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Novel Multilevel Inverter Design and Implementation

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Abstract: A contemporary multi-level dc-ac inverter is used in this project. When the right gate signals are created, the recommended multi-level inverter generates an output voltage that has seven levels. Additionally, the absolute euphonious mutilation of the sinusoidal voltages may be limited by using the low pass channel. The voltage weight of influence frameworks and altering disasters might be reduced in this suggested staggered inverter. The advised inverter operating guidelines and the information capacitor voltage adjusting framework were dropped. A multi-level laboratory inverter system with an output of 220Vrms/2 KW and an input voltage of 400-V is then introduced. The sinusoidal pulse-width (SPWM) of the staggered inverter is adjusted by the computerized sign processor (DSP) TMS320LF2407. Experimental findings demonstrate peak functionality. full load efficiency of 94.5 percent and efficiency of 96.7 percent. There is a widespread perception of confused inverters for high-control, high-voltage applications. They are inherently more generous than traditional two-level inverters in terms of less melodic mutilation, increased electromagnetic square, and larger dc touch voltages. Although it has certain drawbacks, some of them include complicated heartbeat width regulation, expanded part numbers, and voltage balancing issues.

Keywords--- Novel multilevel, TMS320LF2407, SPWM.

Introduction

Electrical demand and performance are higher than before because of more-tech development[1]. Thanks to the development of the semiconductor, the power unit design and the power conversion technique were encouraged [2]. Inverter is one of the power transformations capable of transforming dc-ac. Inverter is the intermediate transmission power to other electrical equipment such as continuous[3].

Smart grid for electricity, servo, air conditioning and renewable energy [4]. The frequency output and voltage must be calibrated to meet different load specifications and characteristics [5]. The sum of instrumentality of energy is growing [6]. Consequently, the harmonic grid emission becomes more severe [7]. In order to limit the performance of harmonics and the power problem of electrical

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instrumentality, several standards and rules are established [8]. In addition, to meet the exchange requirements for high-control applications, the limit device's voltage stress will increase together[9].

Although the associated degree of bipolar electronic transistor (IGBT) isolated gate has options for more power rating and more voltage stress[10], it can't work at more frequency. What's more, in this way, the IGBT door driver style is hard [11]. A MOSFET is that the segment satisfactory to work at more frequency isn't on a par with IGBT. However, many different construction topologies use low rating elements in dynamic application to solve the problem [12].

The structure topology's aim is to reduce the facility switch's voltage score [13]. This is why it is always used in high-power applications [14]. The advantages of less dv/dt, low information current contortion, and lesser switch frequency are at combination of output voltages in structure form. Most topologies have arisen in recent years as the result of the advantages of structure topology [15].

A novel electrical converter for construction is built and implemented [16]. The fundamental element of the topology proposed is that the power components are decreased [17]. Curving pulse width modulation (SPWM) is utilized by digital signal processor (DSP) to control the planned circuit. The inverter must cover the transformer's position to retain system characteristics in transformer fewer PV systems [18]. With a ground fault detector in the inverter, the safety guidelines will be fulfilled [19]. A ground defect sensor is a simple but reliable device that disengages its inverter when an insulation failure is found in the installation[20].

1. System Configuration

Renewable energy, also known as alternative energy, is commonly [21] seen as an alternative to conventional energy typically provided by fossil fuel combustion such as petroleum, [22] coal, or natural gas. Solar radiation, i.e., sunshine, is the main source of renewable energy. Fig.1 shows the proposed device block diagram[23].

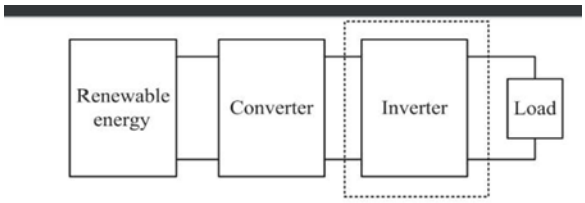

Fig.1 Block diagram of the proposed system

1.1 Cascaded H-bridge Multi level Inverter: -

The fell H-bridge of the hour staggered inverter is to use capacitors and switches and requires low parts at each stage[24]. The above perceptron is made from the structure of the cells and forces of

