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## **Wed-Mo-Po3.13-03 [111]: Ferrite PM Optimization of SPM BLDC Motor for Oil-Pump Applications According to Magnetization Direction**

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This paper proposes optimizing the magnetization direction of isotropic ferrite permanent magnets (Fe-PM) to enable the maximization of back-electromotive force (B-EMF), torque density, and minimum torque ripple of surface permanent magnet brushless direct current motor. The concept design is divided into two steps. First, two general Fe-PM electric oil pump motor models with radial and parallel magnetization are selected and compared with the neodymium permanent magnet models. Secondly, a finite element method (FEM) analysis is carried out with two different magnetization directions for each of the models in open-circuit and load operation. For more accurate results, the effects of no-load B-EMF, magnetic field distribution, air-gap flux density, copper loss, and efficiency are investigated. Finally, the validity and superiority of the FEM design results are confirmed by manufacturing the prototype motor and performing an experiment.

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