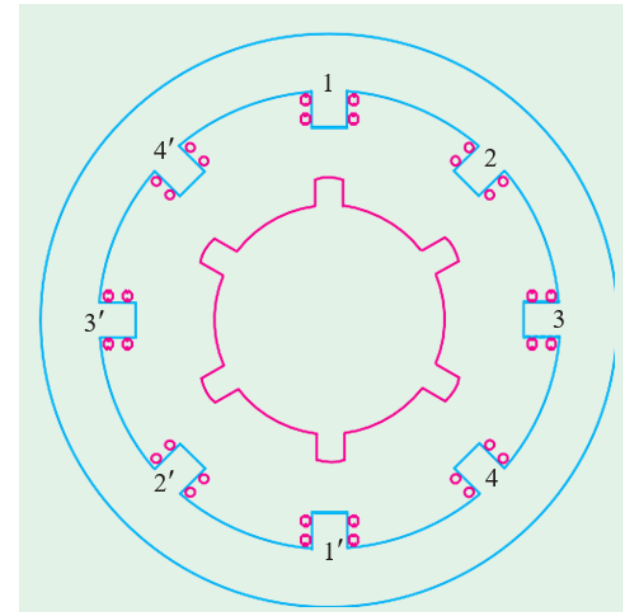
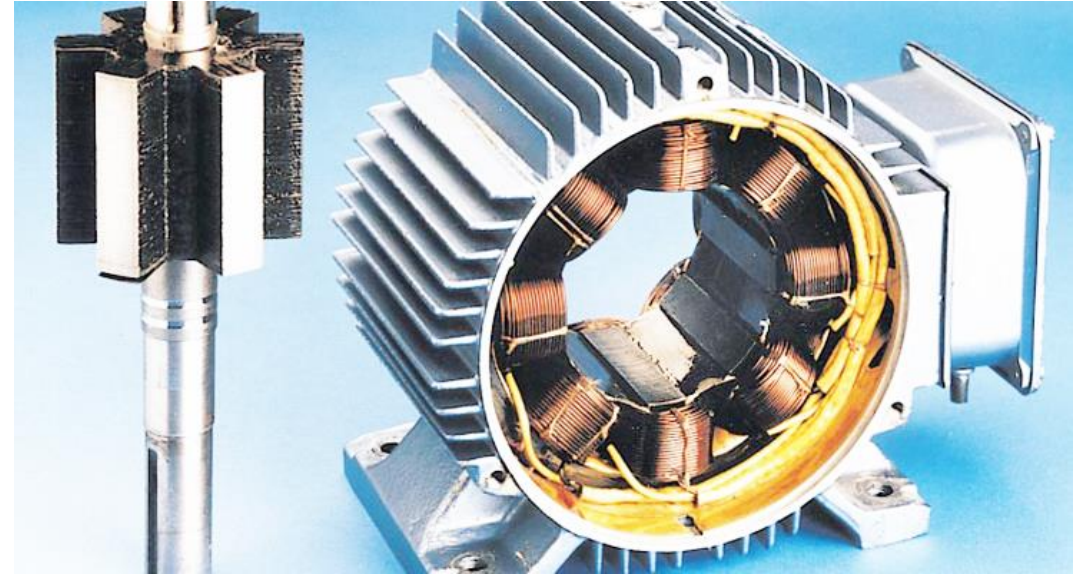


**Course Code - EEE-401**  
**Course Title – Energy Conversion and  
Special Machine**  
**Lecture- Switch Reluctance Motor**

