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High Voltage Gain Step-up/down Converter with Voltage Doubler for Non-Linear Loads

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BSTRACT

This paper proposed method produces two output voltages, one is a step-up voltage and the other is step down voltage simultaneously. This proposed system produces two different output voltages, one is a higher voltage and the other is lower voltage simultaneously. To increase the voltage a high voltage gain converter is used which has many industry applications, like photovoltaic systems, fuel cells systems and high intensity discharge lamps. To buck the voltage a half circuit is used which produces output voltage half of the input voltage. The buck converter is optimized for applications that have specific goals such as high efficiency, power savings and low cost. The proposed high voltage gain converter is a single switch no isolated dc-dc converter which integrates coupled inductor with extended voltage doubler cell and diode-capacitor techniques.

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Keywords: dc-dc converters, high voltage gain converter, voltage doubler, modulation.

INTRODUCTION

In the industrial application where wide voltage range is needed we use buck-boost converter. Buck-Boost converter is a type of switched mode power supply that combines the principles of the buck converter and boost converter in one circuit. The main disadvantage with this converter is that its input current is pulsed so input filter is required and output current is also pulsed which increases output voltage ripple

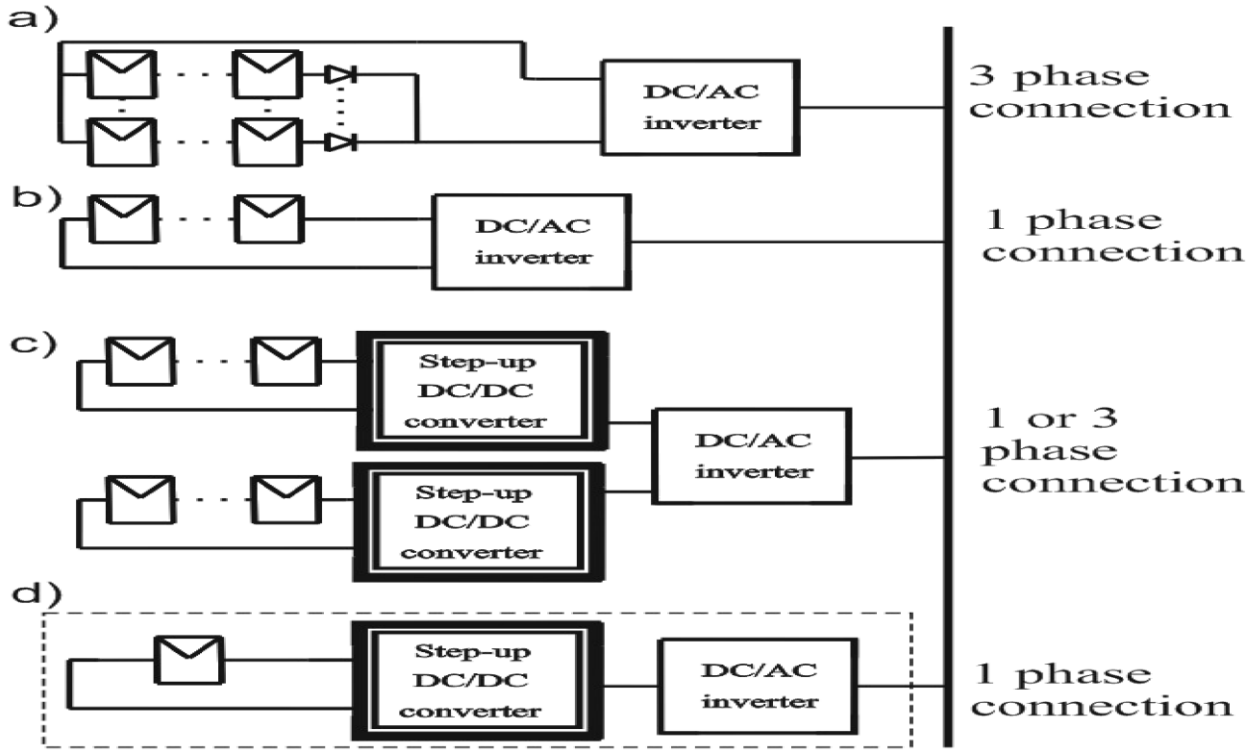

Figure.1.Circuit diagram of proposed converter

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MATERIALS AND METHODS

The components used in this system are as follows

Table.1.Components used

Components	Type	Voltage
Microcontroller	PIC 16F84A	5
Optoisolator	TLP250	5
Buffer	741S244A	5

