An Improvement in Seven Level Multi Level Inverter using Sinusoidal Pulse Width Modulation with Low Levels of Distortion

Ms. Puja Kumari[1], Ms. Alka Thakur[2]
[1]*M. Tech. Research Scholar,* [2]*Associate Professor,*
[12]*Department of Electrical Engineering, Sri Satya Sai University of Technology and Medical Sciences, Sehore, (Madhya Pradesh), India*

Abstract- Now a day's industrial applications have to require higher power apparatus in recent years. a multilevel power converter structure is used in high power and medium voltage situations. The multilevel inverters are starting in three level converters. The elementary concept of a multilevel converter is to achieve higher power to use a series of power semiconductor switches with several lower voltage dc sources to perform the power conversion by synthesizing a staircase voltage waveform. Here we are using seven Level Inverter which is used to convert uncontrolled D.C.multi-level converter can switch each input or output at least between three voltage or current levels. a multi-level inverter involves the combination of power semiconductors and capacitive voltage sources. We will focus particularly on the interest of the improvement of the waveform of the filter voltage compared to its reference, and consequently of the source currents, by carrying out simulations.

Keywords- multilevel power converter, level converters, semiconductor switches, capacitive voltage, power semiconductors

I. INTRODUCTION

The structure of the inverter with two voltage levels encounters physical and technological limits for the rise in voltage and therefore in power [1], in particular the quality of the voltage generated with a high harmonic rate (reference case sinusoidal voltage). It is to overcome these drawbacks that some researchers have introduced inverters having a multi-level voltage structure, and which generate a voltage closer to its reference, with fewer harmonics in the case where the voltage reference is sinusoidal [1]. Now a days supplying high quality power to the critical loads like medical equipment, research instrument is of vital importance. Different hardware structure and techniques have been applied to obtain pure supply. The distortion of the output voltage decreases as the number of level increases and it is further improved by applying pulse width modulation (PWM) techniques. This part of research is focused to reduce the harmonic content in the output voltage by incorporating a single phase nine level cascaded multi-level inverter and PWM techniques [2]. Inverters are used to convert dc power into ac power. That dc power can be taken from solar panels-controlled rectifiers or batteries. Efficiency and power quality are main parameters while designing any power converters. Losses and total harmonic distortions are minimised as low as possible to develop efficient power converter [5]. Square and Modified sine wave inverters are used for small power application due to their high value of total harmonic distortions [6]. For high power applications and to run sensitive loads, multilevel inverters are used due to their better power quality. Increasing the levels in the output of inverter improves power quality and hence reduces the size of filter [5].

Multilevel converters include an array of semiconductor devices and capacitive voltage sources. By proper connection and control, they can generate a multiple-step voltage waveform with variable and controllable frequency, phase and amplitude. The stepped waveform is synthesized by controlling the switch devices to connect the load to the different capacitive voltage sources [7]. A two-level converter generates an output voltage with two values with respect to the negative terminal (N) of the capacitor, while the three-level converter generates three voltages, and so on. It is observed that two-level converters can generate a variable frequency and amplitude voltage waveform by adjusting a time average of the two voltage levels, which is usually performed with pulse-width modulation (PWM) techniques. Multilevel converters have the voltage level as another control degree of freedom to generate the output waveform to obtain improved output waveform quality [9].

