BULETINUL INSTITUTULUI POLITEHNIC IAŞI
TOMUL LIV (LVIII), FASC. 4, 2008
ELECTROTEHNICĂ, ENERGETICĂ, ELECTRONICĂ

A DISCRETE PARTICLE SWARM OPTIMIZATION TECHNIQUE (DPSO) FOR POWER FILTER DESIGN

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Abstract. In this paper, a novel optimization approach is developed to optimally solve the problem of power system shunt filter design based on discrete particle swarm optimization (DPSO) technique to ensure harmonic reduction and noise mitigation on the electrical utility grid. The proposed power filter design is based on the minimization of a multi objective function. The main power filter objective function includes minimum harmonic current penetration into the electric grid system, maximum harmonic current absorption by the harmonic power filter , minimum harmonic voltage distortion at the point of common coupling, and minimum current harmonic injected in the system and also in same time ensure a dynamically maximum current in the shunt power filter. Throughout the optimization process, all parameters of the power filter are being treated as continuous and discrete variables. The power filter design and optimization is performed over a specified set of discrete dominant offending harmonics. Since the optimal power filter parameters are dependant on the selected weighting factors, the weighting factors was also treated as dynamic optimizing parameters within the Particle Swarm Optimization as a dual optimization and global selection of shunt power filters optimal parameters as well as best set of weighting factors.

Keywords: Harmonic filters; Power quality; Discrete Particle Swarm Optimization (DPSO).