Multi-Objective Optimization for DFIG Based Wind Energy Conversion System by using NSGA-II

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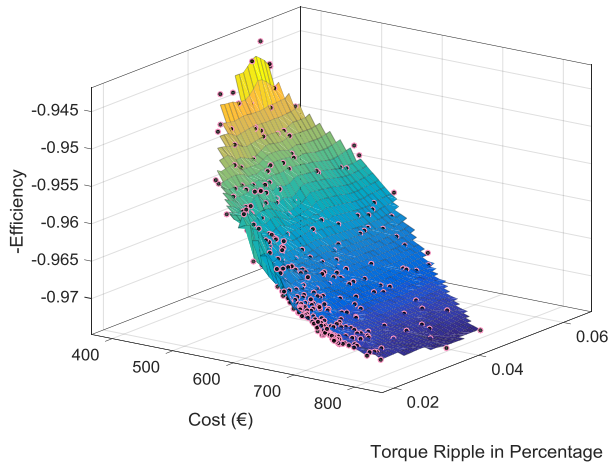
Abstract **- This work presents a novel approach for doubly fed induction generator multiple-objective electromagnetic optimization, by using non-dominated sorting genetic algorithm (NSGA-II). The optimization variables are selected on purpose for making sure both efficiency and torque ripple can be influenced by. Lumped parameter method for geometry and winding calculation are described, then, finite element model is built up and the finite element analysis (FEA) is performed for each design. This FEA based optimization approach guarantees the torque ripple can be optimized as well. A novel method for inductance and rotor current calculation are presented. For driving machine to rated operation point, this novel method avoids rotor current sweeping, thus optimization time can be significantly reduced. Taking rotor slot fill factor and power electronics power loss into consideration, the efficiency of the whole wind energy conversion system, but not only generator itself, can be improved. For 110 kW design, Pareto-Front with 96.86% efficiency while 1.95% torque ripple can be achieved within 3 weeks by workstation with 10 cores.**

Keywords— ***optimization, electromagnetics, generators, finite element analysis, power electronics, wind power generation.***



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