IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE)
e-ISSN: 2278-1676, p-ISSN: 2320-3331, Volume 16, Issue 2 Ser. II (Mar. – Apr. 2021), PP 01-06
www.iosrjournals.org

Analysis and Simulation of Interleaved High Step-Up DC-DC Converter

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Abstract:
The developing worry about the deficiency of petroleum products, the expansion in oil costs, expanded an Earth-wide temperature lift, obliteration of nature prompted the utilization of energy units and sustainable power source power generation. Such force age requires a lift DC-DC converter with high voltage change proportion and high proficiency. A DC-DC lift converter with voltage multiplier cell is proposed in this paper. The proposed configuration comprises a converter with helper capacitors and diodes. VMC proposed in this paper gives high voltage put on by decreasing the voltage weight on diodes and switches. This converter is easy to execute and furthermore financially savvy. Therefore, high proficiency can be accomplished and can be worked for various transformation proportions. A model with an information voltage of 30V, an appraised yield voltage of 225V and evaluated yield intensity of 500W at 50 kHz recurrence is intended to check the hypothetical examinations and exploratory outcomes.

Key Word: *DC Converter ,Regular lift converter ,Staged lift converter ,Stacked lift converter , Switching capacitors.*

Date of Submission: 18-03-2021 Date of Acceptance: 01-04-2021

I. Introduction

Force age utilizing power devices and sustainable power source assets like sun oriented, photo voltaic and wind energies is expanding quickly because of the diminishing in petroleum products accessibility. Inexhaustible assets can be used and controlled better when contrasted with the ordinary petroleum product sources. The yield acquired from these sources is similarly low according to the heap necessity. Consequently, it requires the utilization of gadgets to control the yield provided to the heap. There are numerous customary strategies accessible to control the voltage. Yet, a significant number of them are not proficient enough because of the misfortunes and high voltage proportions. One of the productive techniques to expand the information gathered from these frameworks can be directed by utilizing altered traditional DC-DC help converters.DC-DC lift converters are electronic circuits which convert DC voltage beginning with one territory then onto the following. It basically use high repeat switches, electronic sections like inductors, capacitors, diodes and resistors. Converters are predominantly used to change over the voltage procured from various creating sources to require consistent voltage.The essential target of a lift converter is to let consistent yield voltage. A lift converter is used to wander up the source. In such converters the yield voltage is reliably more conspicuous than the source voltage. Lessing or growing the yield voltage subject to necessities. A lift converter is used to wander up the source. In such converters the yield voltage is reliably more noticeable than the source voltage.

II. Different Configurations Of Lift Converters

2.1 Regular Lift Converter

This is the essential sort of lift converter which utilizes fundamental force components, for example, an inductor, a switch (semiconductor), a diode and a capacitor at the yield side as appeared in fig 2.1. the gain of this converter can be inferred as follows

$$\frac{V_0}{V_1} = \frac{1}{1-D}$$

Where V_0 is output , V_1 is input and D is obligation cycle ratio

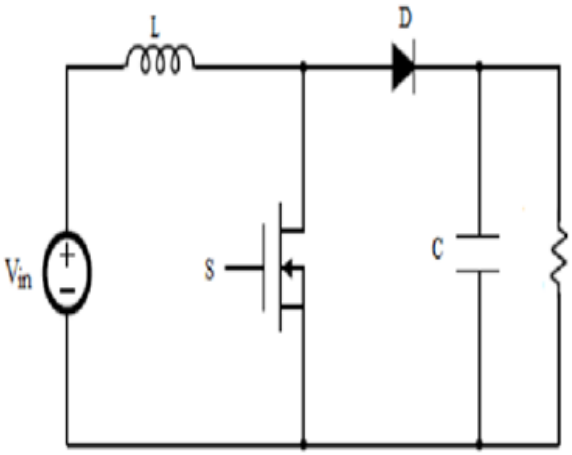
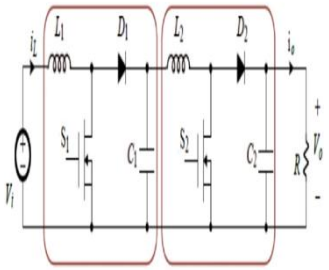


Fig 2.1 Circuit of a regular lift converter

2.2 Staged Lift Converters

While working at a high obligation cycle can diminish the efficiency of the lift converters, this issue can be overcome by the staged topology of conventional lift converters. By cascading the lift converters we can achieve an increase in voltage at a decent obligation cycle. A two staged lift converter i.e a quadratic lift converter is shown in fig 2.2 (a) and (b).



