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Dc-Dc Boost Converter with Ripple Reduction Techniques for Electric Vehicle

[1]P.Yamunaa, [2]A.Antonycharles, [3]S.Dinakar Raj, [4]S.L. Sreedevi, [5]R.Tamilamuthan, [6]G.Irin Loretta

[1,2,3,4,5] Department of Electrical and Electronics Engineering, PERI Institute of Technology, Chennai.

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[1]Corresponding Author:

Dr.P.Yamunaa

Abstract— In this paper, the power converters plays an important role in E-vehicle applications. The fast power conversion system produce more number of ripples and glitches in the power converter circuits. The properly designed system with the help of the opposite polarity of two switches and filter which is used to reduce the ripples. The integration of multiple energy sources is complicated in existing system. In order to reduce the ripple more effectively, the proposed system is designed with PV and battery source. Instead of C-filter, here the Pi-filter is installed and this will improve the efficiency more than in the existing project. The performance of the proposed topology is verified through MATLAB environment.

Keywords: ***Asymmetric structure, reduction in switch count, Voltage sources and Total harmonic reduction.***

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I. INTRODUCTION

The transformer-based dc-dc converters can achieve high Voltage gain ratio by simply increasing the number of turns of the high frequency transformer. Nonetheless, voltage Spikes occur across the power switch resulted from the Transformer's leakage inductance. Equivalently, the Leakage-inductance exists in the coupled inductor as well; Therefore, creating a similar undesirable voltage spike Across the power switch. The voltage spikes can be absorbed by installing a snubber circuit. However, snubber circuits reduce the overall efficiency and introduce more Complexity to the converter.

II. EXISTING SYSTEM

The transformer-based dc-dc converters can achieve high Voltage gain ratio by simply increasing the number of turns of the high frequency transformer. Nonetheless, voltage spikes Occur across the power switch resulted from the transformer's Leakage inductance. Equivalently, the leakage-inductance exists in the coupled inductor as well; therefore, creating a similar undesirable voltage spike across the power switch.

The Voltage spikes can be absorbed by installing a snubber circuit. However, snubber circuits reduce the overall efficiency and Introduce more complexity to the converter. On the other hand, the lower volume and simplicity of the Non- magnetic coupling dc-dc converters made such types of Converters gain the attention of researchers. Several non-isolated voltage step up methods such as Voltage Lift (VL), Switched Inductor (SL), Voltage-Multiplier (VM) and Switched-Capacitors (SC) are investigated and proposed to Various known dc-dc converters.In [1] a single switch high Gain converter using the hybrid switched-capacitor technique introduced.

In [5] a single switch hybrid boosting converter is introduced. Both converters in [1] and [5] withdraw pulsating current from the PV that degrade the performance and life time of it. In [5] and [7] the active switches Inductor (ASL) boosting technique is utilized to provide high Step up capability. The ASL unit is combined with a passive Switched capacitor unit to generate the structure of converter [6]. Similarly, a voltage step up converter using the hybrid Switched inductor methodology is introduced in [7].In addition to the disadvantages pulsating input current in both converters in [6] and [7], the gain can be further increased and the Voltage stress of the switches can be decreased. In [8], a multilevel boost-converter is introduced that has a Continuous input current; however, the input current-ripple and output voltage- ripple can be reduced. Moreover, the voltage gain can be further expanded, and the voltage stress of the Switch can be reduced (normalized to the output voltage). In [9], an interleaved multilevel boost converter is proposed. Converter [9] provides ripple reduction capability but the high Number of components with respect to the given voltage gain Makes the converter practically less attractive. In [10] a continuous input current six-phase interleaved-boost converter with reduced stress is proposed. Nonetheless, the high count of the utilized components (6-switches, 6-inductors, 8-capacitor and 14-diodes) is not practical for the gain ratio and having 6switches require additional gate driver circuits; therefore, more volume, size and complexity. In this paper, a symmetrical multilevel dc-dc boost converter with ripple reduction feature for solar PV Systems Is investigated. Fig. 1 shows the existing system

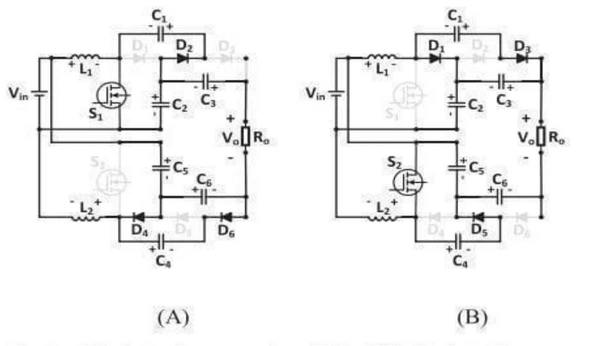

Fig.1. (A) State-1 occurs when (S1) is ON (B) State-2 occurs when (S1)is OF

III. PROPOSED SYSTEM

To simulate multilevel dc-dc boost converter with C-filter to simulate multilevel dc-dc boost converter with ∏-filter to simulate only PV- multilevel dc-dc boost converter with ∏-filter to simulate PV and Battery based multilevel dc-dc boost converter with ∏-filter. Circuit diagram of existing DC source with multilevel DC-DC boost converter C-filter system is simulated Circuit diagram of Proposed PV source with multilevel DC-DC boost converter ∏-filter system is simulated.

