

Abstract

Reluctance synchronous motor (*RSM*) is considered one of the brushless AC motors that have attracted great interests in recent researches. It has been argued to be viable alternative to induction motor, especially in variable speed drive applications. The main advantages of the *RSM* are the relatively low cost, robust design and the easier field weakening capability. It has theoretically no rotor losses and depends on the saliency of the rotor; it has a torque density comparable with that of the induction machine.

This thesis presents the *RSM* as one of the promising motors and introduces the latest improvements made in its design, to increase the saliency ratio, resulting in performance which matches the induction motor or even exceeds, considering the motor efficiency, power factor and torque density. The thesis discusses the design, construction and classifications of the *RSM*.

The mathematical modeling is also presented. The motor operation is studied, in both steady state and transient conditions; considering sudden loading and sudden supply voltage-sag conditions.

Field Oriented Control (*FOC*) on *RSM* discusses in this thesis, the main controlled variables are rotor speed, motor performance (steady state error, settling time and overshoot) and effecting of controller on *RSM* stability. Also the speed and position estimator (sensorless *FOC*) is considered.