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transformation of vitality may be easily controlled. Besides, the blower blend, switches pair is known as an H-development and provides the specific DC voltage information for each H-associate. It includes H-interface cells and the three unavoidable voltages for each unit, for layout, zero, positive DC and negative DC voltages [25]. One of the upsides of such a sort of twofold level inverter is that it requires less modules than got diode and voyaging capacitor inverters [26]. The inverter's efficiency and mass were lower than that of diverse inverters [27]. A portion of the extraordinary methods of trade allow for delicate exchange [28]. Staggered course inverters are valuable to swap the wide transformer accessible for conventional double stage inverters, bracing diodes fundamental for diode clasped inverters and voyaging condensers required for fly condenser inverters. Regardless, they require a monster number of secluded voltages to supply every cell.

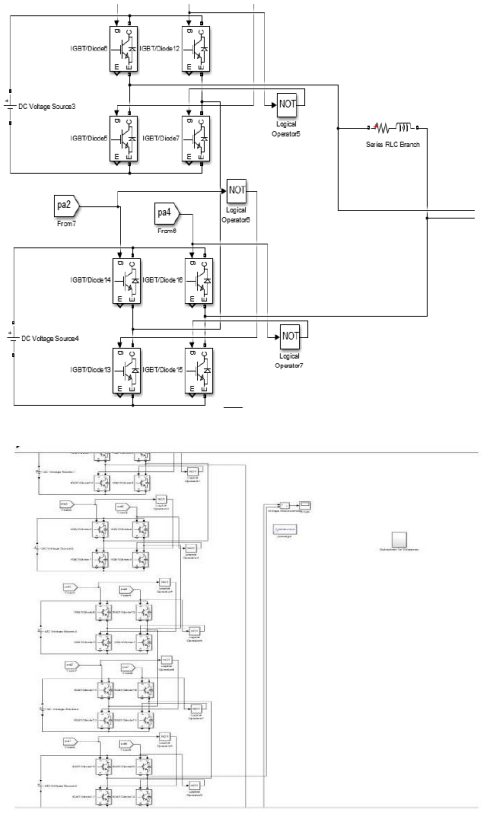

Fig2. Novel multilevel inverter 11 level

2. Simulation Results and Discussion

Based on the 7-level inverter, the same carrier waves are produced with some DC offsets. The one-wave comparison block. Where 1 is the frequency of the carrier and 2 is the frequency of the reference. The system is designed as the pulse is only generated when there is a comparison of two waves to peak and lower limit within the limits of the specific carrier wave.

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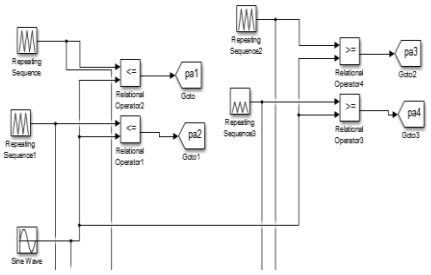

Fig 3 Generation of SPWM pulses

Using the DC offset values, the remaining carriers are created, and the model Fig. 3 is transformed into a subsystem and issued to each carrier wave. Fig.3 shows the total carrier wave generation and comparison.

