iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VI **Month of publication:** June 2021

DOI: https://doi.org/10.22214/ijraset.2021.35927

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VI Jun 2021- Available at www.ijraset.com

Sensorless Control of Switched Reluctance Motor

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Abstract— The main purpose of this project is to develop a sensorless control of the switched reluctance motor. As we know the use of switched reluctance has been increasing .Many industries and all other started switching to the switched reluctance motor ,due to there rugged structure and its capability to withstand harsh environments .In this paper we control the switched reluctance motor by controlling the different blocks in the feed back system in the matlab therefore torque controlled .As the switched reluctance motor is widely used in the industry we need to control the switched reluctance motor without using the sensors. Here main aim is to avoid the use of position sensors in the system.

Keywords— Switched Reluctance Motor, Matlab Simulation ,Torque Control

I. INTRODUCTION

In this paper we get an overview of the switched reluctance motor .A sensorless operation of the switched reluctance motor drive is proposed .In this paper , the control of switched reluctance is done without using the position detector .Is is taken care that the switching of each phase winding takes place based on the gate pulses given to the converter which is made of using IGBTs and DIODEs for the conversion of the dc to the three phase AC supply .And the converted output is fed to the switched reluctance motor.

Switched reluctance motor is a power drive which can be designed and manufactured easily .It is having the capability to withstand certain faults. These Switched reluctance motors are suitable for air craft , generating systems , mining drives ,electric vehicles etc .,so in all these cases and many other cases the use of position sensors deteriotes the capability of the machines and also reduces the reliability of the machines. So to avoid all these there is a necessity to develop a highly reliable and with no sensors in the switched reluctance motor.

II. SWITCHED RELUCTANCE MOTOR

Switched reluctance motor is also called as the Variable Reluctance Motor (VRM).In this switched reluctance motor we use the switching system. The switching system must be there to transfer the power toward the different winding which are diametrically opposite to each other such that at a time the diametrically opposite poles are excited and the rotor rotate to attain the minimum reluctance path .And like this with the switching action we excite the diametrically opposite poles and therefore the rotor rotates. However, due to this switching action the design gets little complicated but the overall performance will be good. The switched reluctance motor are used where there is sizing and horsepower matters more in such cases the utilization of the switched reluctance motor is more preferred.

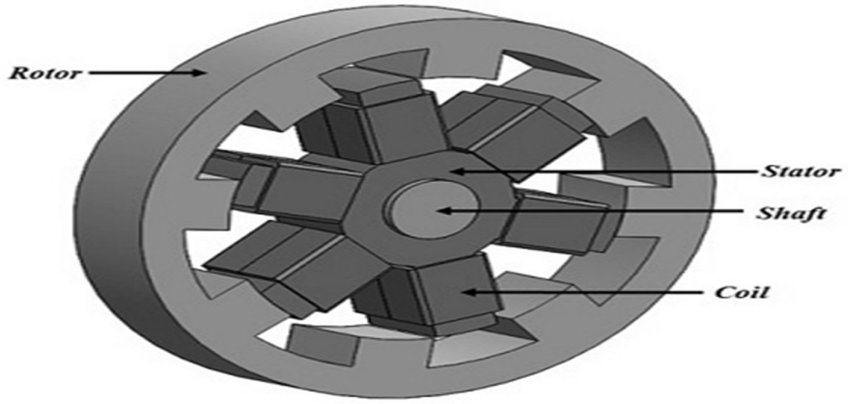

Fig. 1. Switched reluctance motor

The switched reluctance motor works on the reluctance torque principle. The tendency of the rotor poles to align with the stator pole when there is more gap which causes more reluctance so to reduce the reluctance the rotor poles rotate along with the rotor in accordance with the stator this is the reluctance principle on which the switched reluctance motor.