# Switch Reluctance Motor

## Switch Reluctance Motor Construction

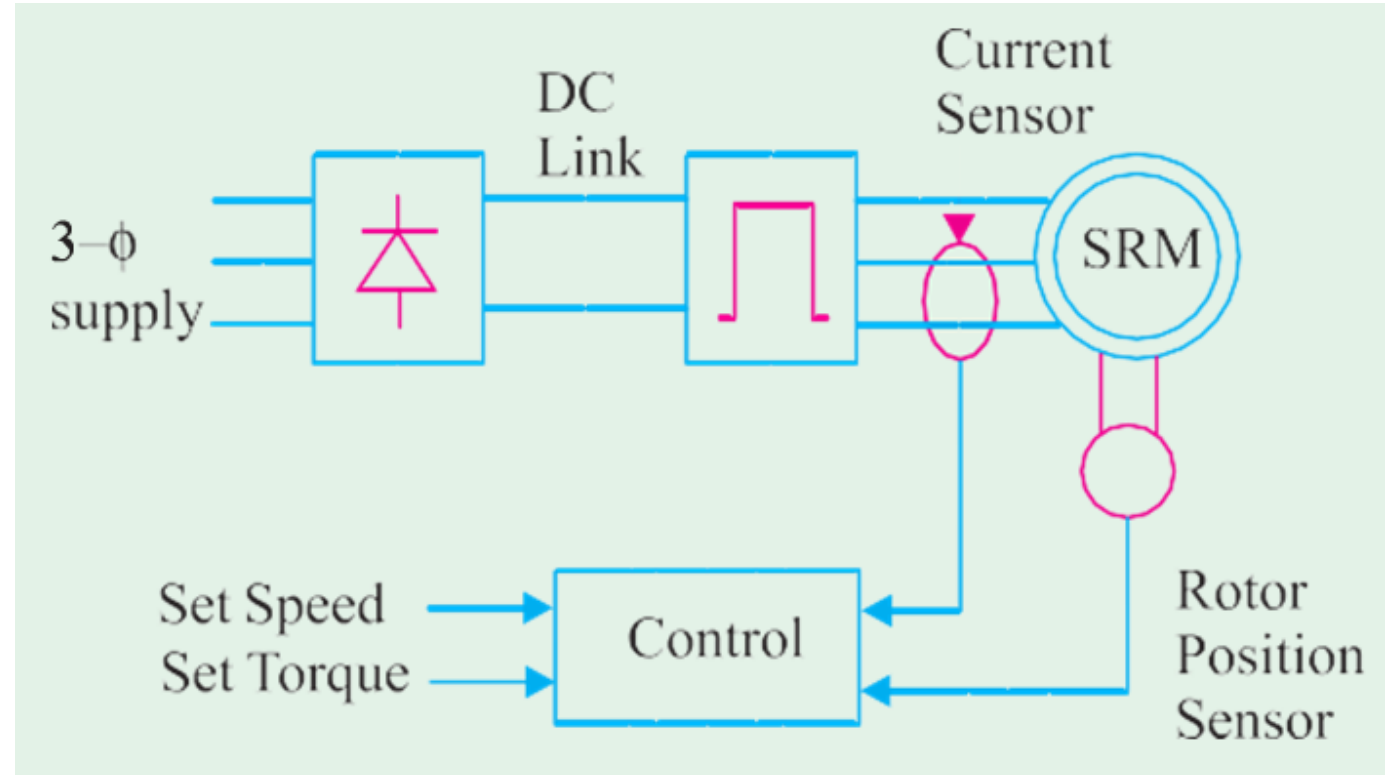
- Unlike a conventional synchronous motor, both the rotor and stator of a SR motor have salient poles as shown in Fig.
- This doubly-salient arrangement is very effective for electromagnetic energy conversion.
- The stator carries coils on each pole, the coils on opposite poles being connected in series.
- The eight stator coils shown in Figure are grouped to form four phases which are independently energized from a four-phase converter.
- The laminated rotor has no windings or magnets and is, therefore cheap to manufacture and extremely robust.
- The motor shown in Fig. has eight stator poles and six rotor poles which is a widely-used arrangement although other pole combinations (like 6/4 poles) are used to suit different applications.



# Switch Reluctance Motor

## Switch Reluctance Motor Working

- Usual arrangement is to energize stator coils sequentially with a single pulse of current at high speed.
- However, at starting and low speed, a current-chopper type control is used to limit the coil current.
- The motor rotates in the anticlockwise direction when the stator phases are energized in the sequence 1, 2, 3, 4 and in clockwise direction when energized in the sequence 1, 4, 3, 2.
- When the stator coils are energized, the nearest pair of rotor poles is pulled into alignment with the appropriate stator poles by reluctance torque.
- Closed-loop control is essential to optimize the switching angles of the applied coil voltages. The stator phases are switched by signals derived from a shaft-mounted rotor position detectors such as Hall-effect devices or optical sensors Fig.
- This causes the behavior of the SR motor to resemble that of a dc motor.



# Advantages and Disadvantages of Switch Reluctance Motor

## Advantages

- Higher efficiency
- More power per unit weight and volume
- Very robust because rotor has no windings or slip rings
- Can run at very high speed (up to 30,000 rpm) in hazardous atmospheres
- Has versatile and flexible drive features and
- Four-quadrant operation is possible with appropriate drive circuitry.

## Disadvantages

- Torque ripple
- Noisy and
- Not well-suited for smooth torque production.

## Application

- General purpose industrial drives
- Traction
- Domestic appliances like food processors, vacuum cleaners and washing machines etc., and
- Office and business equipment.

# Comparison between VR Stepper Motor and SR Motor

## Comparison between VR Stepper Motor and SR Motor

VR Stepper	SR Motor
<ul style="list-style-type: none"><li>• It rotates in steps.</li><li>• It is designed first and foremost for open-loop operation.</li><li>• Its rotor poles are made of ferromagnetic material.</li><li>• It is capable of half-step operation and micro-stepping.</li><li>• Has low power rating.</li><li>• Has lower efficiency</li></ul>	<ul style="list-style-type: none"><li>• It is meant for continuous rotation.</li><li>• Closed-loop control is essential for its optimal working.</li><li>• Its rotor poles are also made of ferromagnetic material.</li><li>• It is not designed for this purpose.</li><li>• Has power ratings up to 75 kW (100 hp).</li><li>• Has higher overall efficiency.</li></ul>