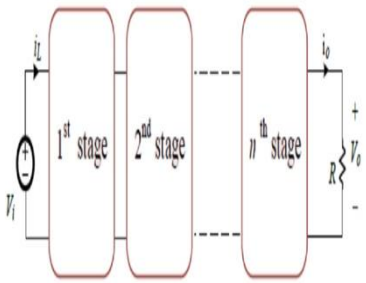


Fig 2.2 (a) 2 -stage staged lift converter Fig 2.2 (b) N-stage staged lift converter

2.3 Stacked Lift Converter

In stacked lift converters the general yield is evuivalent to the total of the individual lift converters.Fig 2.3 shows the stacked lift converters

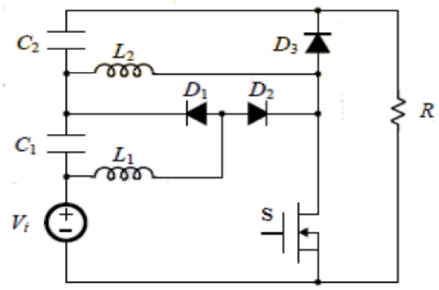
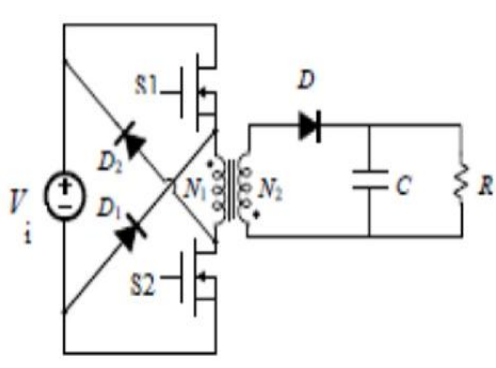


Fig 2.3 Stacked lift converter

2.4 Isolated Lift Converters

Isolated lift converters use transformers and coupled inductors.By expanding the turns proportion of transformers or inductors, the yield voltage of the converter can be expanded. Fly- back lift converters as in Fig 2.4 (a) and Forward lift converter as in 2.4(b) have the asymmetrical cycle in BH-circle.



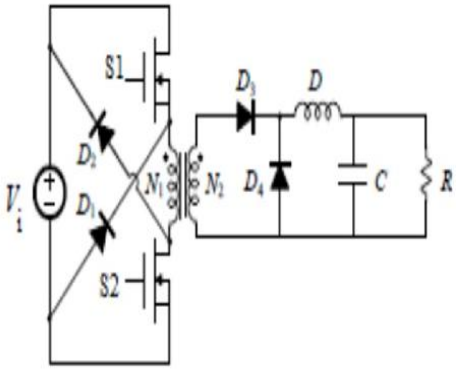


Fig 2.4 (a) Fly-back lift converter Fig 2.4 (b) forward lift converter

2.5 Switching Capacitors

This comprises chiefly capacitors and switches.The voltage is directed by charging and discharging of the capacitors.Inductors are missing in this converters, thus the size of the converter diminishes and it is likewise savvy. The misfortunes in this conveters are high.

2.6 Interleaved Lift Converters

In this sort of converter, ordinary lift converters are associated in parallel. By interphasing in parallel the general decrease in the current weight can be accomplished and misfortunes over the inductor and the capacitors are likewise diminished. However it cannot diminish the voltage weight over the switches. To built the voltage gain VMC's can be utilized.

III. Voltage Multiplier Cells

Voltage multipliers cells comprises of capacitors and diodes, gets AC as source, by charging capacitors in parallel it hepls the yield (DC) which is a a lot higher than the info voltage.One can utilize the transformers and coupled inductors to help the yield voltage aswell, however the size of the transformer makes the circuit setup bulkier. Voltage multipliers can create extreme voltage and low flows so this prompts different proficient uses of VMc's.VMc's configurations can be classified as voltage doubler and voltage tripler and voltage quadrapler.

