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A Novel Method to Eliminate Negative Time Period of SVPWM using DSP TMS320F2812

Ronad B. F.[1], Member IEEE, Naik R. L.[2], Member IEEE and Jangamshetti Suresh.H.[3], Senior Member IEEE

Department of Electrical and Electronics Engineering
Basaveshwar Engineering College, Bagalkot
basugouda.ronad@gmail.com[1], r_l_naik@yahoo.co.in[2], jangam@rocketmail.com[3]

Abstract: **Conventional SVPWM method generates negative time period during lower switching frequency at higher voltage magnitudes. This paper presents a simplified method for implementation of Space Vector PWM technique for two level VSI using DSP TMS320F2812. Methodology presented is to implement SVPWM without lookup table and to calculate time periods independent of voltage magnitude. Experimental results show that proposed method overcomes problem of negative time period for said conditions. An experimental setup is developed in the laboratory around TMS320F2812 to obtain and verify the desired results. This work is a part of project titled "Development of FPGA-DSP Controlled Multilevel Inverter Interface for Grid connection of Wind Turbine Generators" funded by AICTE New Delhi.**

Keywords: Voltage **source inverter, Space Vector PWM, DSP TMS320F2812.**

I. INTRODUCTION

Power quality is the major issue in the power system. As the complexity of power system increases, power quality gets affected due to switching circuits. Thus, it is necessary to develop optimized control technique for inverter switches to achieve quality output voltage of desired amplitude and frequency. The efficiency of the inverter depends on the efficiency of the control technique involved in switching the power transistors. With PWMs, the inverter can be thought of as three separate push-pull driver stages which create each phase waveform independently. The PWM pulses are applied to inverter switches. Various PWM techniques were developed for optimized performance of converter in applications like power system and renewable energy sources [1-3]. Sinusoidal PWM reduces the harmonics and increases the control on phase current; SVPWM technique increases the utilization of DC bus voltage and reduces the switching losses [3].

SVPWM technique can be implemented in DSP using look up table [1]; this method increases the execution time and overload the processor during closed loop operation. An alternate method includes the calculation of three sub intervals of the time period [4]. This method generates the time period varying with voltage magnitude. This will result in negative time period for higher range of voltages. The problem of the negative time period is addressed [5] by setting negative time period to zero. Other two sub intervals of the time period are calculated such that the algebraic sum of the two time values will be equal to the total time period, but this method looses the symmetry of switching waveform, which results distortion in output voltage.

In few cases [2-4] the problem of processor overloading is avoided by setting duty cycle value in the compare registers of DSP. However in this method as the time periods are generated depending on the voltage magnitudes, negative time periods are generated for certain range of voltages.

This paper presents simplified method for the implementation of the SVPWM algorithm using Texas Instrument Digital Signal processor (TMS320F2812). Methodology used in the algorithm is to generate switching pulses independent of magnitude of voltages and without using the lookup table. TMS320F2812 DSP processor has components like compare units and event manager, which is suitable for implementation of SVPWM algorithms [6]. The proposed methodology of inverter control extends the operating voltage and frequency to a wide range.

II. SPACE VECTOR PWM METHOD

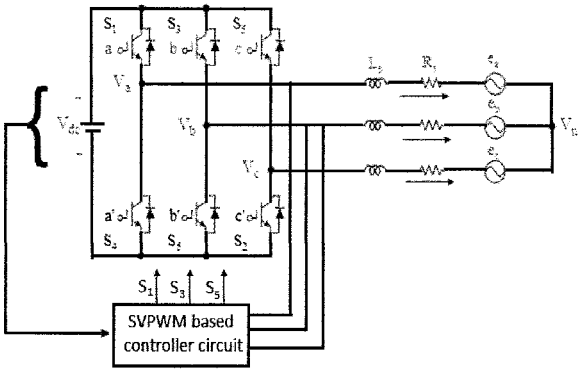

Fig.1: Structure of typical 3-phase VSI

Space vector PWM refers to a switching scheme of the six power switches of a 3-phase VSI. It generates minimum harmonic distortion and also provides more efficient use of DC supply voltage in comparison with