

Improving torque per kilogram magnet of permanent magnet couplings using finite element analysis

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This paper presents the methodology and subsequent findings of a performance-improvement routine that employs automated finite element (FE) analysis to increase the torque-per-kilogram-magnet (TPKM) of a permanent magnet coupling (PMC). The routine is applied to a commercially available cylindrical PMC with rectangular permanent magnets (PM), and a new design is discovered which increases TPKM by 15.6%. Furthermore, the study is repeated using concave/convex-shaped PMs, which results in an increase of TPKM of 57.6%. The FE models are validated against experimental measurements of the static torque-performance of the PMC selected for design improvements. The new designs are constrained such that they do not inflict any significant changes to the manufacturing process of the investigated PMC. The routine is found to be readily implementable for investigating existing PMC designs

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