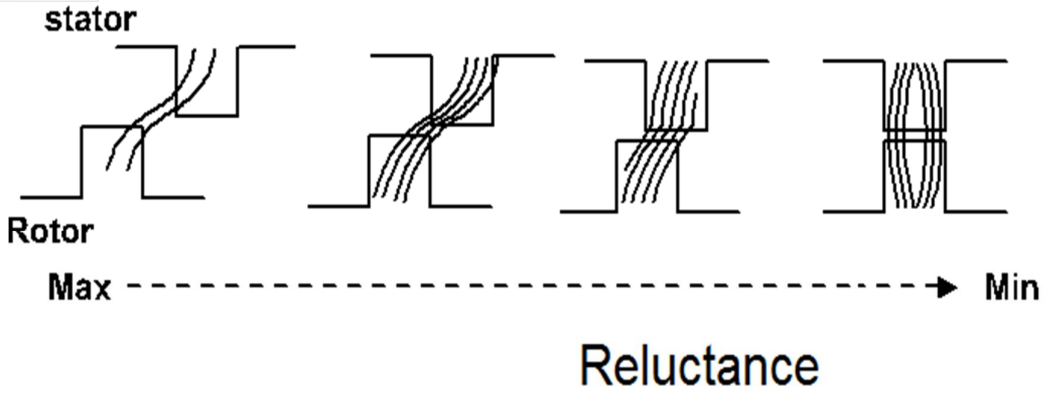

Fig.2.Reluctance principle

III. SIMULATION MODEL OF SRM DRIVE

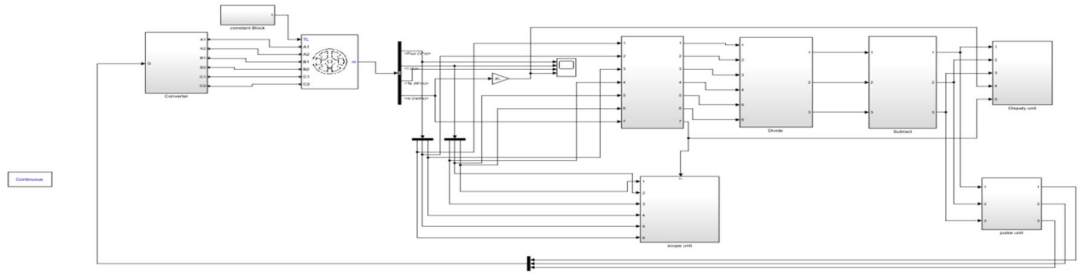

Fig. 3.simulation model of switched reluctance motor.

A 6/4 switched reluctance motor used in this paper. The simulaton model of the sensorless SRM drive is developed using available SRM and other components or blocks using matlab simulation. The above figure represents the 6/4 simulation model of SRM drive. The main components used in simulation model of SRM are Switched Reluctance Motor, dc to three phase AC converter, Bus selector, Mean blocks , Pulse generators etc.

IV. SIMULATION AND RESULTS

AC to DC Converter

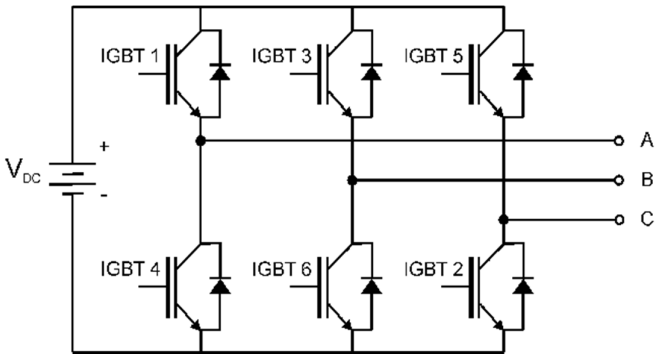

Fig.4.Converter

Simulation was done by using the MATLAB software. The 6/4 switched reluctance motor was used in the simulation. A dc to three phase AC converter was used for the switching action for the switched reluctance motor .Switching pulses were developed

by the pulse generators. By controlling the pulses the torque was controlled and the variable current and variable flux types of flux are obtained. Some amount of ripples observed in the waveforms obtained.