3.1 Voltage Multiplier Cells For Lift Converters

Lift converters can build the voltage level however it is additionally resrticted to a specific worth.Henceforth, the extra circuit plan is needed to radically expand the voltage.It tends to be done either by utilising transformers or including a circuit course of action of diodes and capacitors.Fundamentally an amended channel of rectifier with filter.

3.2 Lift Converters With VMC Configuration

A stage up converter comprises two inductors , two switches and two VMC units as an exampleappeared in Fig 3.1

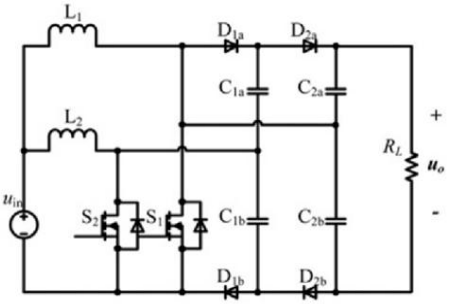


Fig 3.1 Lift converter with VMC

IV. Proposed Lift Converter With VMC

The proposed convereter appeared in figure comprises three inductors three switches and numerous VMC units. A solitary VMC unit comprises three helper capacitors as appeared in figure is comsidered to inprove the activty and execution examination. The setting off signs of the apparent multitude of three switches are interleaved and note worthy than half. The switches can worked in five modes as appeared in Fig.4.1

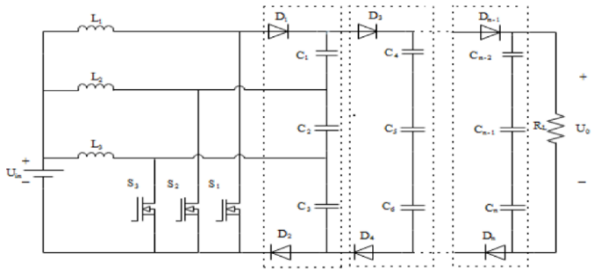


Fig 4.1 Proposed converter configuration

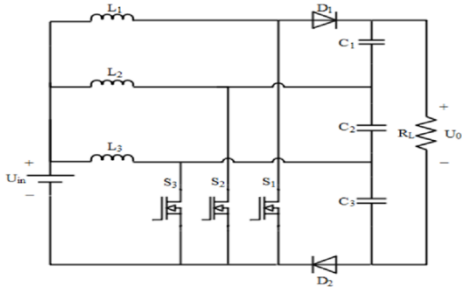


Fig 4.2 Proposed converter with single VMC

V. Simulation Results

Proposed converter , three inductors are utilized .As we probably are aware that inductors are utilized as capacity components .In DC –DC Converters we use converters to ensure there is a non stop vitality gracefully to the heap . Voltage across three inductors are appeared in fig 5.1 (a) and flows across inductors are appeared in fig 5.1(b)

