CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 CONCLUSION

Solid state control of ac power using thyristors and other semiconductor devices is in extensive use in a number of applications such as Adjustable Speed Drives (ASD), furnaces, computer power supplies and asynchronous ac-dc-ac links. These power converters behave as non-linear load to ac supply system and causes harmonic injection, low power factor, poor voltage regulation and utilization of ac networks. Moreover, a three phase ac system load such as traction, a furnace etc., result in harmonics in a system. The unbalance in the voltage affects the performance of other loads. If the system is not properly designed or rated, electrical equipment will often malfunction when harmonics are present in an electrical system. So, it is necessary to improve the power quality.

Hence, this thesis proposes the effectiveness of Current Source Inverter (CSI) and Voltage Source Inverter (VSI) based Active Filters (AFs) for a non-linear load. From the simulation results based on a power circuit, VSIAF is best suited over CSIAF because of lower THD (3.67%).

Next, VSI based Shunt Active Filters (SHAF) were tested for its performance for various Pulse Width Modulation (PWM) techniques, namely Single pulse, Multipulse, Sinusoidal pulse and Space Vector Modulation (SPWM, MPW, SinePWM and SVPWM). Here, VSI-SHAF based SVPWM has the lowest THD (10.07% for R-load and 10.27% for DC Motor load).
Various closed loop reference estimation techniques, namely Instantaneous Reactive Power Theory (p-q), Synchronous Reference Frame Theory (d-q), Synchronous Detection Method (SDM) and Perfect Harmonic Cancellation technique (PHC) were simulated using conventional and Fuzzy Logic Controllers (FLC) based PI. Here, the FLC based PHC technique gives the least THD (4.05% for R-load and 3.84% for DC Motor load) of all the remaining techniques which is in accordance with IEEE 519 standard.

6.2 FUTURE SCOPE

The Fuzzy Logic Controller based SAPF demonstrates a better dynamic behavior than conventional methods. It does not require any mathematical model of the system and can also work with imprecise inputs. The analyzed results conclude that the proposed FLC based VSI-SHAF improves the harmonic filtering performance and gives better transient and steady state response to the system. Recently a genetic algorithm has been proposed for the design of membership functions and rule sets, which will be reported later.

- To improve the Power Quality, the same system can be tested for various filter configurations.

- In the PHC control strategy, power factor is not made unity. Hence, the PHC in conjunction with the UPF strategy can be coupled to get better performance.

- Various optimization techniques can be used to have better control for the PI block.

- In addition, research can be extended to have Power Quality standards on the load side.