2.1 Output wave forms from subsystem

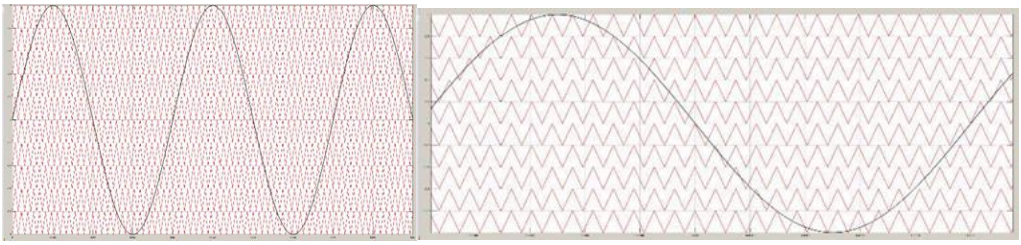

Fig 4 Carrier wave forms for eleven level generation from subsystem

2.2 Output wave forms from main block: -

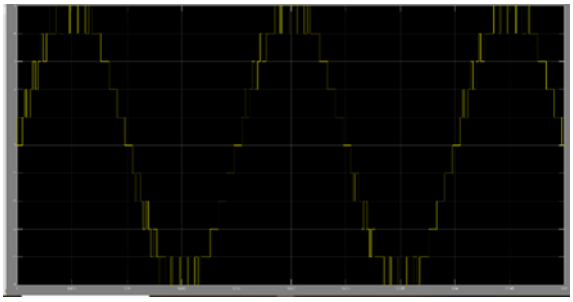

Fig 5 (a) output waveforms for 11 level inverters from main block

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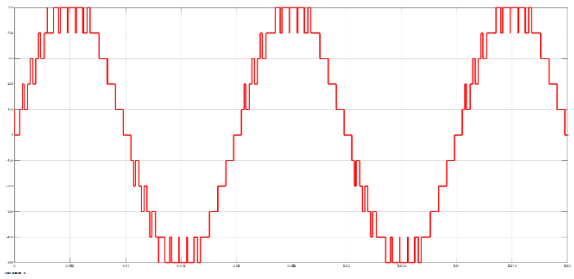
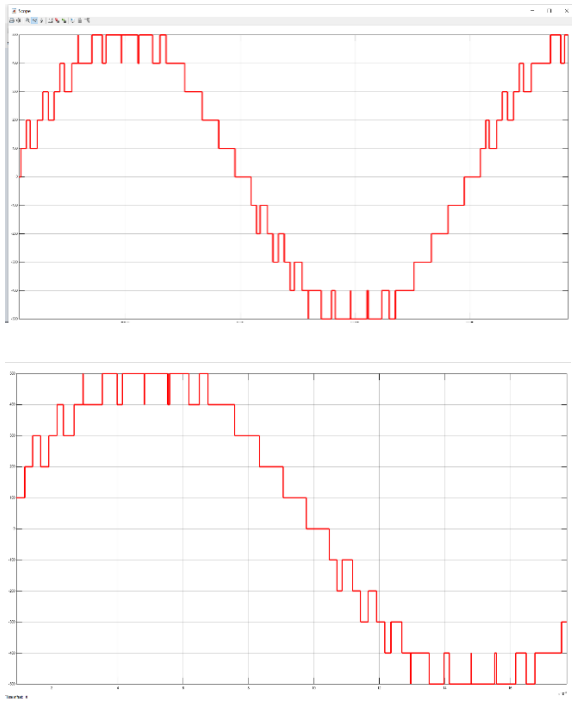


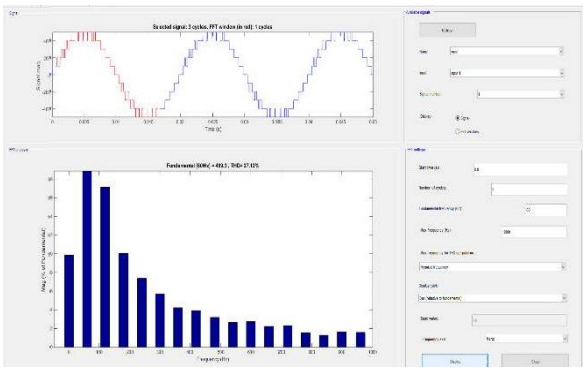
(5)(b) output wave forms form 11 level inverters from main system



2.3 Different types of input cycles from Power GUI

The number of cycles where it occurred, and we can see the different threshold values which are decreased forusing 60 frequencies in it is shown in the following outputs.

1. No of cycles=1



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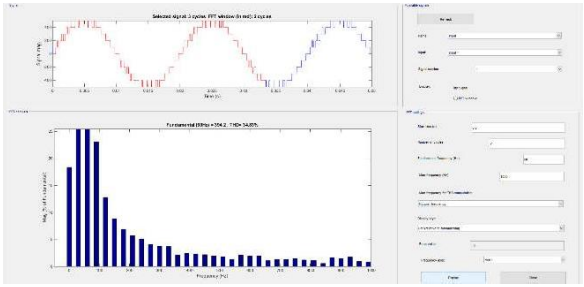
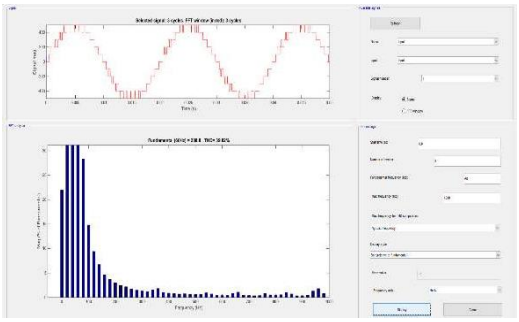
2. No of cycles= 2