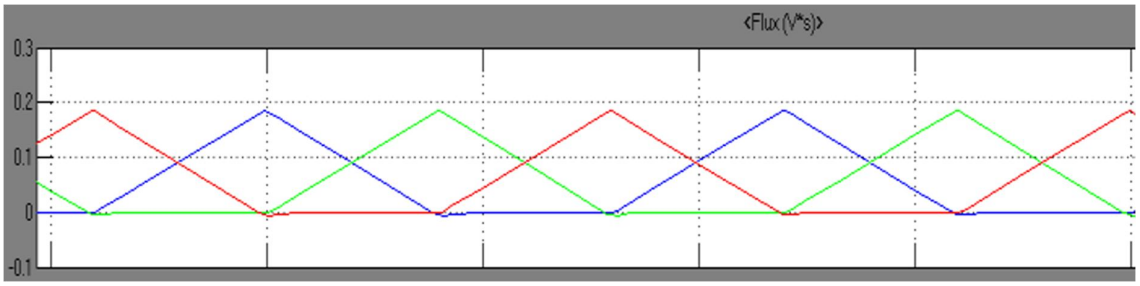

Fig.5.flux waveform

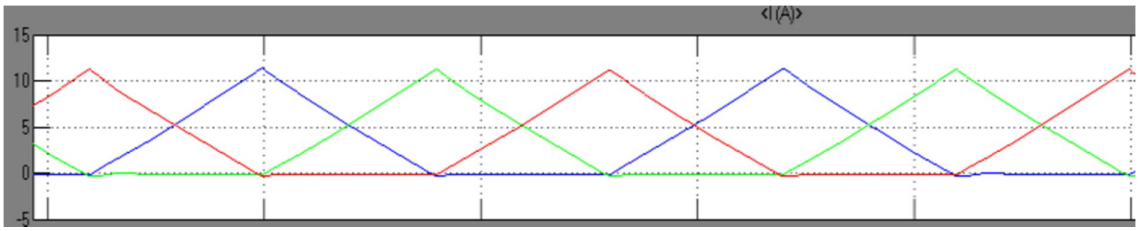

Fig.6.current waveform

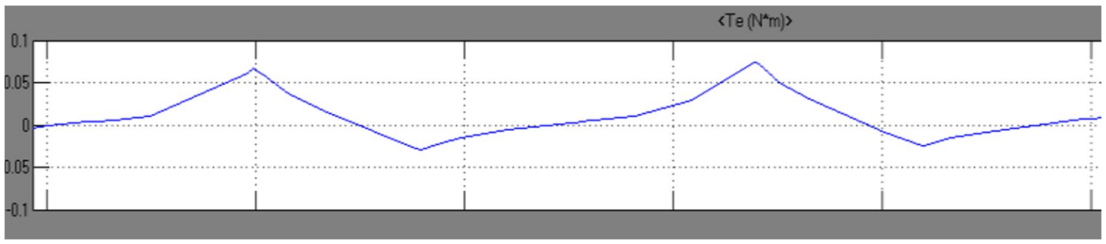

Fig.7.Torque

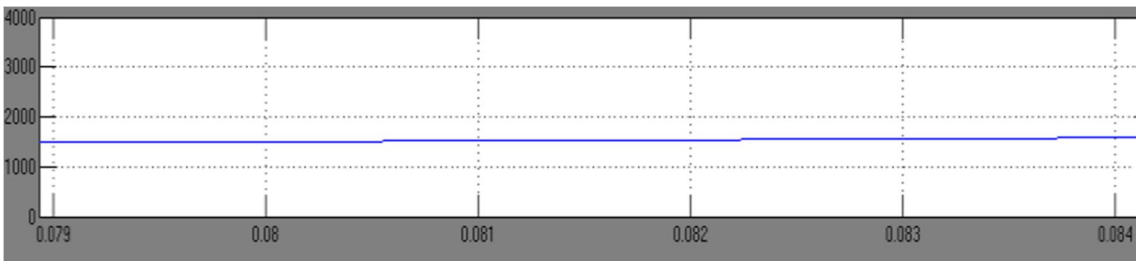

Fig.8.Speed

V. CONCLUSION

The Simulation of a position sensorless system for a switched reluctance motor is carried out in this work. The error is processed to generate the switching signals of the converter used to switch the machine windings. An experimental validation of the system is in progress. The hardware implementation of the proposed scheme is feasible with sensor less control used for stating the SRM, thereby reducing the disadvantages with the normal position sensors and therefore the sensorless control is done successfully and the reliability improved.

