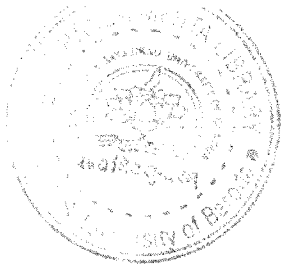


Abstract

Multilevel inverter and hybrid multilevel inverter play important role in medium and high voltage industries. In this project these multilevel inverters are compared and work is done for hybrid multilevel inverter. Different topologies are available for multilevel inverters. Some of them are simulated and their working is understood.

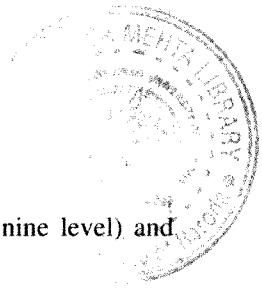
Over modulation, linear range of modulation, switching states, switching frequency and capacitor charge maintenance are contributing factors in limiting the capability and performance of the multilevel inverter. Anyhow higher order harmonics can be controlled by changing the switching frequency. Hybrid multilevel inverter systems are designed to work in environments with as many modulation techniques as possible in varying power conditions. Multilevel inverter and hybrid multilevel inverter have emerged as one of the most promising approaches for high voltage inverter with lowest total harmonic distortion, lower voltage stress on switches and increased approximation towards sinusoidal wave. Hybrid multilevel inverter also provides very high efficiency over normal inverter.

The aim of the project is simulation, design and implementation of hybrid multilevel inverter. Simulations are carried out for cascaded multilevel inverter and different hybrid multilevel inverter for comparison.

In this project hybrid multilevel inverter is controlled by multi carrier pulse width modulation techniques like PDPWM, PODPWM, APODPWM and THIPDPWM obtained using DSP. All these modulation techniques are adapted for selected HMLI which in general are implemented for either cascaded multilevel inverter, symmetrical or asymmetric hybrid multilevel inverter or other multilevel inverter. In that way all these modulation techniques are novel for this work. The combination of MATLAB/SIMULINK, CCS, emulator and DSP is used for controlling of system. The software based control developed for optimization of hybrid Multilevel Inverter system give provisions for configuration changes or further development.

If this system is to be made portable then batteries can be used. Here testing is done on batteries as well as regulated power supply. Regulated power supply is developed for high voltage and current rating.

The work presents the use of different modulation techniques, simulation, analysis and implementation of the control of hybrid multilevel inverter. Regulated power supply for DC 40V/80V is developed with 5A current rating. Simulations are for



single phase cascaded multilevel inverters (five level, seven level and nine level) and THD is compared.

Simulations are also done for different hybrid multilevel inverters like asymmetric hybrid multilevel inverter, symmetrical hybrid multilevel inverter and half bridge module based hybrid multilevel inverter with single phase and three phase configurations. Simulations are done with and without modulation. For simulated circuits with modulation THD is varying from 0.6% to 1.8% for different topologies with different modulation techniques for single phase and three phase.

Similarly, simulations are done for selected hybrid multilevel inverter with different modulation techniques for single phase and three phase and comparison is done on basis of THD. For single phase THD varies from 1.15% to 1.52% and for three phase THD varies from 0.84% to 1.41%.

The selected hybrid multilevel inverter is designed for single phase and three phase. In the project multicarrier modulation techniques like PD, POD, APOD and THIPDPWM are implemented with constant modulation index which can be changed to achieve different results.

THD obtained as low as 1.2% from hardware and 0.19% from simulations. This system can work for 1.5 kW power output.