II. PROPOSED METHODOLOGY

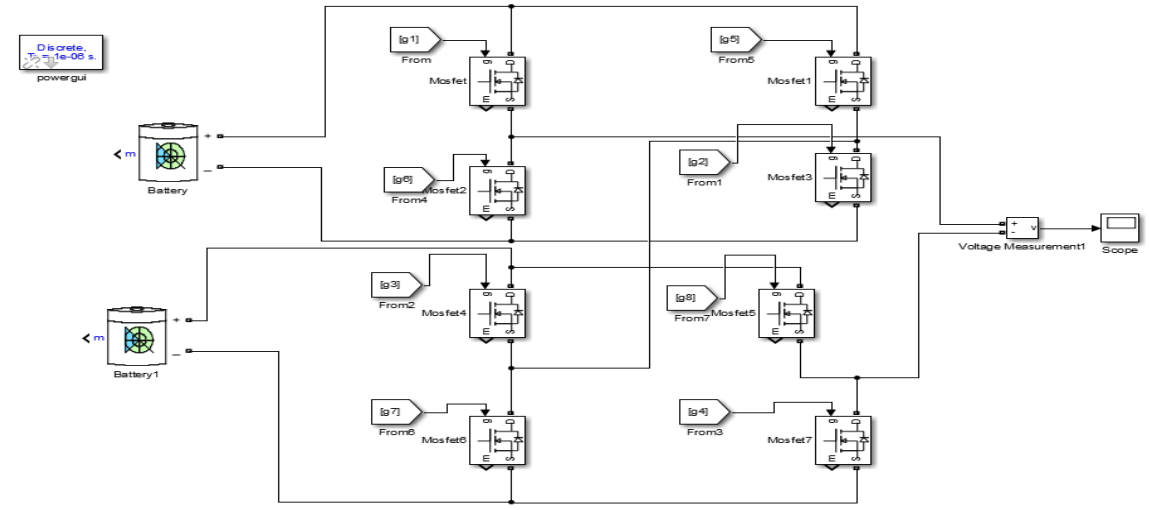

Fig.1: Multi-level Inverter for 5 –level

For controlling of the switch's techniques used is based on Sinusoidal Pulse width modulation which is basically known as SPWM. The control diagram is shown in Fig 4.2.

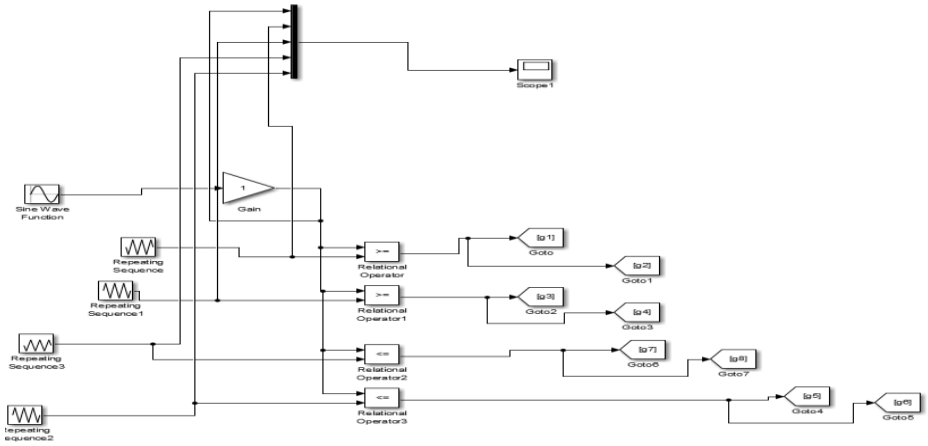

Fig.2: Controlling of Converter 5 level

Figure 2 shows the output waveform, and figure 4.5 shows the waveform for FFT exploration of the same and Figure 4.6 shows the FFT analysis.