VI. FUTURE SCOPE

Due to the high demand of the switched reluctance motor in the market it is very much essential to design the motor with more reliability and controllability. Traditional use of the position sensors decreases the reliability of the machine .So it is very much needed of the sensorless control of the switched reluctance motor.

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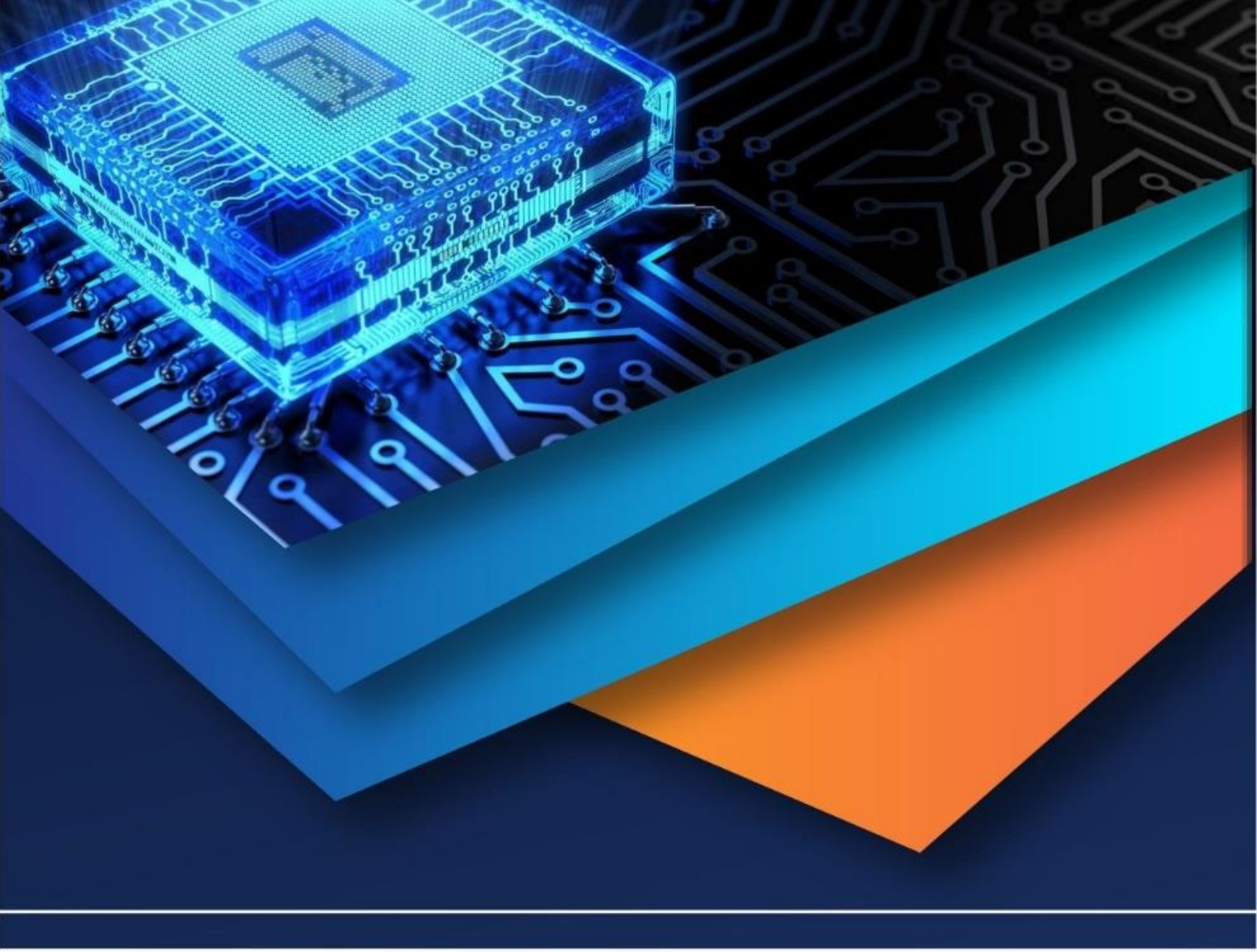

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