

CONTRIBUTION AND COMPARISON STUDY FOR TORQUE RIPPLE REDUCTION IN VARIABLE RELUCTANCE GENERATOR USING THREE-DIMENSIONAL FE ANALYSIS AND WINDING FUNCTION THEORY

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The aim of this study is to overcome the major drawback of the SRM (synchronous reluctance machine) which is torque ripple to be used as a wind generator or traction motor. In this work we are interested to enhance and improve the torque ripple of variable reluctance machine and find the better torque evaluation for multiphase machine, tow different machines of the same power order are compared (three phases machine, five phases machine). This comparison is focused on geometry parameters study for the important parts of the SRM, which proved that they have a direct impact on the reluctant torque (slots, winding, rotor geometry), which represents the inductance variation. For the geometry parameters effect we used winding function theory which have approved it effectiveness in case of complex geometry study, this method is compared to finite elements analyses (two and three dimensional), and a VSI is used for the alimentation source. The VSI is used as feeding source only for the reluctance machines, the interrupter switching command for 120° electrical angle.

Keywords: Variable Reluctance Generator, torque ripple, winding, rotor topology, Winding Function Theory, Finite Elements Method, Voltage Source Inverter

1. Introduction

In the presence of a variable magnetic field with a ferromagnetic asymmetric structure, the last one can create a motion, this motion is the original phenomena for reluctance variation, and this phenomenon has been developed to create the SRM. The SRMs are an electromagnetic converter which are particularized by the simplicity in structure construction (there is no winding or permanent magnets magnetic in the rotor) and easy in operating principle as it is showing in “Fig. 1”. The old studies prove that the SRM present two big remaining advantages when it operated as automotive motor: ability to product a big torque [1], and their robustness which allows them a high-speed operation [2]. Regarding these advantages, the SRM is more used in all technology fields as automotive motors [3], renewable energy [4] nave application [5], etc. However,

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