

## **Analytical Modeling of Equivalent Magnetic Circuit in Multi-segment and Multi-barrier Synchronous Reluctance Motor**

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**Abstract :** This paper describes characteristic analysis of a synchronous reluctance motor (SynRM)'s rotor with the Multi-segment and Multi-layer structure. The magnetic-saturation phenomenon in SynRM is often appeared. Therefore, when modeling analysis of SynRM the calculation of nonlinear magnetic field needs to be considered. An important influence factor on the convergence process is how to determine the relative permeability. An improved method, which ensures the calculation, is convergence by linear iterative method for saturated magnetic field. If there are inflection points on the magnetic curve, an optimum convergence method of solution for nonlinear magnetic field was provided. Then the equivalent magnetic circuit is calculated, and d,q-axis inductance can be got. At last, this process is applied to design a 7.5Kw SynRM and its validity is verified by comparing with the result of finite element method (FEM) and experimental test data.

**Keywords :** SynRM, magnetic-saturation, magnetic circuit, analytical modeling

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