ABSTRACT

Power electronic converter applications have rapidly been expanded in many sectors in the society. The present day electronic equipments are more sensitive to supply disturbance. Hence the DC power supply in the electronic equipments has to produce regulated output with fast response and it has to be less sensitive to change in parameters and change in load etc. In order to get the desired performance in the DC power supply, it is essential to control the DC power supply using feedback controllers.

In this research work, DC power supply constructed using Single Ended Primary inductor Converter (SEPIC) is considered since it produces non-inverted output and can operate in buck and boost modes. Different feedback controllers for the SEPIC such as PI controller tuned by Ziegler Nichols method, neural network tuned PI controller, Fuzzy Logic based controller and Sliding Mode Controller (SMC) are developed and implemented. The PI controller and SMC are designed using state space average model and the performance of designed SMC for SEPIC is compared with that of Proportional-Integral controller. It is found that the SMC improves the transient and steady state performance of the SEPIC than PI controller. The fuzzy logic controller is implemented for maximum power point tracking in a standalone Photo Voltaic (PV) system having SEPIC. A low cost PV system that uses SEPIC controlled by a PI controller and also tracks the maximum power from the PV system is designed and verified. The PI controller for two Parallel connected SEPIC (PSEPIC) converters that use coupled inductors for low voltage application is developed. This configuration allows sharing of load current with constant output voltage and also reduces the component count and size of the converter.

The performance of the various feedback controllers for SEPIC are analyzed under various conditions such as line variation, load variation, components variation and, startup and steady state conditions wherever possible. All the above feedback controllers are simulated using MATLAB simulink to verify their performance. Experimental implementation and performance analysis is also done for most of the feedback controllers.