ORIGINAL RESEARCH PAPER

Engineering

Design and implementation of boost converter

KEY WORDS: Design of dc-dc boost converter

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ABSTRACT

The paper presents the design of efficient and reliable solar powered inverter with DC-DC Boost Converter is to be implemented. Simulation of boost converter will performed according to design values.High frequency range is suggested so that Inductor size and hence core loss is reduced. A single Integrated circuit unit is used to drive the HF inverter with Pulse Width Modulation and also line frequency inverter with Pulse Width Modulation. Thus a regulated output voltage with reduced harmonics is obtained. According to design results.The Simulation results of MATLAB/SIMULINK model indicate the performance of the proposed control system as well as the precision of the proposed model.

INTRODUCTION

Renewable energy systems such as photovoltaic power generation, wind power generation and fuel cells are receiving a huge attention globally. Eco friendly power generation is the best feature of renewable energy systems. Renewable energy systems emit no pollution into the atmosphere when they generate electricity. However, most power plants such as thermal power generation and nuclear power generation plants have produced most of the power supply. But, Thermal and nuclear plant establish a danger impacts in the world.On the other hand, renewable energy systems are very clean on a large scale from the perspective of return of investment. We propose a management system to maximize the efficiency of a photovoltaic power system in application's aspect.

Boost converter

Introduction of boost converter

The boost converter provides higher output voltage then the input voltage. The boost converter is like the step-up. Shows the circuit diagram of the boost converter having IGBT as a switch. The switch is first turned on it conducts from 0 to δT hence current flow in the inductance. Inductance stores the energy during this period. The out put voltage and current is maintained by. The filter capacitor. Show in fig.the capacitor is discharge from 0 to δT .the switch is turned off at δT. hence inductance generates a large voltage Ldi/dt with the polarity show in fig. this voltage forward biases. D_1 to maintain current the current flows through load. The output current is ripple free and continuous due to capacitor frome δT to T the inductance energyvis transferred to the capacitance and load.

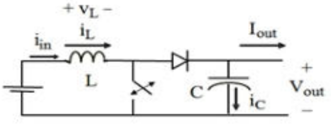

Figure 1: boost converter

Design of Boost converter

Equation 1 Duty Cycle Equation

$$D = 1 - \frac{V_{in(min)} \times \eta}{V_{out}}$$

$V_{in(min)}$) = minimum input voltage(100Volt)

V_{out}= desired output voltage(230volt)

h = efficiency of the converter, e.g. estimated 80

$$D = 1 - \frac{100 \times 0.8}{230}$$

$$D = 0.630$$

The efficiency is added to the duty cycle calculation, because the converter has to deliver also the energy dissipated. This calculation gives a more realistic duty cycle than just the equation without the efficiency factor. The next step to calculate the maximum switch current is to determine the inductor ripple current.

Equation 2 Inductor Ripple Current Equation

$$\Delta I_L = \frac{V_{in(min)} \times D}{F_s \times L}$$

$V_{IN(min)}$ = minimum input volt age

D = duty cycle calculated

f_s = minimum switching frequency of the converter

L = selected inductor v alue

$$\Delta I_L = \frac{100 \times 0.630}{8000 \times L}$$

Equation 3 Inductor Equation

$$L = \frac{V_{in} \times (V_{out} - V_{in})}{\Delta I_L \times F_s \times V_{out}}$$

$$L = \frac{100 \times (230 - 100)}{0.69 \times 8000 \times 230}$$

$$= 1.02\ mH$$

A good estimation for the inductor ripple current is 20% to 40% of the output current.

Equation 4 Inductor Ripple Current Equation

$$\Delta I_L = 0.2\ to\ 0.4 \times I_{out(max)} \times \frac{V_{out}}{V_{in}}$$

$$\Delta I_L = 0.3 \times 1 \times \frac{230}{100}$$

$$\Delta I_L = 0.69$$

Equation 5 Capacitor Equation

$$C_{out(min)} = \frac{I_{out(max)} \times D}{F_s \times \Delta V_{out}}$$

$$C_{out(min)} = \frac{1 \times 0.630}{8000 \times 0.03}$$

$$= 2625 \times 10^{-3}\ \text{farad}$$

CONCLUSIONS

DC-DC boost converter with have most promising device for the renewable low powe application.Among the other inverter, the DC-DC boost converter and inverter requires less number of switches and capacitor with respect to other converter to achievedesired output. Also using cascade multilevel inverter the harmonics distortion of the output waveform can be decrease and get desired output

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