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Research on control system of a novel coil assisted reluctance motor

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The novel coil assisted reluctance motor is a kind of high torque DC motor combined with traditional permanent magnet brushless DC motor and switched reluctance motor. The motor with double sets of armature windings and the central coil (field winding) which is installed between two-stator-rotor by axial excitation has a 9\6 symmetric double salient pole structure. Based on the special structure of the motor, a two group of power module with one power supply is designed to control the amount and direction of the phase voltage and exciting current, and to adjust magnetic field as magnetic flux density is not saturated. In the case of being constant for the phase voltage, the speed and torque can get the corresponding change separately by increasing or decreasing the excitation current. When the load is constant, increasing the field current and reducing armature voltage can get the effect of saving energy.Because of inherent torque ripple problem of doubly salient motor, after simplifying mathematical model of the motor, a three phase-six state control mode on the basis of the standard angle control mode is put forward—increase the conduction phase during commutation, according to finite element analysis of ANSYS/MAXWELL. And a new speed-torque closed loop control mode is formed by adding a field current control to achieve the aim of increasing starting torque, minimizing commutation torque ripple and extending speed range. Finally the reliability and feasibility of the control method is verified through the simulation and experiment respectively. The load capacity of the motor has been greatly improved and the motor runs more calmly.
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