Design & Implementation of Interleaved Boost Converter

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Abstract— This paper deals with the design and simulation of interleaved boost converter for sustainable nonconventional energy sources. Both low and high-power application demands the use of DC/DC converter. Two Phase Interleaved DC-DC Boost converters have many advantages compared to conventional boost converter such as very less current ripple, high efficiency, faster dynamics. Two phase interleaved converter is used to boost the output voltage to 400V with higher efficiency of around 98%. Further using interleaving device stress can be lowered and result in increase in efficiency. The proposed work is simulated using MATLAB simpower system.

Keywords: IBC, Boost Converter

I. INTRODUCTION

The increased environmental pollution have lead to the replacement of conventional sources by renewable sources like photovoltaic sources, windmills etc which result in turn an increase in the demand of DC- DC converters. Basically DC-DC converters are used to boost the input voltage to required output voltage and to get the high voltage gain. The converter should be operated with the duty cycle of more than 50% to get higher gain in voltage level. The drawback of conventional boost converter is low voltage gain. Hence to overcome this problem an interleaved boost converter is proposed for renewable systems. As power densities continue to rise, interleaved boost designs become a powerful tool to manage input currents with increased efficiency.

Two phase interleaved DC-DC boost converters are used for the application requiring demands such as low current ripple, high efficiency, faster dynamics, and higher power density. With the help of interleaving technique, the inductor current of interleaved boost converter can be reduced.

In case of simple conventional boost converter current injected to the load is discontinuous and capacitor current has high ripple at the output. This is especially so in the emerging application areas of automotive power conversion, where the input voltage is low and large voltage boost are desired.

A. Main Objective of Interleaved Boost Converter is:

To study how the model of Interleaved Boost Converter is made in MATLAB/Simulink.

II. EXPERIMENTAL SETUP:

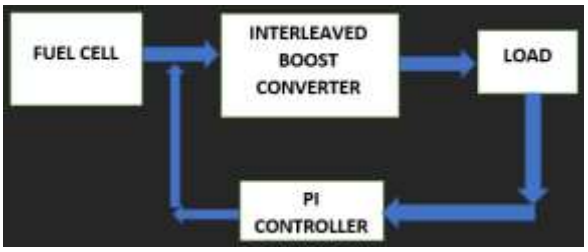

Fig. 1: Block Diagram of Interleaved Boost Converter

Fig1. Shows experimental set up for system. It contains inductor L1 in parallel with inductor L2, switch Q1 in parallel with another switch Q2, diode D1 in parallel with diode D2, thereby forming two parallel channels between input and output circuits. All identical components are used for the circuit to obtain interleaving operation.

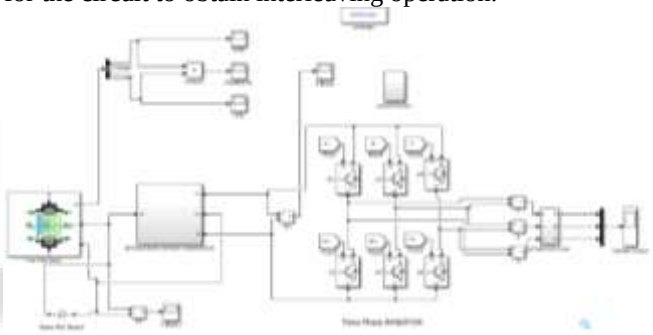

Fig. 2: Simulation circuit of Interleaved Boost Converter

A. Components Used in System:

1) Fuel Cell
2) Interleaved Boost converter
3) 3 Phase Inverter
4) Filter
5) Diode
6) IGBT
7) Voltage Measurement Instrument
8) Capacitor
9) Inductor

B. Result:

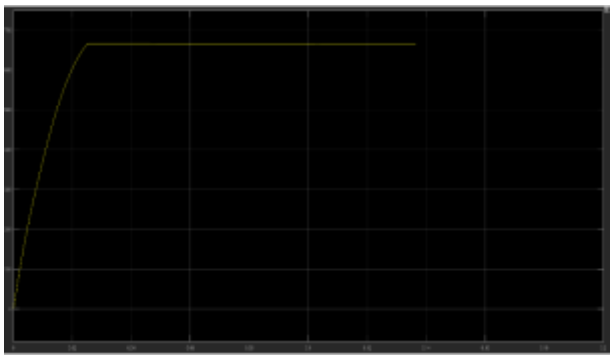

Fig. 3: Constant Output Volatge

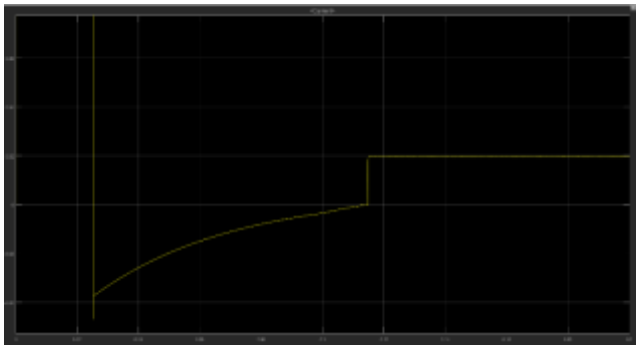

Fig. 4: No Current Ripple Observed

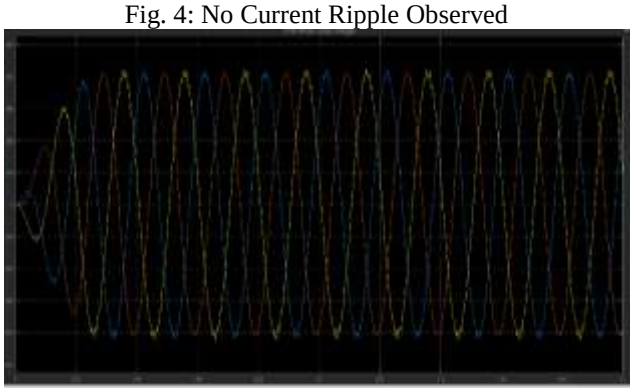

Fig. 5: Phase Output of Interleaved Boost Converter

C. The Advantages of Interleaved Boost Converter are:

1) Low input current ripple.
2) High efficiency.
3) Faster transient response.
4) Improved reliability.

III. CONCLUSION:

In this paper Design & Implementation of interleaved boost converter is done using Simulation. The simulation results are obtained for open loop operation for dc-dc Interleaved Boost Converter (IBC).

IV. FUTURE SCOPE:

1) Simulation of interleaved boost converter is done using MATLAB and it can also be simulated with different types of feedback control like Fuzzy controller, genetic algorithm, artificial neural network and other methods can be used for improving power quality and to get better efficiency.
2) In addition, it can be used to check the constant output voltage with least ripple and to support different appliances with different voltage ratings.

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