

Comparative evaluation of three-phase double stator pmsm with different slot number in inner and outer stators

Abstract

This paper presents a comparative evaluation of three-phase double-stator permanent magnet synchronous machines (DS-PMSM) in which the slot number of outer stator is different than that of the inner stator. The fractional-slot machine type is considered in both inner and outer stators. The rotor core material which can be either iron-core or air-core is analyzed in order to evaluate the magnetic performance of DS-PMSM. In addition, several models of the proposed DS-PMSM with different rotor magnet pole arc have been investigated. Finite element method (FEM) is employed intensively to predict the flux line distribution, flux density distribution, back-emf, cogging torque, output torque and torque ripple for each model. Systematic comparison is further conducted for different rotor materials. The results show that the rotor with iron-core is eminently appropriate for better torque density, but it suffers higher torque ripple. While the rotor with air-core structure has advantage in producing smaller cogging torque and almost ripple-free output torque. © 2020 SERSC.

Keywords

Double-stator; Fractional motor; Magnet pole arcs; Permanent magnet