Influence of end-effects on static torque performance of misaligned cylindrical permanent magnet couplings

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Permanent magnet couplings are widely used in applications requiring torque to be transmitted through an airgap. The aim of this study is to observe and explain the effect of radial and axial misalignment in a 12-pole, cylindrical permanent magnet coupling. Pull-out torque was measured for two coupling pairs which showed an increase of 3.1% and 3.8%, respectively, at maximum radial misalignment. When modeled in finite element analysis software, the coupling produces 3.7% more static pull-out torque than the aligned case. For axial misalignment the pull-out torque at different misalignment distances was measured and simulated. An insignificant reduction in pull-out torque was observed for small misalignment, whereas it decreases linearly with misalignment distance when above 3-4 mm. These results show that radial and axial misalignment do not adversely affect static torque performance, though the affect on non-static performance is not considered and may be detrimental.

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