

# Modeling of A Single Phase 7-Level Cascaded H-Bridge Multilevel Inverter

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## Abstract

Recently, almost all industrial devices are mostly built on electronic devices which are precisely sensitive to harmonic. In order to meet the requirement from the industries demand aimed at a free-harmonics and high power rating source is remarkably increased in past few years. An inverter which a device or electric circuit that convert direct current to alternating current is one of the electronic devices that give concern to researchers for improvement of generating a neat power source. The inverter can be categorized into a single level and multilevel inverter. As compared to single level inverter, multilevel inverter offers minimum harmonic distortion and higher power output. This paper presents a model of multilevel inverter using 7-level Cascaded H-Bridge of multilevel DC-AC inverter to reduce total harmonic distortion with different sinusoidal pulse width modulation such as phase disposition and phase opposition disposition. Simulation output of single phase multilevel inverter cascaded H-bridge are analysed and verified in the Matlab/Simulink software. The result show that the 7-level cascaded H-Bridge multilevel inverter with phase disposition technique generate less total harmonic distortion if it is compared to the phase opposition disposition technique.

**Keywords:** Cascaded H-Bridge Multilevel Inverter, Total Harmonic Distortion, SPWM- Sinusoidal Pulse Width Modulation, SPWM disposition and SPWM phase opposition disposition technique.

## 1. Introduction

Recently, the increasing number of electrical energy loads causes the increasing consumption of fossil fuel. This high consumption will affect the increasing of environment pollution. Besides, due to concern toward pollutions and insufficient of conventional energy resources many countries change over to renewable energy sources. Among these sources, solar energy is on attention because of the unlimited power, pollution free, reliability and low maintenance cost [1][2][3][4][5].

Concerning the DC-AC stage efficiency of energy conversion, the multilevel inverters have attracted attentions over years as a good solution for solar energy system [6][7]. Multilevel Inverter is one of the possible solution which is applicable in many application system. They are capable to use in high voltage application with low harmonic also and easily provide the require power levels needed by the high voltage drives. Hence, they have the capability to ease the waveforms of output voltage with a greater harmonic spectrum.

The term of multilevel inverter start with three levels is introduced [8][9]. As the number of inverter level is increased the output voltage steps, the output is generated with low harmonic distortion. The standard Total Harmonic Distortion (THD) value provided by IEEE Std 519-1992, THD limitations for specific equip-

ment has to be 5% with the filter and 15-25% without a filter can be accomplish by using carrier or space vector based method [10]. However, by increasing number of level lead to complexity of circuit when high number of switches is needed. This paper present a modeling of a seven-level cascaded H-bridge inverter and performance verification of the inverter in different Sinusoidal Pulse Width Modulation (SPWM) control techniques.

## 2. A seven-level cascaded H-bridge inverter design

Multi Level Inverters (MLI) has developed into wide and great deal of technology. Day by day, there are hundred thousand of inverters available all over the world but multilevel inverters come with great advantages and abilities. One of them is Cascaded H-Bridge inverter (CHB). Comprehensively, the advantages of CHB multilevel inverter are focusing in the improvement of output signal quality and overcome the high risk damage of power device damage for being failed to achieve desired voltage and current rating. Multilevel inverter are developed in way to overcome some limitations of the conventional inverter with some impressive features which is good including capable to generate output voltage and draw current with lowest distortion and can operate at low switching frequency. The proposed a single phase 7-level CHB MLI in this paper is shown in Figure 1.