Design of Transverse Flux Machines Using Analytical and Numerical Computing Methods

Topic Area: C3 Machine Design

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Abstract

This contribution deals with a method for designing of permanent magnet excited Transverse Flux Machines (TFM). This type of machines features high torque density combined with high efficiency. The specific torque density of TFMs is three to five times higher compared to conventional DC, induction and reluctance machines. Hence TFMs are attractive alternatives to conventional machines especially in direct drive applications. The design method described in this paper is based on analytical modelling of the electromagnetic relationships in TFMs. This process will be supported by a finite element filed computing. The analytical model considers the air gap flux distribution using variable flux tubes and leads to networks of permeances which correspond with the rotor position. As the flux path has to be investigated in all three dimensions the numerical model observes the machine with 3D finite element computing. The machine design process focuses on optimization of the torque density and torque shape. The structure and the principle of function of TFMs, analysis of the torque components in the machine, the mathematical relationships and simulation results are described in the paper.