Simulation results: Simulation results of the proposed converter are shown in the figures. It is seen from the figure that input current is continuous and this is optimal for the input current ripple cancellation, dynamic response improvement, and power device peak current cancellation.

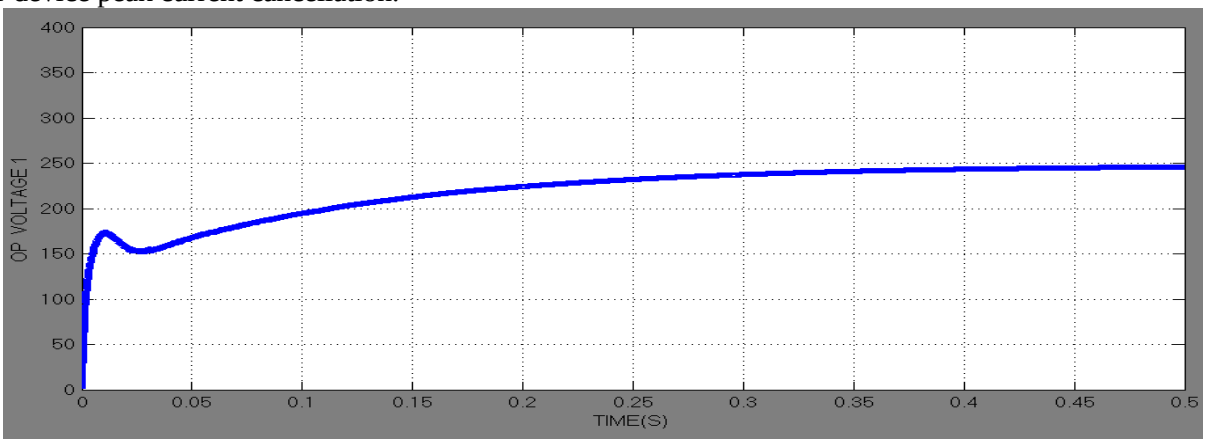

Fig.2.Shows the Output voltage 1

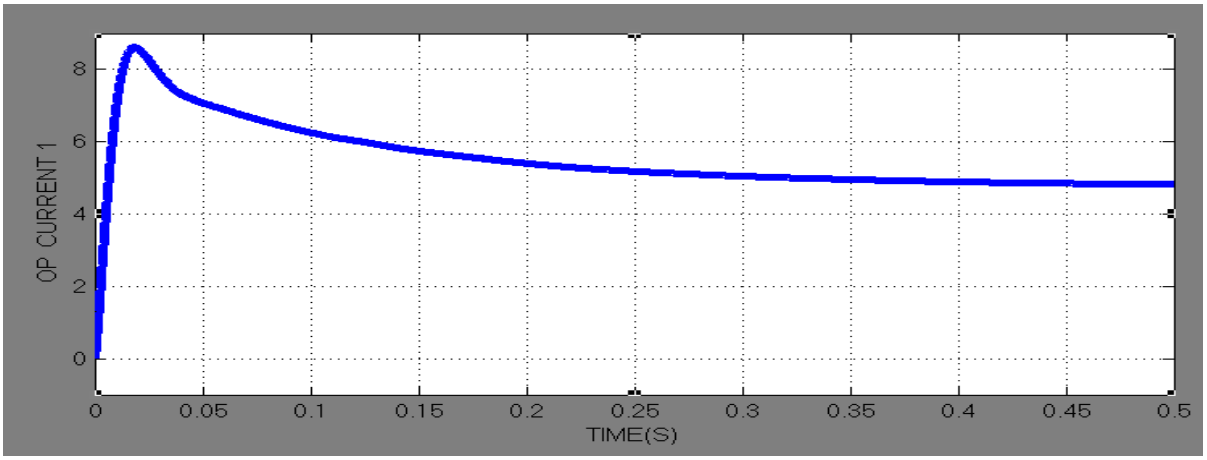

Fig.3.Shows the Output Current 1

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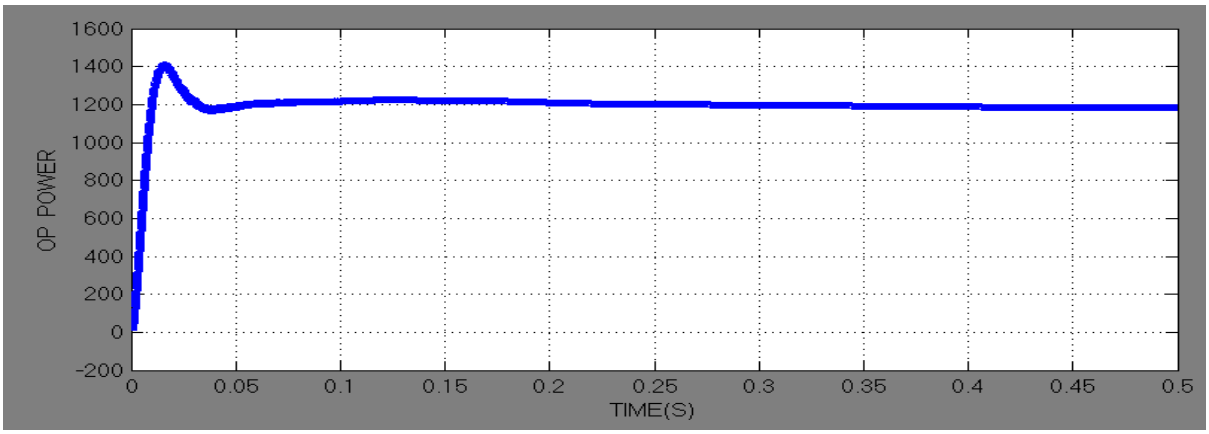

