MICRO-GENERATOR DESIGN FOR SMART GRID SYSTEM (COMPARATIVE STUDY)

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Abstract*—High Speed PM Generators driven by micro-turbines are widely used in Smart Grid System. So, this paper proposes comparative study among six classical, optimized and genetic analytical design cases for 400 kW output power at tip speed 200 m/s. These six design trials of High Speed Permanent Magnet Synchronous Generators (HSPMSGs) are: Classical Sizing; Unconstrained optimization for total losses and its minimization; Constrained optimized total mass with bounded constraints are introduced in the problem formulation. Then a genetic algorithm is formulated for obtaining maximum efficiency and minimizing machine size. In the second genetic problem formulation, we attempt to obtain minimum mass, the machine sizing that is constrained by the non-linear constraint function of machine losses. Finally, an optimum torque per ampere genetic sizing is predicted. All results are simulated with MATLAB, Optimization Toolbox and its Genetic Algorithm. Finally, six design examples comparisons are introduced with study of machines waveforms, THD and rotor losses.

Index terms*:* High Speed, Micro-Turbines, Optimization, PM Generators, Smart Grid, MATLAB.