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Performance Analysis of BLDC Motors for Flywheel Energy Storage Applications with Nonmagnetic vs. Magnetic Core Stator using Finite Element Time Stepping Method

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Abstract : This paper presents a comparative analysis of Brushless DC (BLDC) motors for flywheel applications with a focus on the choice of stator core materials. The study employs a Finite Element Method (FEM) in time domain to investigate the performance characteristics of BLDC motors equipped with nonmagnetic and magnetic type stator core materials. Preliminary results reveal significant differences in motor efficiency, torque production, and electromagnetic properties between the two configurations. This research sheds light on the advantages of utilizing nonmagnetic materials in BLDC motors for flywheel applications, offering potential advantages in terms of efficiency, weight reduction and cost-effectiveness.

Keywords : finite element time stepping method, high-speed BLDC motor, flywheel energy storage system, coreless BLDC motors
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