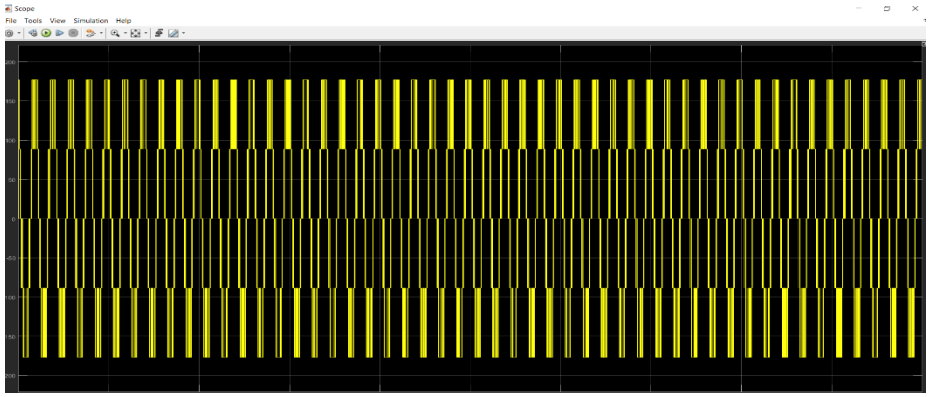

Fig.3: Waveform output

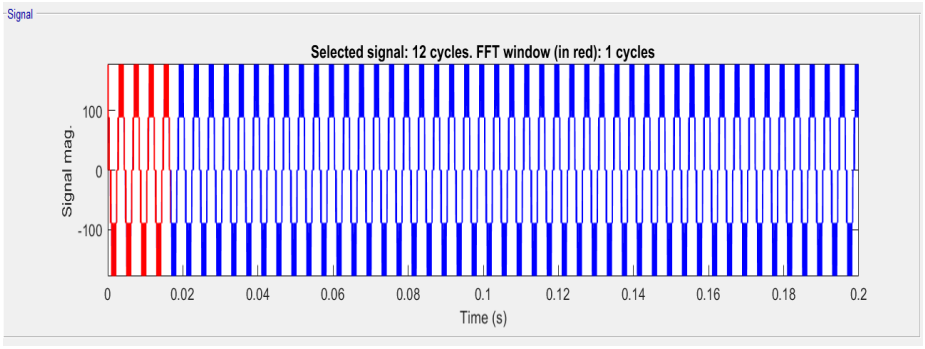

Fig.4: Waveform output for FFT analysis

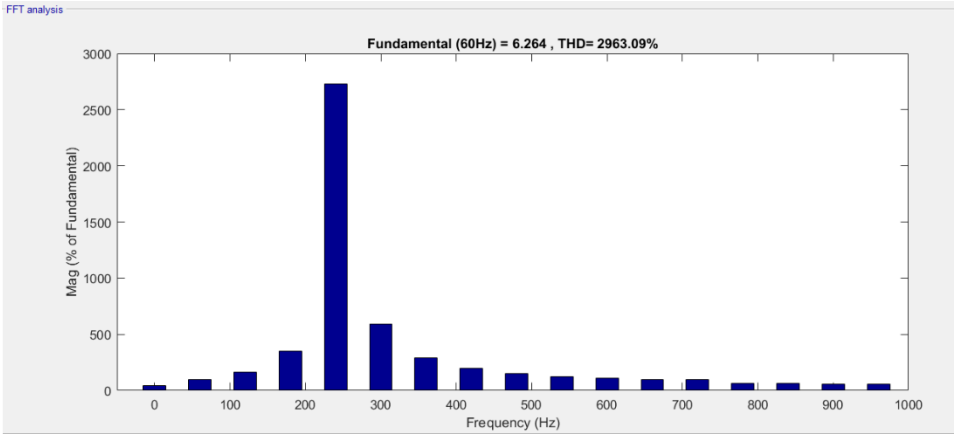

Fig.5: FFT analysis of 5 level

In the above figure THD for base implementations is shown, in below figure the model proposed circuit is shown.

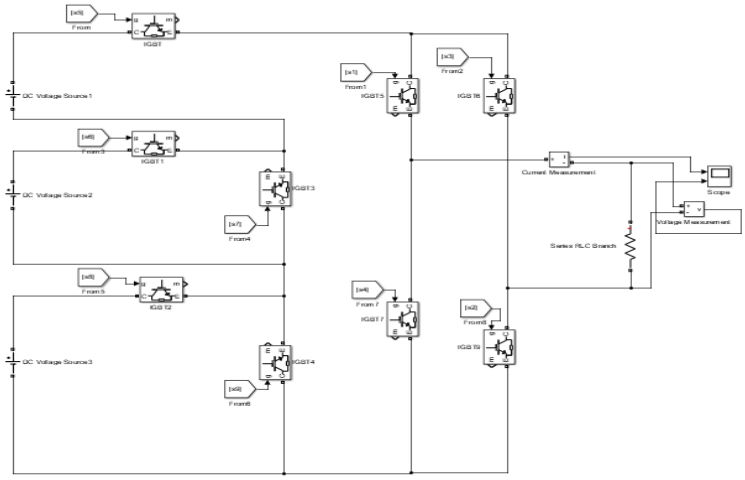

Fig.6: Proposed Model for 7 -level

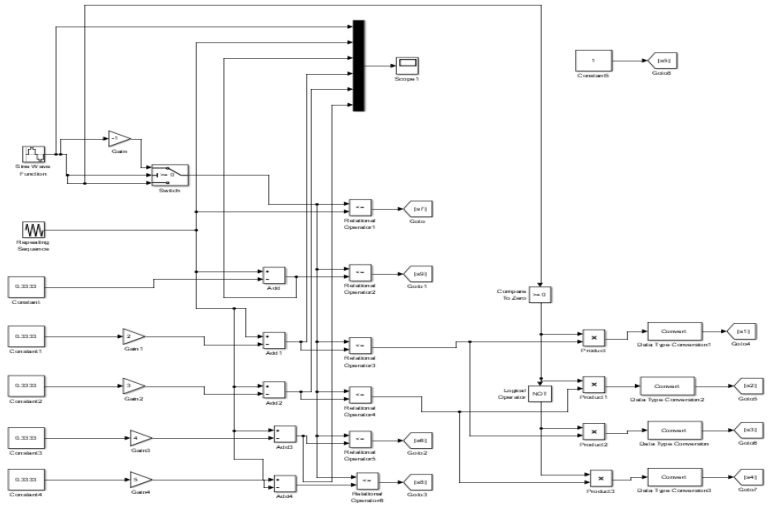

Fig.7: Control Strategy for proposed model

In figure 7, the control strategy is shown and in figure 4.9 the output current and voltage waveforms are shown.

