Switched Reluctance machines

Mukhtar Ahmad, Aligarh Muslim University
Switched Reluctance Motor Drives

Prof Mukhtar ahmad
Aligarh Muslim University Aligarh

2/2/2008
The basic concept of reluctance machines is quite old.

In 1838 a locomotive was driven by this motor in Scotland.

The stepper motor which is also a reluctance machine was patented by CL Walker in 1920.

The term switched reluctance motor was coined by SA Nasar in 1969 in his paper in Proceedings IEE.
During late 70’s and 80’s, as fast switching devices became available, the applications of SRM have increased manifold. Due to their simple and rugged topology these motors are finding applications in consumer appliances, auto industries, and defence. Presently Ford motor company is using SRM in power assisted steering system.
The slow development in commercialization of these motors was mainly due to the need to have specialized design, and requirement of a sensor to control the speed. The other disadvantages are the torque ripple and acoustic noise. Now these disadvantages have been minimized by improving the design, sensorless drives have been developed, and many manufacturers are producing the SRM, making it easily available motor. The switched reluctance motors have many advantages, e.g. high efficiency, can be designed for ratings from few watts to M watts and can be employed in harsh working environments.
Applications

- Application
- Industrial
- Parameters
- Voltage Range 100 - 240 V ac
- Motor Power: 50W - 10's KW
- Speed Range: 0 - 60,000 RPM
- Automotive
- Voltage Range 12 - 42V dc
- Motor Power 50W - 1kW
- Speed Range 0 - 20,000 RPM

2/2/2008
6/4 pole motor
Construction

- These machines are doubly salient ie have salient poles in both stator and rotor.
- There is concentrated winding on stator with phase coils mounted on diametrically opposite poles.
The rotor has only salient poles without winding.

- One phase of stator is energized at a time by dc voltage pulses.
- The rotor experiences a torque and moves to a position to align with stator pole so that the reluctance is minimized.
- Due to their simple and rugged construction, these machines are getting considerable attention for all types of drives.
Construction and Functional Details

SWITCHED-RELUCTANCE MOTOR
Two Phase motor
3-phase 6/4 pole motor
Working

- In order to produce continuous rotation, each of the three phases is energized and then de-energized in succession at specific position of rotor.

- Rotor position information is used to control phase energization in an optimal way to achieve smooth, continuous torque and high efficiency.