International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

A Comparison of 5 Level Multilevel Inverter Topologies

Vivekkumar A Patel[1], Rital R. Gajjar[2]

[1]Student of Electrical Department in Parul Institute of Technology, Limda, Vadodra

[2]Associate professor, Electrical Department in Parul Institute of Technology, Limda, Vadodra

Abstract: ***Now days, multilevel inverters are required for high power applications. The multilevel inverters are not only achieves high power ratings, but also use the renewable energy sources. Renewable energy sources like photovoltaic, wind and fuel cells can easily used to supply to inverter system. This paper deals with the comparative study of other topology of multilevel inverter and traditional multilevel inverter basically cascaded H-bridge inverter topology. The proposed topology reduced the number of switches and THD compare to the traditional multilevel inverter.***

Keywords: Cascaded H-bridge inverter, Total Harmonic Distortion

1. Introduction

Power electronic inverters are widely used in various industrial drive applications. To overcome the problems of the limited voltage and current ratings of power semiconductors devices, some kinds of series and/or parallel connections are necessary [1]. Now days, the multilevel inverters have received more attention due to their ability to synthesize waveforms with a better harmonic spectrum and to attain higher voltages. The most popular topologies for multilevel inverters are neutral-point clamped (NPC) inverters and cascaded H-bridge inverters. The traditional three-level NPC inverter is simple in structure, but can only be used in the medium voltage drives because of the limited voltage of the semiconductor devices. The inverter output voltage required an LC output filter to smooth output voltage which is heavy and expensive. So that in most high-voltage industrial drives the cascaded H-bridge inverters are used which typically consists of five or more H-bridge cells per phase. This topology presents excellent input-current and output-voltage waveform, however, suffers from some drawbacks: the big number of components for the rectifier and inverter, as well as the complexity of the control and input transformer. Furthermore, it's very difficult to operate at 4 quadrants with energy recuperation. All these have negative impacts on the efficiency and cause a higher cost of the drives.

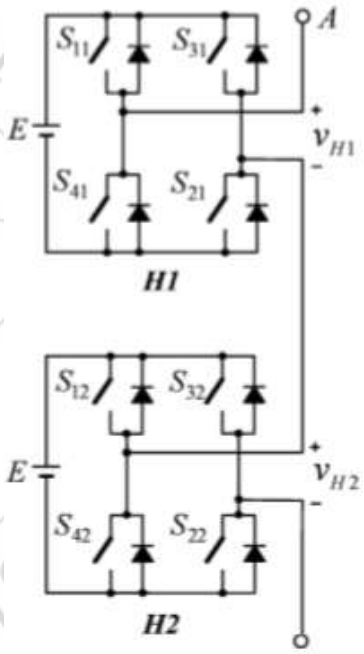

Figure 1: 5-level cascaded multilevel inverter

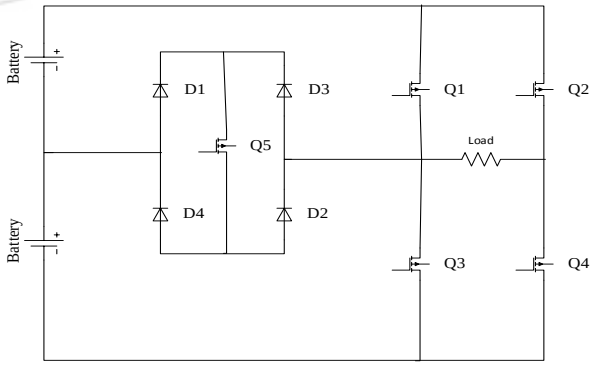

Figure 2: 5-level other multilevel inverter topology

2. System Overview

This paper proposes the comparison of different topologies of cascaded multilevel inverters. A traditional 5-level cascaded multilevel inverter utilizes 8 switches. The other multilevel inverter topology also produces 5-level with 5 switches. A traditional 5-level inverter required 2 battery sources. The other multilevel inverter topology also required same number of battery sources which is used in traditional 5-level multilevel inverter.

3. Simulation Results

The simulation model was designed using MATLAB / Simulink Software. The gating signals for the inverter are generated by using multicarrier pulse width modulation technique

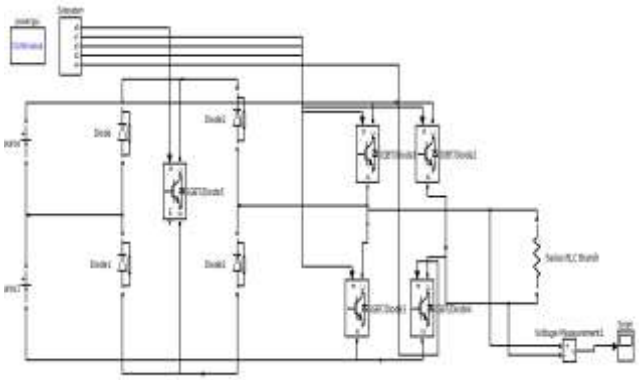

Figure 3: MATLAB simulation circuit diagram for Circuit for 5 level other multilevel inverter topology

