

Title of Ph.D. Dissertation:

“Optimal and Flexible Strategy for Adaptive Control of Active Filters Under Non-Sinusoidal Line Voltages”

Advisors :

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Abstract :

This Dissertation gives a new insight into the concept of load compensation under distorted voltages. Achieving both unity power factor (UPF) and perfect compensation of current harmonics are not possible where a competition will arise between these two important factors. Through evaluating the present control strategies, a generalized, optimal, and flexible control strategy (OFC) for harmonic compensation of utility lines is proposed. The proposed control strategy, which provides a unified and highly flexible compensation framework has the ability of programming for perfect current harmonics compensation, or (UPF) accomplishment, or other newly defined objectives such as maximizing the power-factor subject to some adjustable constraints on the level of current harmonics and unbalancing via an on-line optimization algorithm. The strategy can fulfill the IEEE-519 standards requirements, while guaranteeing the best achievable power factor and optimum required rating for the compensator. A fast and simple version of OFC strategy has been successfully proposed and realized using neural networks. The optimization algorithm is replaced by a neural network based system that is learned off-line and has the real time realization capability. Theoretical concepts and practical features of the proposed control strategies have been shown through extensive simulation studies using MATLAB/SIMULINK programs.

Key Words: Distorted voltage, harmonics, power factor, active filter, flexible compensation strategy, optimization, real –time control, neural networks