Chapter 1

THD and Compensation Time Analysis of Three-Phase Shunt Active Power Filter Using Adaptive Blanket Body Cover Algorithm

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ABSTRACT

A novel Adaptive Blanket Body Cover Algorithm (ABBC) has been presented, which has been used for the optimization of conventional control scheme used in shunt active power filter. The effectiveness of the proposed algorithm has been proved by applying this in balanced, unbalanced and distorted supply conditions. The superiority of this algorithm over existing Genetic Algorithm results has been presented by analyzing the Total Harmonic Distortion and compensation time of both the algorithms. The simulation results using MATLAB model ratify that algorithm has optimized the control technique, which unmistakably prove the usefulness of the proposed algorithm in balanced, unbalanced and distorted supply system.

INTRODUCTION

Non-linear loads cause the harmonics into the facility arrangement and these harmonics produce copiously of issues within the system. Once application of unbalanced and nonlinear loads will increase, supply gets distorted and unbalanced. These currents foul the provision point of the utility. Therefore, it is important to compensate unbalance, a harmonic and reactive component of the load currents. Whereas once supply is unbalanced and distorted, these problems worsen the system (Chen Donghua, 2005) (Saifullah & Bharti, 2014) (Saifullah Khalid, Application of AI techniques in implementing Shunt APF in Aircraft Supply System, 2013). By the appliance of shunt active power filter within the system can eliminate harmonic, reactive and unbalanced current still as improve the ability provide performance.

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In this chapter, 2 totally different soft computing techniques i.e. adaptive Blanket Body cover algorithm and Genetic algorithm are applied for reduction of harmonics and others downside generated into the balanced, unbalanced and distorted system attributable to the nonlinear loads (Chen Donghua, 2005). The results obtained with each the algorithms are far better than those of typical strategies. ABBC algorithm has given the better results as compare to GA and traditional scheme. The effectiveness of the planned scheme has been evidenced by the simulation results mentioned. The result justified their effectiveness.

In this chapter, ABBC algorithm has been wont to search the optimum value of PI controller parameters. For the case of GA, the optimum value of filter inductor has been calculated. The controlling theme has been modeled on the idea of Constant instantaneous Power control Strategy.

BACKGROUND

When one of the initial models based on instantaneous reactive power theory was reported, active filters had been advanced. The application of this technique allows compensating independently the average or oscillating portions of the active (real) and reactive (imaginary) powers. One of the complications of the controllers based on the well-known PQ Theory is the practice of low-pass filters to distinct the average and oscillating portions of powers.

Literature Survey

The key papers that play a major role for the implementing Aircraft Power filters are listed below:

- **E.J. Woods, 1990**: Computer simulation results for a single channel of an aircraft electrical system with rectified power loads has been shown in this chapter. The computer model comprised of a generator, ac load with resistance and inductance, and a resistive dc load. The results are there in the form of computer generated plots which show system reaction (E.J. Woods, 1990).

- **Donghua Chen, Tao Guo, Shaojun Xie, Bo Zhou, 2005**: This chapter presents an aircraft shunt active filter, which provides a suitable answer for the neutral current in the three-phase system and the appropriate current controller. The preset frequency current controller implementing 3DSVM strategy is applied to balance the asymmetrical current. The simulation results induce that the discussed active filter can compensate the harmonics, reactive and unbalanced currents entirely (Chen Donghua, 2005).