Fig.4.Shows the Output Power 1

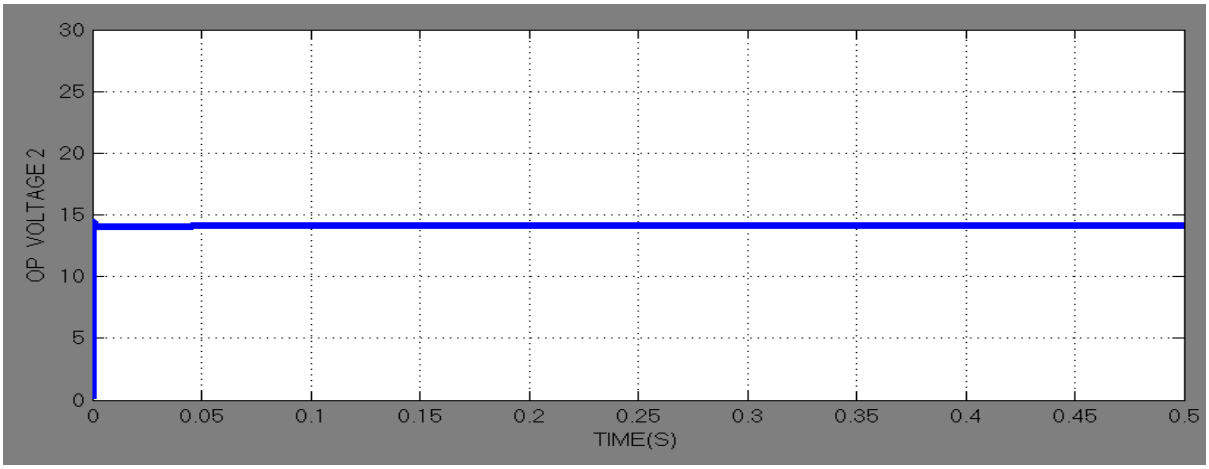

Fig.5.Shows the Output voltage 2

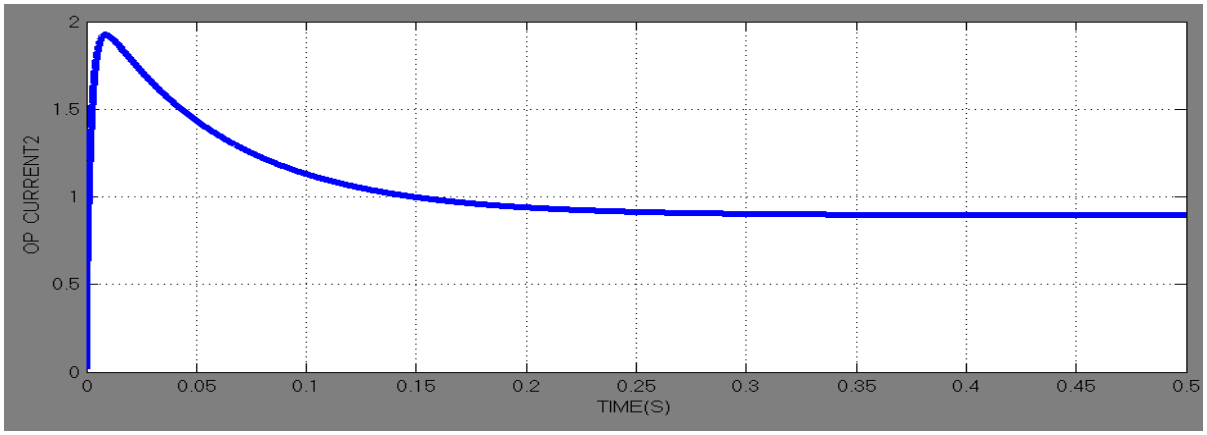

Fig.6.Shows the Output Current 2

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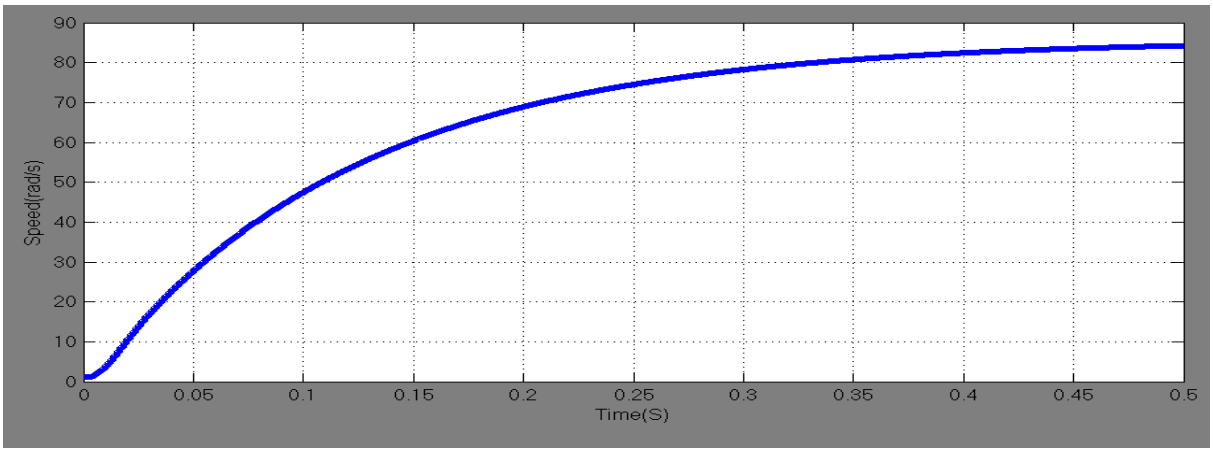

