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Version Number:

Team Members: **01**

Team No:

Module: **Design and Stimulation of Circuits and Embedded Systems**

Version Number:

Team Members :

Team No:

Module: Model Based System Engineering

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| **Ver. Rel. No.** | **Release Date** | **Prepared By** | **Reviewed By** | **Approved By** | **Remarks/Revision Details** |
| 1 | 20/02/2022 | KOUSHIKA B |  |  |  |
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**Document History**

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**CASE STUDY – SWITCHED RELUCTANCE MOTOR(SRM)**

**INTRODUCTION**

An electrical machine is a device which does electromechanical energy conversion. It is of two types, AC and DC machines. In order to overcome the difficulties in those machines, special electrical machines have been designed based on the requirements. Among the special electrical machines, Switched Reluctance Motor(SRM) can be used in various application such as electric vehicles and wind energy systems due to its good performance characteristics.

**RESEARCH**

This project aims to overcome the drawbacks of the AC and DC motors. It also aims to improve the efficiency of the motor. . Switched Reluctance Motor requires a sensor for the rotor position combined with a feedback loop to operate smoothly. The feedback loop compares the actual current and rotor position to send signal and adjusts for the difference, a typical SRM operation. It is due to this requirement of fast electronics that these motors recently have gained popularity again, due to the great break through in fast electronics.

**FEATURES**

* Continuously rotating motor
* Run at high speed about 2×105 rpm
* Control of one phase is independent of another phases
* Speed control is simple

**COST**

High Cost - Cost required to do the prototype of Switched Reluctance Motor(SRM) will be high.

**ADVANTAGES**

* Rotor has no windings, commutators or brushes
* Torque –inertia ratio is high
* Fast response, ruggedness, fault tolerance

**DISADVANTAGES**

* Torque ripple
* Acoustic noise

**APPLICATIONS**

* Electric Vehicles
* Conveyors
* Compressors

**SWORT ANALYSIS**

**Strength**

* High reliability
* Wide speed range
* Low cost

**Weakness**

* Rotor position sensor is required
* Torque ripples are high

**Opportunities**

* Electric Vehicles
* Drilling machine
* Vacuum cleaner

**Threats**

* Acoustic noise
* Vibration

**5W’s and 1H**

* **What?** – Switched Reluctance Motor(SRM)
* **Where?** – Electric Vehicles, Washing machine, Vacuum Cleaner, etc.,
* **Who?** – Users are industrialists, public people, etc.,
* **Why?** – For the conversion of electrical energy into mechanical energy
* **When? –** During the need of the people
* **How? –** Microcontroller collects the information gathered by the position sensor and reference speed. It sends the information as signal to the 3 phase inverter. According to the signal, 3 phase inverter rotates the motor.

**REQUIREMENTS**

**High Level Requirements**

* HLR01 - Converts electrical energy into mechanical energy
* HLR02 - Run continuously
* HLR03 - Simple speed control
* HLR04 – Run at high speed
* HLR05 – Simple phase control

**Low Level Requirements**

* LLR01 – Manual ON and OFF
* LLR02 – Inverter for converting DC power supply into AC
* LLR03 – Position Sensor to sense the position of the rotor

**DESIGN**

**BLOCK DIAGRAM**

3 PHASE INVERTER

DC POWER SUPPLY

REFERENCE SPEED

POSITION SENSOR

MICROCONTROLLER

**COMPONENTS DESCRIPTION**

**3 Phase Inverter**

It is used to convert DC power supply into AC. Power supply is given to phase winding with respect to information given by the position sensor.

**Position Sensor**

It is used to sense the positionof the rotor with reference to the reference axis.

**Microcontroller**

Microcontroller is used to collects the information gathered by the position sensor and reference speed. It sends the information as signal. According to the signal, it suitably turn on and off the concerned power semiconductor device (3 Phase Inverter).

**Reference Speed**

Speed at which the motor will rotates.

**DC Power Supply**

Power supply is given to 3 phase inverter in order to run it.