3. No of cycles = 3



Conclusion:

Another eleven-level inverter has been created and implemented by DSP for this project. The main idea behind the suggested structure is to reduce the number of intensity devices. In contrast to conventional frameworks, the control unit decreases. Eventually, a 400-V input voltage and 220 Vrms/2 kW output performance inverter design is introduced. At this frequency of 60 Hz. The threshold values are measured here for three cycles at a frequency of 60 Hz. We may supply the circuit with positive and negative power and then watch the outputs by utilising a level shift carrier pulse.

References

[1] R. Gonzalez, E. Gubia, J. Lopez, and L. Marroyo, "Transformer-less single-phase multilevel-based photo- voltaic inverter," IEEE Trans. Ind. Electron., vol. 55, no. 7, pp. 2694–2702, Jul. 2008.

[2] S. Daher, J. Schmid, and F. L. M. Antunes, "Multilevel inverter topologies for stand-alone PV systems," IEEE Trans. Ind. Electron., vol. 55, no. 7, pp. 2703–2712, Jul. 2008.

[3] W. Yu, J. S. Lai, H. Qian, and C. Hutchens, "High-efficiency MOSFET inverter with H6-type configuration for photo-voltaic no isolated, ac-

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

module applications," IEEE Trans. Power Electron., vol. 26, no. 4, pp. 1253–1260, Apr. 2011.

[4] R. A. Ahmed, S. Mekhilef, and W. P. Hew, "New multilevel inverter topology with minimum number of switches," in Proc. IEEE Region 10 Conf. (TENCON), 2010, pp. 1862–1867.

[5] M. R. Banaei and E. Salary, "New multilevel inverter with reduction of switches and gate driver," in Proc. IEEE 18th Iran. Conf. Elect. Eng. (IECC), 2010, pp. 784–789.

[6] Wang, H., Liu, J.Plasma asymmetric dimethylarginine and l-arginine levels in Chinese patients with essential hypertension without coronary artery disease(2011) Journal of Cardiovascular Disease Research,2 (3), pp. 177-180. DOI: 10.4103/0975-3583.85265

[7] Lamia medouni-haroune, farid zaidi, sonia medouni-adrar, mouloud kecha (2018) olive pomace: from an olive mill waste to a resource, an overview of the new treatments. Journal of Critical Reviews, 5 (6), 1- 6. doi:10.22159/jcr.2018v5i5.28840

[8] Durai Muthumani, Agaath Hedina, Juveriyah Kausar, Vijaya Anand, Pushpa. "Phytopharmacological activities of Euphorbia thymifolia Linn."Systematic Reviews in Pharmacy 7.1 (2016), 30-34.Print. doi:10.5530/srp.2016.7.4

[9] A. Shukla, A. Ghosh, and A. Joshi, "Flying-capacitor-based chopper circuit for dc capacitor voltage balancing in diode-clamped multilevel inverter," IEEE Trans. Ind. Electron., vol. 57, no. 7, pp. 2249–2261, Jul. 2010.

[10] C. L. Xia, X. Gu, T. N. Shi, and Y. Yan, "Neutral-point potential balancing of three-level inverters in direct-driven wind energy conversion system," IEEE Trans. Energy Convers., vol. 26, no. 1, pp. 18–29, Mar. 2011.

[11] T Vijay Muni, S V N L Lalitha, "Power Management Strategy in Solar PV System with Battery Protection Scheme in DC Microgrid", International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-6, April 2019, pp:960-964.