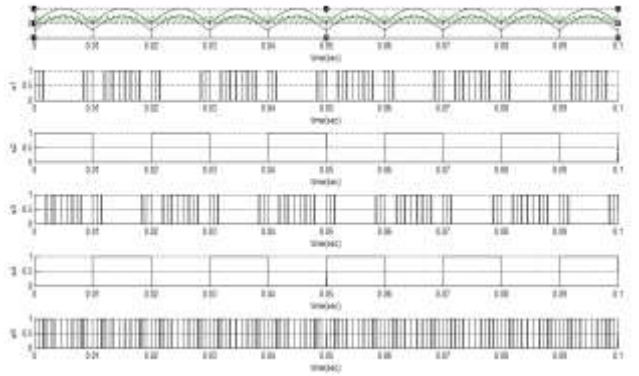

Figure 4: Gate pulses of 5-level other multilevel inverter topology

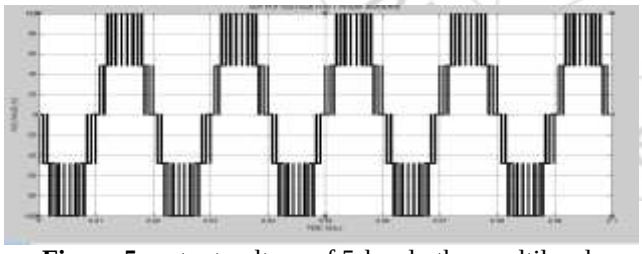

Figure 5: output voltage of 5-level other multilevel inverter topology

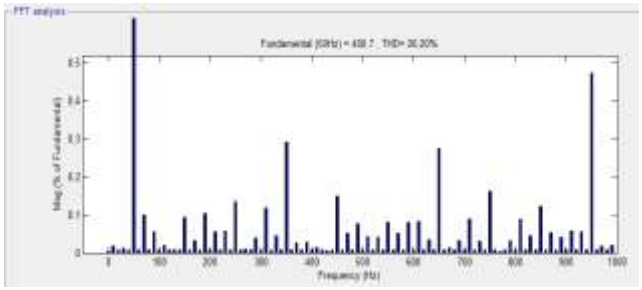

Figure 6: 5-level other multilevel inverter topology with multicarrier modulation THD=26.20%

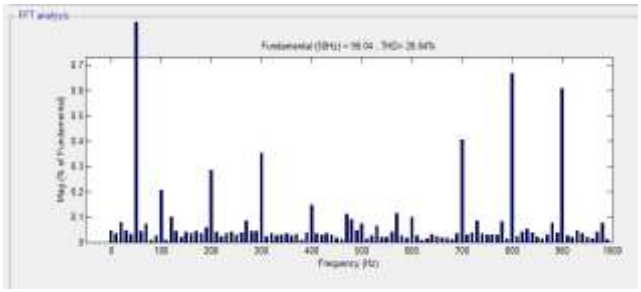

Figure 6: 5-level traditional multilevel inverter topology with multicarrier modulation THD=26.64%

Multilevel inverter	Number of battery source	Number of switches	THD (%)
5-level cascaded multilevel inverter	2	8	26.64%
5-level other multilevel inverter	2	5	26.20%

4. Conclusion

Comparing the result of different topologies prove that topology of fig 2 is better as it gives nearly same output with reduce number of switches

References

[1] Divya Subramanian and Rebiya Rashee, "Modified Multilevel Inverter Topology for Driving a Single Phase Induction Motor", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, (An ISO 3297: 2007 Certified Organization) Vol. 2, Special Issue 1, December 2013
[2] Satheeswaran .K and Dr. K. Ramani, "Modified Hybrid Multilevel Inverter for Induction Motor Using Solar energy", International Journal of Ethics in Engineering & Management Education, ISSN: 2348-4748, Volume 1, Issue 4, April 2014
[3] Daniel Korbes and Domingo Ruiz-Caballero, "Modified Hybrid Symmetrical Multilevel Inverter", International Journal of Ethics in Engineering & Management Education, 978-1-4577-1216-6/12/2012 IEEE
[4] Jianye Rao, "Investigation of Control Method for a Other Hybrid Cascaded Multilevel Inverter", The 33rd Annual Conference ofthe IEEE Industrial Electronics Society (IECON) Nov. 5-8, 2007, Taipei, Taiwan
[5] Zhong Du. John N. Chiasson, Burak Özpineci, "A Cascade Multilevel Inverter Using a Single DC Source", 0-7803-9547-6/06/2006 IEEE.
[6] Zhong Du and John N. Chiasson, "Inductor less DC-AC Cascaded H-bridge Multilevel Boost Inverter for Electric/Hybrid Electric Vehicle Applications", 0197-2618/07/$25.00 © 2007 IEEE
[7] Ch.Venkateswra rao, S.S.Tulasiram and Arun Kumar Rath, "Simulink modelling of novel Hybrid H-bridge inverter for smart grid application", International Journal of Modern Engineering Research (IJMER) Vol.3, Issue.2, March-April. 2013 pp-659-666
[8] Bin Wu, High power converter and AC drives, wiley-interscience, A john wiley & sons, Inc., Publication, PP 119-188
[9] Muhammad H. Rashid, Power Electronics, Academic Press, 2001, PP 225-271