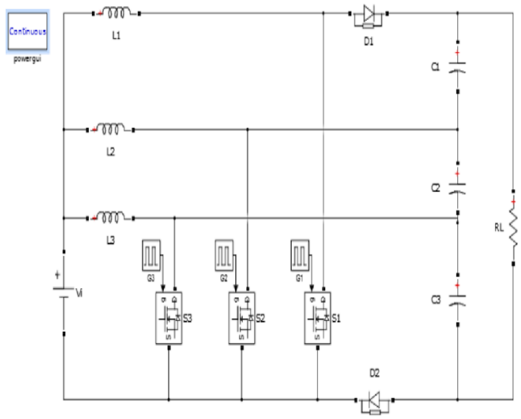


Fig 5.1 Simulation Circuit

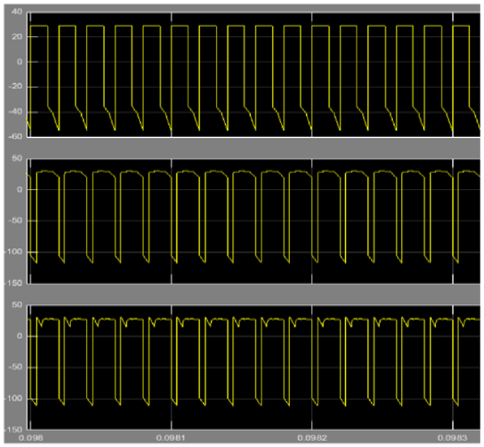


Fig 5.1 (a) Inductor Voltages

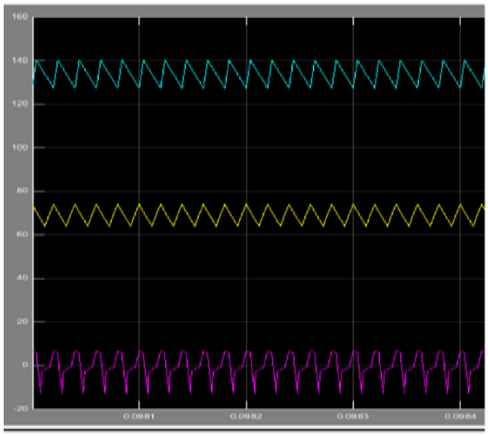


Fig 5.1 (b) Inductor Currents

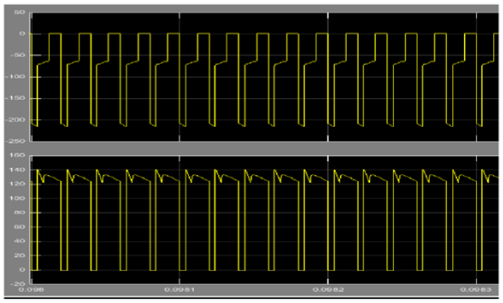


Fig 5.1 (c) Diode Voltages

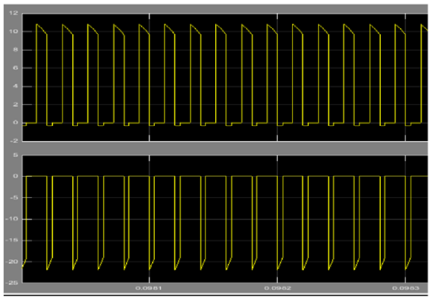


Fig 5.1 (d) Diode Currents

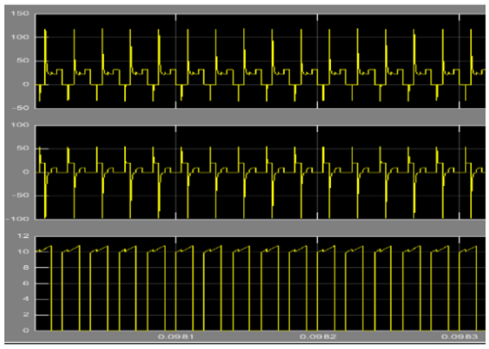


Fig 5.1 (e) Switches Currents

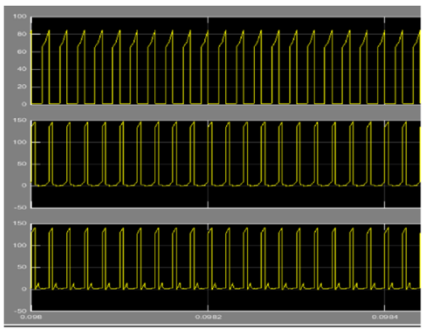


Fig 5.1 (f) Switches Voltages

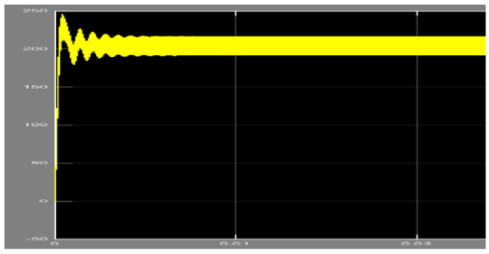


Fig 5.1 (g) Output Voltage

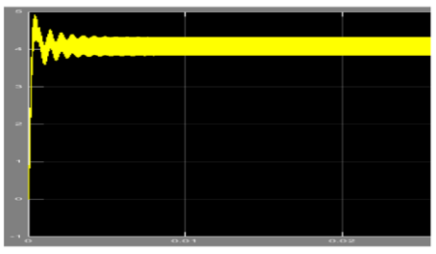


Fig 5.1 (h) Output Current

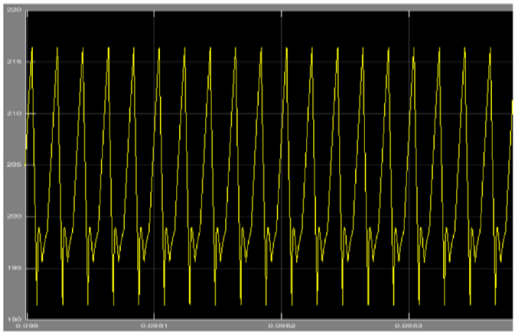


Fig 5.1 (i) Output Voltage waveform

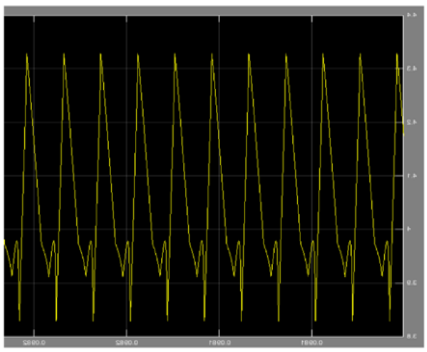


Fig .5.1 (j) Output Current waveform

VI. Conclusion

In this undertaking, a DC-DC lift converter with adjusted VMC has been proposed to lift the voltage obtained from this sustainable power source or energy unit sources.The priciple goal of proposing this converter was to diminish and restrict the voltage weight on switches and diodes.The converter input is 30v and it lifts the voltage to 205V utilizing a solitary VMC. This hypothetical assisment is confirmed by reproducing the proposed converter. This converter brings about high yield voltage with loiw current and further more decreases voltage loads viably. Nontheless the quantity of parts utilised in the proposed converter are all the more at it can lessen voltage weight on switches effectively. Subsequently test confirmation can be completed further for sometime later.This proposed converter can be certainly utilised for the high current and low current applications.

