Chapter 8

Performance Analysis of Cascade H-Bridge Multilevel Inverter Topology With Filter Circuit and Without Filter Circuit

Nikhil Agrawal
Ujjain Engineering College, India

ABSTRACT

Multilevel inverter is a modified version of inverter. Multilevel inverter recently emerged in the area of high power and medium voltage application. In the last few decades, the great innovation has been done to improve the inverter performance, and it is challenging even today. The multilevel inverter performance is examined by total harmonic distortion and component required. In multilevel, as level increases, the total harmonic distortion value decreases, but the number of components required and driver circuit increases that make the circuit more complex and also the effect on cost. So, the challenge is to balance the bridge between cost and total harmonic distortion. This chapter simulates the various levels of conventional cascade H-bridge inverter and new proposed topology of multilevel inverter with using different modulation techniques and with using filter circuit and without filter circuit.

INTRODUCTION

The objective of Inverter is to produce an AC output power from a DC power source at rated voltage and frequency. The DC source can be fuel cell, battery, renewable energy source. The output of ideal inverter should be AC sinusoidal but in practice the output obtain AC non-sinusoidal waveforms that contains large number of harmonics. These harmonics degrade the performance of inverter and also produce power quality issue at consumer end. These harmonics content minimized by modifies the inverter circuit. Inverter circuit basically two level. Multilevel inverter is unfurled version of inverter circuit (Agrawal, Singh, and Bansal, 2017). Multi-level inverter starts basically from three level. Two level inverter produce square wave output i.e. it is much more deviated from sinusoidal waveform and THD value about 48 percent is much higher than IEEE standard limit that produces power quality issue at consumer end. To overcome these problem multilevel inverter used. As level increases the square waveform converts in staircase sine waveform so by which it contains less harmonics and also THD value lowered (Rodriguez, Jih-Sheng, and Zheng, 2002). To minimize THD value further various scheme adopted such as filter circuit and various PWM techniques. But problem arise in increase the level, the component required more and also cost associated with. So obtain less THD value in output different topology invented.

MULTILEVEL INVERTER

The multi-level inverter has invented in 1970-1980s (Baker, 1980). The basic concept of multi-level inverter is to obtain high power and voltage by using a power semiconductor switches. Multilevel inverter produce staircase voltage waveform. To eliminate the harmonics many scheme adopted such as multicarrier modulation techniques and filter circuit. The modulation techniques compared reference wave i.e. sinusoidal wave (fundamental frequency wave) with carrier wave (higher frequency triangular wave) and output pulse is intersection of these signals and it is responsible for switching ON or switching OFF the inverter switching device.

The several advantage over a two- level inverter. The brief introduction of these advantages as follows (Ebrahimi, Babaei and Gharehpetion, 2012; Colak, Kabalci, Bayindir, et al., 2011).

13 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/performance-analysis-of-cascade-h-bridge-multilevel-inverter-topology-with-filter-circuit-and-without-filter-circuit/235784

Related Content

Deep Learning-Based Machine Color Emotion Generation
Tongyao Nieand Xinguang Lv (2023). *International Journal of Mobile Computing and Multimedia Communications (pp. 1-14).*
www.irma-international.org/article/deep-learning-based-machine-color-emotion-generation/325349

Secure Agent Data Protection for E-Commerce Applications
S. Guan (2007). *Encyclopedia of Mobile Computing and Commerce (pp. 826-831).*
www.irma-international.org/chapter/secure-agent-data-protection-commerce/17182

Context-Aware and Adaptive Units of Learning in mLearning
Sergio Gómezand Ramón Fabregat (2012). *International Journal of Handheld Computing Research (pp. 1-25).*
www.irma-international.org/article/context-aware-adaptive-units-learning/67094

The Effects of National Culture on Social Commerce and Online Fashion Purchase Intention
Sarah Josephine Heppleand Julie A. Dennison (2018). *Mobile Commerce: Concepts, Methodologies, Tools, and Applications (pp. 870-896).*
www.irma-international.org/chapter/the-effects-of-national-culture-on-social-commerce-and-online-fashion-purchase-intention/183321

Mobile Multimedia for Speech and Language Therapy
Nina Reeves, Sally Jo Cunningham, Laura Jefferiesand Catherine Harris (2009). *Mobile Computing: Concepts, Methodologies, Tools, and Applications (pp. 3529-3539).*
www.irma-international.org/chapter/mobile-multimedia-speech-language-therapy/26739