

**OPTIMIZING MAGNETIC CORE STRUCTURE OF MULTI-STACK SWITCHED  
RELUCTANCE MOTOR (SR) USING FINITE-ELEMENT MODELLING**

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## **ABSTRACT**

Switched Reluctance Motor (SRM) is simple in construction compared to induction and synchronous machine with non-winding structure on its rotor side. SRM comes with several advantages such as high efficiency, low cost and maximum operating speed. The torque production in SRM comes from the tendency of rotor poles to align to the stator poles. This proposal described the application of Finite Element Magnetic Method (FEMM) on analysis of optimizing the magnetic core structure of a multi-stack switched reluctance motor (SRM). The motor stack is modeled in Finite Element Magnetic Method (FEMM) package and the performance parameter computed such as inductance, resistance, flux linkage, voltage drop and etc. The pole widths of the stator is varied in steps to search for the optimum rotor pole width for a given stator pole width. After that flux linkage over current and rotor position versus torque index are plotted. The process is repeated for other stator pole widths until both optimum stator and rotor pole widths are obtained.

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# CHAPTER 1

## INTRODUCTION

### 1.1 BACKGROUND OF STUDY

Most of SR motor structures are reported as single stack type, where multi-phase pole-pairs which normally diametrically opposite are spaced evenly around the stator inner circumference. In other words, the spaces available are share evenly amongst the phases. Multi-stack design is common in stepper motor but not common in SR motor. In multi-stack each stack represents a phase. Multi-stack can has an odd number of poles as compared to single-stack motor must have even number of poles. For the pole windings, it can be connected in series or parallel and the implementation can be simplified for both low and high speed motor. In terms of size, multi-stack can be compared to single-stack design at the condition of same speed and power rating .The total pole cross-section area for each phase of both designs have to be the same for the same rating.

Switched reluctance motor drive present several advantage such as high efficiency, maximum operating speed, better performance of motor in terms of torque and inertia. For better performance it needs a small air gap. Switched reluctance motor is a type of motor which produce torque. Torque is produced from the movement of stator and rotor and the combination of ideal stator and rotor will produced an optimum torque. On its stator windings, there are wound with field coil whereas there