

Design and Construction of a Low Speed Rare-Earth Permanent Magnet Wind Energy Converter with New Configuration

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Abstract

Based on the equivalent magnetic circuit approach and the permanent magnet load line characteristics, a preliminary design of a low-speed rare-earth permanent-magnet wind energy converter is firstly carried out. The Finite Element Technique (FET) is then used to check the electromagnetic design of the machine. Rectangular NdFeB permanent magnets with flux concentration arrangement are used. The rotor support structure is manufactured from light nonmagnetic material. The windings are of toroidal (torus) type with short ends and placed in flat slots. The prototype machine was constructed and tested as a variable low-speed generator. Good agreement between theoretical and practical results has been achieved. The developed prototype machine exhibits relatively high efficiency and a typical 'rule of thumb' value for the leakage flux coefficient.