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Analysis of Magnetic Polarity Distribution for a Dual-rotor Switched Reluctance Machine

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DR-SRM is a novel structure device which can be evolved from conventional SRMs with a single stator and single rotor by increasing a rotor and changing the structure of stator and rotor. The double mechanical ports and double electrical ports are formed by increasing the number of rotor. This paper presents a model for dual rotors switched reluctance motor consisting of two airgaps, an outer-stator, a middle-rotor and an inner-rotor. This model can optimize structure geometry size parameters and polarity distribution of DR-SRM. The average torque of middle rotor in the outer airgap contributing to the main parts of energy conversion with different geometry size of stator and rotors. The sensitivity of inner-rotor pole-arc coefficient, inner-rotor yoke thickness, outer-stator pole-arc coefficient, outer-stator yoke thickness, middle-rotor inner tooth pole-arc coefficient, middle-rotor outer tooth pole-arc coefficient, and middle-rotor yoke thickness is analyzed based on the present model. The final geometry size is designed for enhancing the average torque of middle-rotor in the outer airgap considering the limitation of outer-stator outer radius and laminated thickness of motor, the configuration intensity and manufacture techniques. Comparison of torque on the dual rotors switched reluctance motor and the conventional single inner rotor switched reluctance motor is made. Three kinds of magnetic polarity distribution of outer-stator with four kinds of magnetic polarity distribution of inner-rotor are studied. NSNSNSNSNSNS magnetic polarity distribution of outer-stator with NSNSNS magnetic polarity distribution of inner-rotor is selected for enhancing the average torque of middle-rotor in the outer airgap. The comparison results of torque on the dual rotors SRM and the conventional single inner rotor SRM show that the torque on dual rotors SRM is larger than that on the conventional single inner rotor SRM since the dual rotors SRM has two sets of excitation windings.

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