Circuit diagram of only PV source with multilevel DC-DC boost converter R- load and Battery load system is simulated Circuit diagram of PV and battery source with multilevel DC-DC boost converter R-load and Battery load system is simulated. Above systems are compared Output voltage ripple is reduced from1.60V to 0.15V by using modified ∏ -filter system Output ripple current is reduced from 0.017A to 0.001A by using modified ∏ -filter system.

Output Power ripple is reduced from 5.60W to 0.60W by using modified ∏ -filter system. Output voltage is improved from 210V to 250 V by using modified PV and battery based multilevel DC- DC boost converter system Output power is improved from 440W to 650W by using modified PV and battery multilevel DC-DC boost converter modified PV and battery based multilevel DC-DC boost converter ∏ -filter system has better performance than existing DC source multilevel DC-DC boost converter C-filter system. Fig. 2 shows the proposed system

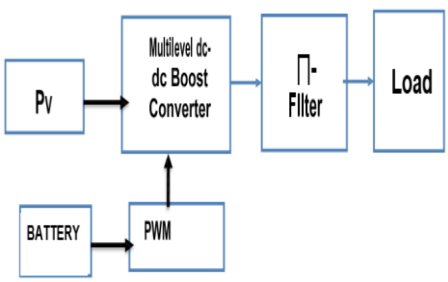

Fig.2.Proposed Circuit Diagram of PV and battery based multilevel DC-DC boost converter with ∏-filter

IV. CONTROL STRATEGY

For high step-up ratio to increase the low voltage produced by the PV system. The converter withdraws a continuous current with low ripple which is an essential factor to protect the PV and Increase its lifetime. The proposed converter reduces the voltage stress on the Active switches as a function of the output voltage. The proposed converter does not include magnetically coupled inductors. Therefore, there is no high voltage spikes on the active switches. Due to the transformer less configuration of the proposed Converter, it is not necessary to utilize snubber circuits to mitigate the ringing on the switch that is caused by the Transformer.

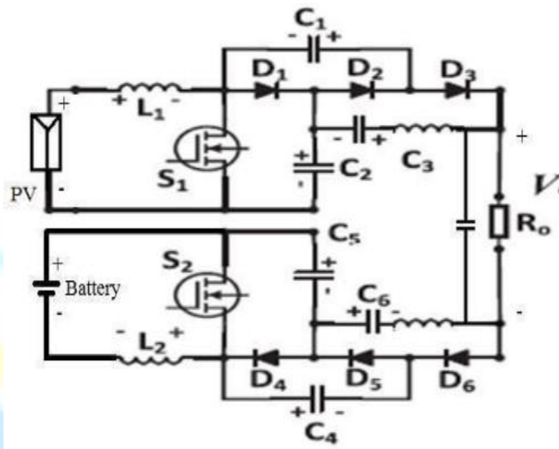

Fig.3. Block diagram of proposed system

V. SIMULATION RESULTS

A simulation is a model that mimics the operation of an proposed system as shown in Fig 5 providing evidence for decision-making by being able to test different scenarios or process changes.

In this simulation a multilevel Dc-Dc boost converter with ∏ −-filter shown here. In current situation a electric Vehicle plays a major role in our country.so we are going to remodel a electric hybrid vehicle. In our existing project we are using only dc supply and c filter to reduce ripple reduction and in our proposed project we are using battery and PV source for more efficiency.

Instead of ∏ - filter we are using pie filter for reducing more ripple reduction. While comparing our existing project in proposed paper we are getting more than 50% of efficiency. The rate at which the DC voltage is switched on and off during the pulse width modulation process in a switching power supply as shown in Fig 6. Fig 7- Fig 9 discussing about the output current, output voltage & output power. The switching frequency in an inverter or converter is the rate at which the switching device is turned on and off. Typical frequencies range from a few KHz to a few megahertz (20Khz-2MHz). The rate at which the DC voltage is switched on and off during the pulse width modulation process in a switching power supply. Fig. 11 show the dynamic characteristics of battery.