Fig.7.Shows the Speed 1 of a Closed loop control

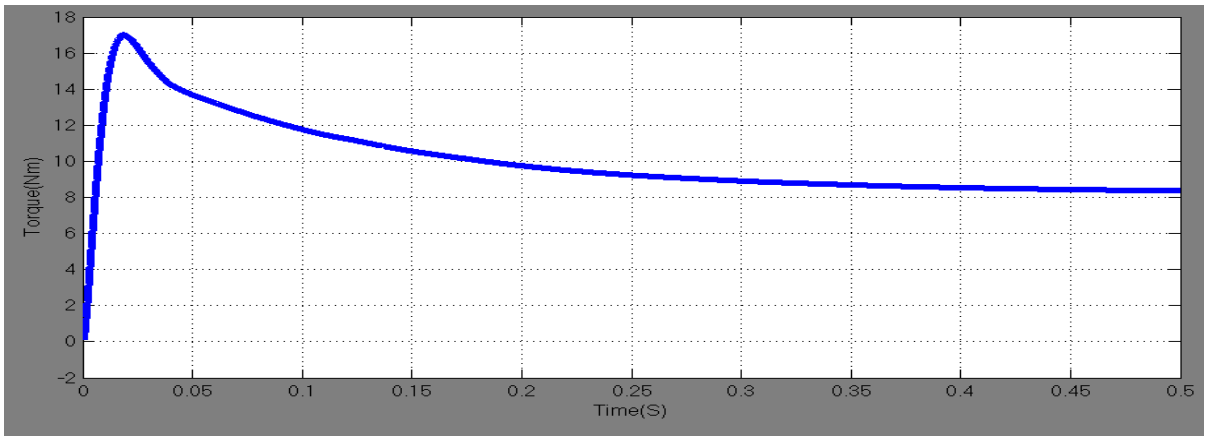

Fig.8.Shows the torque 1 of a Closed loop control

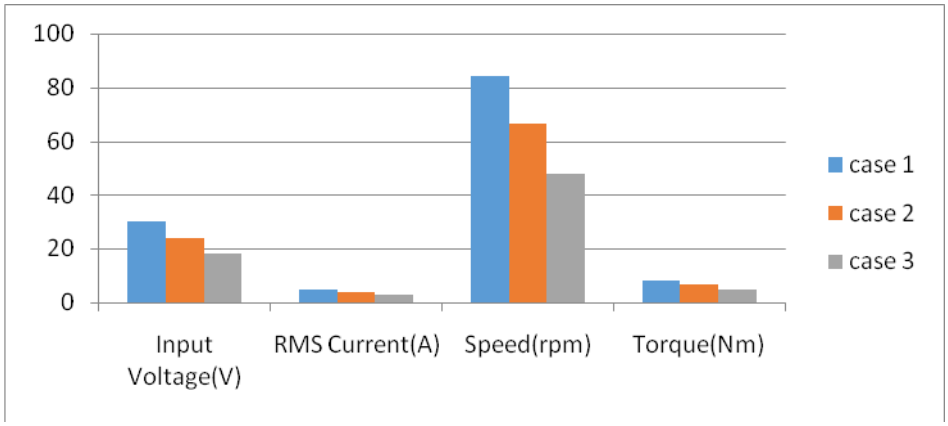

Fig.9.Shows the comparison of closed loop control of proposed method

CONCLUSION

The proposed converter produces both step-up voltage and step-down voltage simultaneously, the step-up circuit combines a quadratic boost converter with coupled inductor and diode-capacitor techniques. A clamped capacitor circuit which is connected to the primary of the coupled inductor reduces the voltage stress and also transfers the primary leakage energy to the output. A diode capacitor circuit is integrated with the secondary ending for further extending the voltage gain greatly. nother advantage of this circuit is that the energy of secondary leakage inductor can be recycled and turned off voltage spikes on the main switch are suppressed. For producing step down voltage half circuit is implemented. In comparison with some active clamp or three level counterparts, only one MOSFET is required to simplify the circuit configuration and it improves the reliability, and this proposed method maintains the advantage of continuous input current.

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