References

[1]. ML Alghaythi, RMO connell , NE Islam, Joseph M Guerrero, 2020 IEEEPower & Energy Society Innovative Smart Grid Technologies Conference (ISGT) ,1-5,2020.

[2]. Tohid Nouri, seyed Hossein Hosseini, Ebrahim Babaei , Jaber Ebrahimi,IET Power Electronics 8(2) , 175-189,2014

[3]. Yie-Tone Chen, Wei-Cheng Lin, Ruey –Hsun Liang, International Journal Of Circuit Theory and Aplications 43(8), 967-983, 2015.

[4]. Hossein Shojaein, Mojtaba Heydari, Saeed Hasanzadeh, 2017 8th Power Elecrtonics, Drive Systems And Technologies Conference(PEDSTC), 288-293, 2017.

[5]. Ying Huang, Siew-Chong Tan, Shu Yuen Hui, IEEE Transactions on Power Electronics 34(8), 7703-7718, 2018.

[6]. Yifei Zheng Wenhao Xie, Keyue Ma Smedley, IEEE Journal of Engineering and Selected topics in Power Electronics 8(2),1560-1570,2019.

[7]. Ankit Mittle, Ravindra Kumar singh Sarath Chandra J, IEEE Students Conference 2019.

[8]. Yie-Tone Chen; Wei-Cheng Lin, 2015 IEEE 2nd International Future Energy Electronics Conference(IFEEC).

[9]. Kuo-Ching Tseng, Chun-Tse Chen, Chun-An Cheng, Journal Of Power Electronics, Vol:16, No:2 PP. 414-424, March 2016.

[10]. Mohabbat Vafa, Mohammad Hossain Ershadi, Mehdi Baharizadeh, Iranian Journal Of Science & Technology , Transactions of Electrical Engineering 2020.

G.Usha Rani. "Analysis and Simulation of Interleaved High Step-Up DC-DC Converter." *IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE)*, 16(2), (2021): pp. 01-06.