

Experimental Study of SBPWM for Z-Source Inverter Five Phase

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ABSTRACT

On the basis of a conventional Z-source inverter, this paper presents an extension of the existing study about a driving scheme implementation of a simple boost pulse width modulation under open loop system for five phase two level system. The impact of design parameter (fixed modulation index and switching frequency) versus performance parameter (capacitor voltage, inductor current, total harmonic distortion and DC link voltage) are studied and analysed. To validate the advantages of Z-source five-phase inverter, the driving scheme are simulated using Matlab/Simulink and verified with real-time target board eZdspTMTMS320F28335. From the study, it was found that under specified modulation index and switching frequency, the THD of an output current fulfilled the EN61000-3-2 standard.

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1. INTRODUCTION

Over the past forty years, there has been a dramatic increase in the use of fivephase voltage source inverter (VSI) fed motor drive [1], a well-known system that can be fabricated using low-cost, high-performance insulated gate bipolar transistor (IGBT) modules or intelligent power modules [2]. Recent developments in VSI fed motor drive have heightened the need for analyzing the topology, driving scheme, control technique and application. One type of VSI fed motor drive is the Z-source inverter (ZSI), as proposed by F.Z. Peng [3]. Other researcher found [4] that ZSI has progressed actively with the electric vehicle whereby the drive voltage is stress in huge and its investigation has also become a continuing concern within the scope of multiphase systems. There is a large volume of published studies describing the roles of ZSI in multiphase systems [5]–[7]; however, this paper focuses only on the fivephase inverter since it commonly used and the smallest number of phases in a multiphase systems [8].

ZSI has the capability to resolve mutual problems either in VSI fed or in current source inverter (CSI) fed motor drive, which are [3]:

- Issues in bucking and boosting mode operation. The output produced by a H-bridge inverter is restricted either to greater than or smaller than the input voltage. By controlling the modulation index (M_i) of the driving scheme, there is a range of M_i that can be used for bucking and boosting purposes.
- The input circuit to the H-bridge inverter is fixed. During bucking mode, a specific buck converter circuit must be added, while during boosting mode, a boost converter circuit must be provided. With ZSI, bucking and boosting modes can be provided using with similar topology and single stage conversion.