SNS College of Technology,
Coimbatore-35

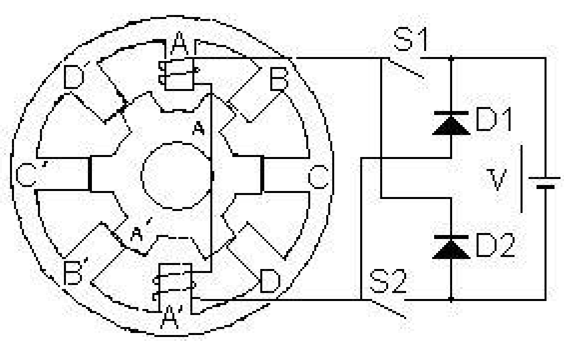
19MEE402 Hybrid Technology

UNIT 3-REQUIREMENTS IN HYBRID AND ELECTRIC VEHICLES

Switched Reluctance Motor

Switched reluctance motors (SRMs) are electromagnetic devices that convert electrical energy into mechanical motion. Here's a brief overview of their working, advantages, disadvantages, and applications:

Switched Reluctance Motor Components:



Stator:

The stator is the stationary part of the motor and contains coil windings. When electric current flows through these windings, it produces a magnetic field.

Rotor:

The rotor is the moving part of the motor. It typically consists of salient poles that are attracted to the stator poles when the corresponding phase is energized.

Phases:

SRMs have multiple phases, each with its own set of stator windings. The phases are energized sequentially to create a rotating magnetic field and drive the rotor.

Switching Electronics:

Control electronics determine the timing and sequence of switching the phases.This precise control is crucial for optimal motor performance.

Position Sensor:

Some SRMs may include position sensors to provide feedback for accurate control of the rotor's position.

Basic Switching Sequence:

Phase 1:

Current flows through the windings of Phase 1, creating a magnetic field that attracts the rotor poles.

Phase 2:

After a specific duration, the current is switched to Phase 2, causing the rotor to align with the new magnetic field.

Sequential Phases:

This process continues through the different phases, producing a continuous rotation of the rotor.

Remember, the actual design and complexity may vary based on the specific type and application of the SRM. The control electronics play a crucial role in determining the switching sequence and timing to achieve efficient operation.

Working:

SRMs operate on the principle of magnetic reluctance. The rotor tends to align with the minimum magnetic reluctance path.

Phases:

They typically have a simple structure with a wound stator and a salient-pole rotor without any windings.

Control:

Control is achieved by switching phases to create a magnetic path for the rotor. Precise timing of these switches is crucial for optimal performance.

Advantages:

Simplicity:

SRMs have a simpler mechanical structure compared to some other motor types, leading to easier maintenance.

High Torque Density:

They can provide high torque density, making them suitable for applications requiring high torque in a compact design.

Robustness:

SRMs can be robust in harsh environments due to their simple construction and lack of sensitive components like permanent magnets.

High Temperature Tolerance:

SRMs can handle higher temperatures compared to certain motor types, making them suitable for applications in demanding conditions.

Disadvantages:

Vibration and Noise:

SRMs may produce more vibration and noise compared to some other motor types, affecting their suitability for noise-sensitive applications.

Complex Control:

Achieving optimal performance requires complex control algorithms, which can add to the overall system complexity.

Lower Efficiency at Partial Loads:

SRMs might exhibit lower efficiency at partial loads compared to some other motor types, impacting their performance in certain applications.

Applications:

Industrial Drives:

SRMs find applications in industrial drives, especially where variable speed and high torque are required.

Electric Vehicles (EVs):

Due to their high torque density, SRMs are considered in electric vehicle applications where space and weight are critical factors.

Appliances:

Some household appliances and HVAC systems may use SRMs due to their simplicity and reliability.

Pumps and Fans:

SRMs can be suitable for applications like pumps and fans where variable speed operation and efficiency are crucial.