

Design of a PWM for UPS with Pulse Dead Time

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ABSTRACT : This paper presents a new design of a power width modulator PWM with and without dead time for each PWM pulses based on specific criteria given. In order to study and design a new model of PWM inverter and to show the effects of dead time on the PWM which was designed and achieved. In this paper, comparison between PWM with & without dead time. The design methodology comprises of the calculations and results analysis. P-Spice simulator was used as a tool to verify the results. The effectiveness of the proposed technique was confirmed. All the waveforms voltage, current, and power achieved and discussed.

Keywords – PWM, Modeling, power electronics design, Harmonics elimination, and inverters.

I. INTRODUCTION

One of the main problems encountered in open-loop pulse width modulation inverter (PWM) drives is the nonlinear voltage gain caused by the non ideal characteristics of the power inverter. The most important nonlinearity is introduced by the necessary blanking time to avoid the so-called shoot through of the dc link. To guarantee that both switches in an inverter leg never conduct simultaneously a small time delay is added to the gate signal of the turning-on device.

This delay, added to the device's finite turn-on and turn-off times, introduces a load dependent magnitude and phase error in the output voltage. Since the delay occurs in every PWM carrier cycle the magnitude of the error grows in inverse proportion to the output fundamental frequency, introducing a serious waveform distortion and fundamental voltage drop. The voltage distortion increases with switching frequency introducing harmonic components that, if not compensated, may cause instabilities as well as additional losses in the machine being driven [1].

The output voltage distortion is the finite voltage drop across the switches during the on state the dead time necessary to prevent the short circuit of the power supply in pulse width modulated (PWM) voltage inverters results in output voltage deviations. Although individually small, when accumulated over an operating cycle, the voltage deviations are sufficient to distort the applied PWM signal [2].

The top and bottom switch has to be "complementary", i.e. if the top switch is closed (on), the bottom must be off, and vice-versa. In practical, a dead time as showed below is required to avoid "shoot-through" faults as showed in Fig.(1) [3].

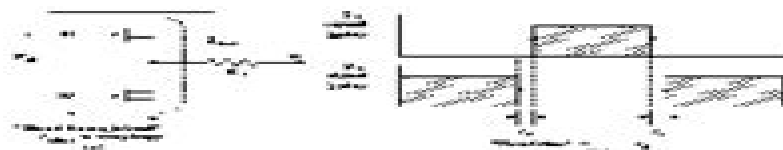


Fig.1 (a) Shoot through fault, (b) Deadtime waveform

Based on various circuit topologies and modulation strategies have been reported for better utilization of multilevel voltage source inverters. Multilevel topologies are classified in to three categories: diode clamped inverters, flying capacitor inverters and cascaded inverters. The topologies have an equal number of main switches [4].

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