Analysis of Shunt Active Filter with PI, Fractional Pi Controller and ANN based Controller

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Abstract

Non-linear loads connected in electrical power system leads to distortions in the source current waveform. One solution to improve power quality is the use of Shunt active power filter which are able to correct both the harmonics and the unbalance in the load current. In any active power filter system, performance of compensation of harmonics largely depends upon the algorithm adopted as the control methods are responsible for generating the reference currents which are used to trigger the voltage source inverters. In this paper, Hysteresis-band PWM is used as control strategy in which generated reference sin current wave is compared with actual current wave and the desired output of hysteresis-band PWM is applied to trigger the voltage source inverter. In this paper Shunt active power filter has been implemented in MATLAB using three different controllers in order to reduce current harmonics on load side. As the performance of three controllers Fractional PI, PI and ANN Controller have been simulated it has been concluded that in any system PI controller requires precise linear mathematical models, which are difficult to obtain and fails to perform satisfactorily under parameter variation, load disturbances, on the other hand Fractional PI Controller performs satisfactorily for the same
parameter variation. Whereas ANN Controller is considered to be the new tool in the design of Shunt active power filter control circuit as it provides high speed recognition, learning ability etc.

References

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Index Terms

Computer Science Circuits and Systems

Keywords

Shunt Active Power Filter (SAPF), Passive filters, PI Controller, Fractional PI Controller, Ann Controller, and Hysteresis current control.