EXPERIMENTAL PERFORMANCE EVALUATION OF A VARIABLE RELUCTANCE MOTOR

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ABSTRACT

The Variable reluctance motor (VRM) and generator (VRG) are now under development as the prime mover in aerospace actuators, and the prime source in aerospace power systems respectively. Among the advantages of the VRM and VRG in these applications are the absence of permanent magnets, and the magnetic and electric independence of their phases, which improve reliability, the mechanical integrity of their rotors which permits high-speed high-power-density operation and their ability to operate in high temperature environment.

This project will discuss an experimental study of the variable reluctance motor (VRM). The VRM is known for its simplicity, reliability, high power density, controllability, and brushless and variable speed. The VRM, however, requires some form rotor position sensing and a drive converter. The project work involves development of the drive circuit, setting the test rig and determination of flux linkage waveform.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1. Introduction

Variable Reluctance Machines (VRMs) are perhaps the simplest of electrical machines. It consists of a stator with excitation windings and a magnetic rotor with saliency. Rotor conductors are not required because torque is produced by the tendency of the rotor to align with the stator-produced flux wave in such a fashion as to maximize the stator flux linkage that result from a given applied stator current.

Although the concept of the VRM has been around for along time, only recently have these machines begun to see widespread use in engineering applications. This is due in large part to the fact that although they are simple in construction, they are somewhat complicated to control. For example, the position of the rotor must be known in order to properly to energize the phase windings to produce torque. It is only relatively recently that the widespread availability and low cost of micro and power electronics have brought the cost of the sensing and control required to successfully operate VRM drive system down to a level where these systems can be competitive with systems based on dc and induction motor technologies.

Torque is produce by the tendency of salient-pole rotor to align with excited magnetic poles stator. Its torque-speed characteristic can be easily tailored for driving fans and pumps.