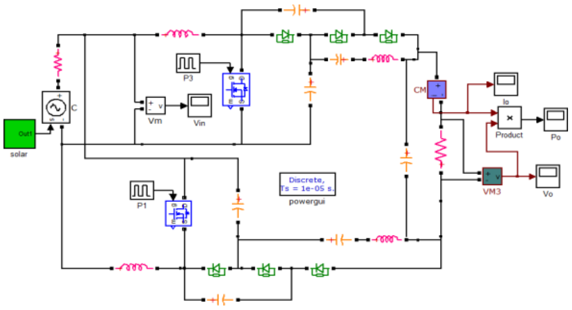

Fig. 5. Simulation diagram of proposed system

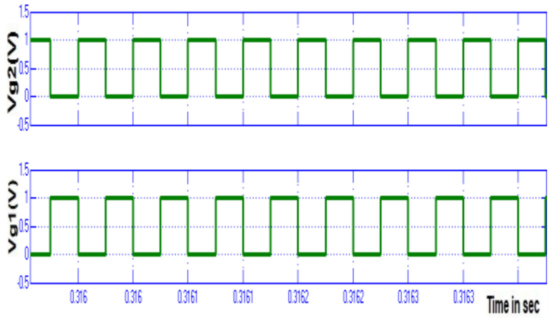

Fig. 6. Pulse generation of proposed system

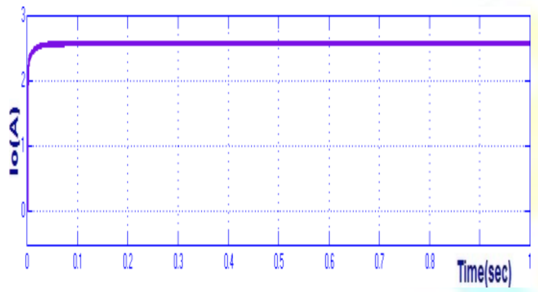

Fig. 7. Current in Rload proposed system

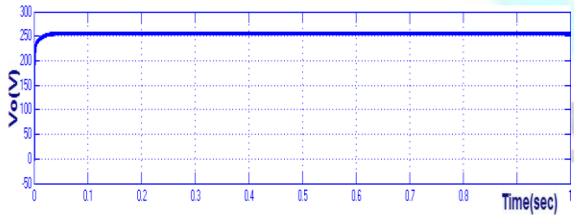

Fig. 8. Voltage across PV System

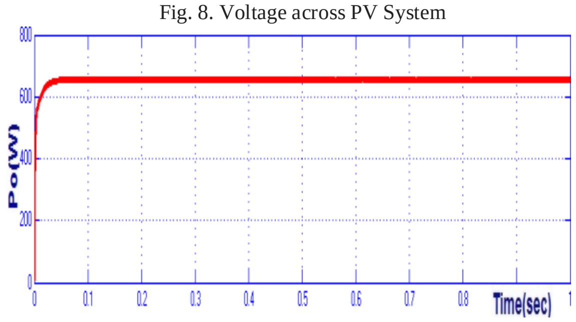

Fig. 9. Power generate in proposed system

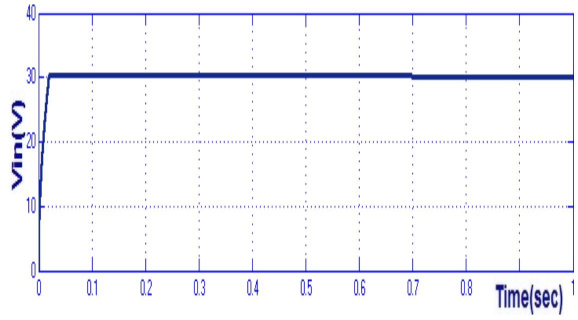

Fig. 10. Voltage across battery

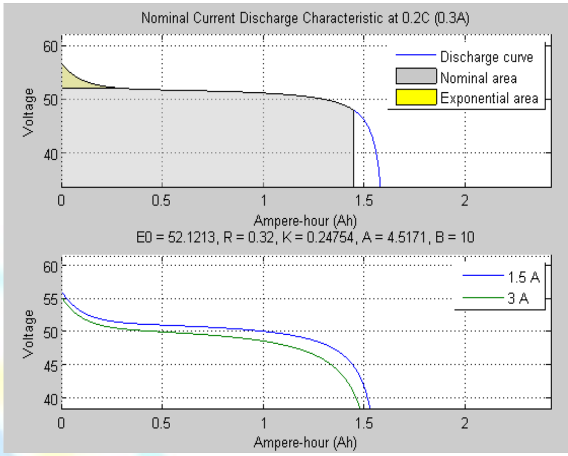

Fig. 11. Battery dynamic characteristics

Table-1: In this table comparison between the pv source only and pv , battery source. It is consists of output voltage and output power

Multilevel DC-DC converter	Vo(V)	Po(W)
PV only	210	40
PV and Battery	250	650

VI. CONCLUSION

In this paper output voltage ripple is reduced from 1.60V to 0.15V by using modified ∏ - filter system. Output ripple current is reduced from 0.017A to 0.001A by using modified ∏ -filter system. Output Power ripple is reduced from 5.60W to 0.60W by using modified ∏ -filter system. Output voltage is improved from 210V to 250V by using modified PV and battery based multilevel DC-DC boost converter system. Output power is improved from 440W to 650W by using modified PV and battery based multilevel DC-DC boost converter system .Hence modified PV and battery based multilevel DC-DC boost converter ∏ -filter system has better performance than existing DC source multilevel DC-DC boost converter C-filter system.

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