III. RESULT

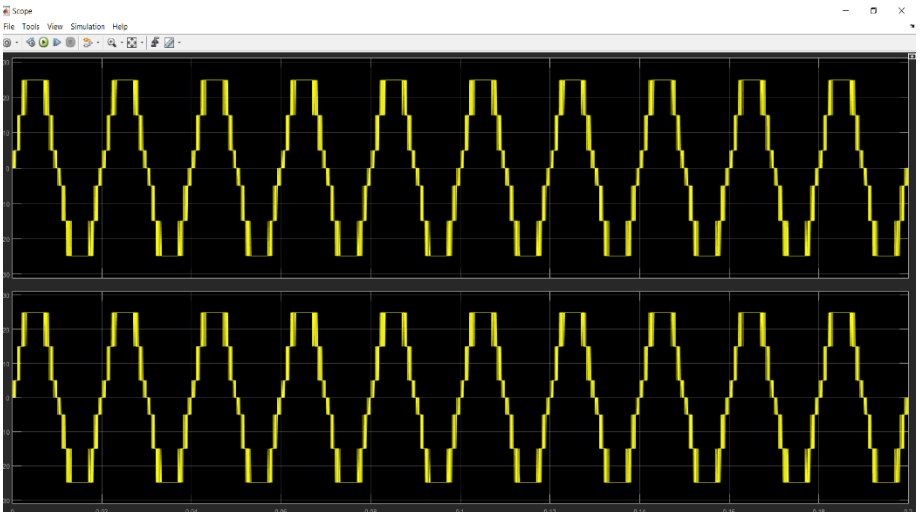

Fig.8: Waveform output of proposed 7-level

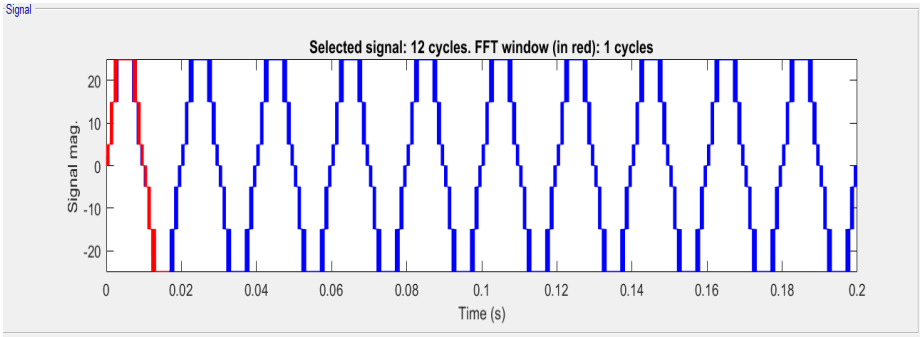

Fig.9: Waveform output for FFT Analysis proposed 7-level

In this figure 9, the FFT analysis is shown for seven level inverter and figure 4.11 shows the THD for the output waveform.