[12] T Vijay Muni, S V N L Lalitha, "Fast Acting MPPT Controller for Solar PV with Energy Management for DC Microgrid", International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249-8958,Volume-8 Issue-5, June 2019, 1539-1544.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

[13] T Vijay Muni, P Srinivasa Varma, S Kiran Priya, J Bhavya, S Rajasekhar," Energy Management in a DC Microgrid with Energy Storage System", Jour of Adv Research in Dynamical & Control Systems, Vol. 12,Issue-02, 2020, 130-136

[14] K. Sano and H. Fujita, "Voltage-balancing circuit based on a resonant switched-capacitor converter for multilevel inverters," IEEE Trans. Ind. Appl., vol. 44, no. 6, pp. 1768–1776, Nov./Dec. 2008.

[15] J. Rodriguez, S. Bernet, P. K. Steimer, and I. E. Lizama, "A survey on neutral point clamped inverters," IEEE Trans. Ind. Electron., vol. 57, no. 7, pp. 2219–2230, Jul. 2010.

[16] Suroso and T. Noguchi, "New generalized multilevel current-source PWM inverter with no-isolated switching devices," in Proc. IEEE Int. Conf. Power Electron. Drive Syst. (PEDS), 2009, pp. 314–319.

[17] J. Selvaraj and N. A. Rahim, "Multilevel inverter for grid-connected PV system employing digital PI controller," IEEE Trans. Ind. Electron., vol. 56, no. 1, pp. 149–158, Jan. 2009

[18] N. A. Rahim, K. Chaniago, and J. Selvaraj, "Single-phase seven-level grid-connected inverter for photovoltaic system," IEEE Trans. Ind. Electron., vol. 58, no. 6, pp. 2435–2443, Jun. 2011.

[19] G G Raja Sekhar, T Vijay Muni A_Novel Methodology for Single Phase Transformerless Inverter with Leakage Current Elimination for PV Systems Applications.

[20] T. Vijay Muni, S V N L Lalitha, B Rajasekhar Reddy, T Shiva Prasad, K Sai Mahesh, "Power Management System in PV Systems with Dual Battery", International Journal of Applied Engineering Research ISSN 0973-4562 Volume 12, Number 1 (2017), pp.:523-529.

[21] T. Vijay Muni, G Sai Sri Vidya, N Rini Susan, "Dynamic Modeling of Hybrid Power System with MPPT under Fast Varying of Solar Radiation", International Journal of Applied Engineering Research ISSN 0973-4562 Volume 12, Number 1 (2017), pp.:530-537.

[22] M Srikanth, T. Vijay Muni, M Vishnu Vardhan, D Somesh, "Design and Simulation of PV-Wind Hybrid Energy System", Jour of Adv Research in Dynamical & Control Systems, Vol. 10, 04-Special Issue, 2018, pp: 999-

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 10, Iss 4, 2021

1005

[23] S Ilahi, M Ramaiah, T Vijay Muni, K Naidu, " Study the Performance of Solar PV Array under Partial Shadow using DC- DC Converter", Jour of Adv Research in Dynamical & Control Systems, Vol. 10, 04- Special Issue, 2018, pp: 1006-1014.

[24] T.Vijay Muni, K. Venkata Kishore, N.Sesha Reddy, "Voltage Flicker Mitigation by FACTS Devices", IEEE International Conference on Circuit, Power and Computing Technologies (ICCPCT 2014).

[25] T. Vijay Muni, D. Priyanka, S V N L Lalitha, "Fast Acting MPPT Algorithm for Soft Switching Interleaved Boost Converter for Solar Photovoltaic System", Journal of Advanced Research in Dynamical & Control Systems, Vol. 10, 09-Special Issue, 2018

[26] D. Ravi Kishore, and T. Vijay Muni, "Efficient energy management control strategy by model predictive control for standalone dc micro grids", AIP Conference Proceedings 1992, 030012 (2018); doi: 10.1063/1.5047963

[27] K Venkata Kishore, T Vijay Muni, P Bala Krishna, "Fuzzy Control Based iUPQ Controller to Improve the Network of a Grid Organization", Int. J. Modern Trends Sci. Technol. 2019, 5(11), 40-44.

[28] T Vijay Muni; Kishore, K.V. Experimental Setup of Solar–Wind Hybrid Power System Interface to Grid System. Int. J. Modern Trends Sci. Technol. 2016, 2, 1–6.