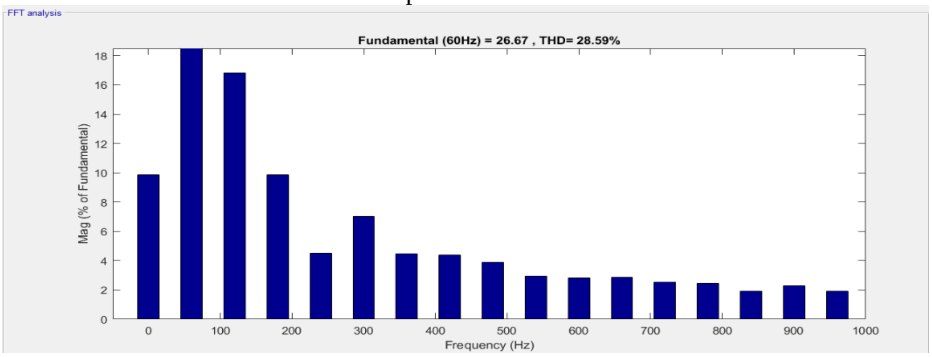

Fig.10: FFT Analysis of Proposed 7-level

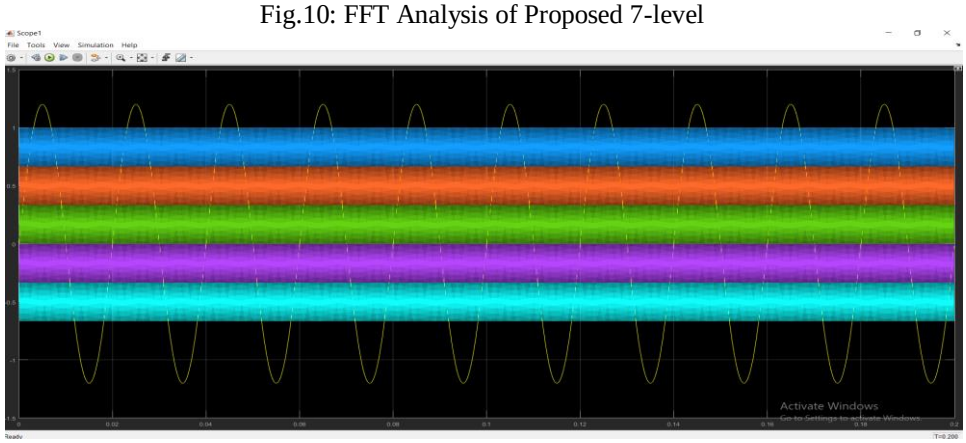

Fig.11: The proposed SPWM Waveform

In the above, figure shows the SPWM technique for the proposed seven level inverter for lower distortion level.

IV. CONCLUSION

A relative report is improved arrangement of multilevel inverter. Fell sort multilevel inverter is picked for this exploration, in view of its basic structure and less part prerequisites. The seven level fell inverter arrangement is reproduced in open circle control utilizing multiple PWM and Sinusoidal PWM systems. The re-enactment results are displayed and broke down. From this piece of work, the sinusoidal PWM based reproduction gives better outcomes. Subsequently, it is taken for further investigations in the inverter. The streamlining methods are connected to compute the exchanging edges in order to acquire least absolute symphonies twisting in the output of the fell seven level inverter. The hereditary calculation enhancement strategy is first connected and the exchanging points are discovered dependent on the target capacity and imperatives for ideal THD. The outcomes are displayed and analysed with better results.

V. REFERENCES

[1]. Iti Mahashabdey et al., "Harmonic Analysis Of Multilevel Inverter" August, 2016

[2]. Mr. Punit Ratnani et al., "Simulation of Five-Level Inverter with Sinusoidal PWM Carrier Technique Using MATLAB/Simulink" ISSN 0974-2158 Volume 7, Number 3 (2014), pp. 367-376

[3]. M. Murugesan et al., "Comparison of Sinusoidal Pulse Width Modulation based Seven and Five Level Cascaded Inverters" ISSN 0974-2158 Volume 6, Number 5 (2013), pp. 541-550

[4]. Manikandan et al., "Implementation of Multilevel Inverter Using Sinusoidal Pulse Width Modulation Technique" Volume 2, Issue 7, July 2013

[5]. L. Benyettou et al., "Comparison performance five level and seven-level cascaded H-bridge multilevel inverter of total harmonic distortion (THD)" Received: 28 January 2018 Accepted: 15 April 2018

[6]. Jahangeer Soomro et al., "Comparative Analysis Between Conventional and Modified Cascaded H-Bridge Nine Level Topologies Using Multicarrier Pulse Width Modulation Techniques" ISSN: 2146-5193, September 2018 Special Edition, p.2032-2042

[7]. Kureve D. Teryima1 et al., "THD Analysis of an Overlapping Carrier Based SPWM For a 5-Level Cascaded H-bridge Multilevel Inverter", International Journal of Advanced Science and Technology Vol.87 (2016), pp.47-56.

[8]. jigar N. et al., "Flying Clamped Capacitor Multilevel inverter in variable Frequency Drive", international journal of Advanced Research in Computer and Communication Engineering, vol. 2, issue 9, September 20l3, pp. 3697-370l.

[9]. S. Krishnapriya et al., "Multilevel inverter Fed induction Motor Drives", international journal of Research in Engineering and Technology (ijRET), volume 04, issue 09, September20l5, pp. 60-64.