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Reduction of DC Link Voltage Ripple using Superlift Converter for Electric Vehicle Applications

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ABSTRACT: This paper represents reduction of dc link ripple voltage using superlift luo converter(SLLC).By using this method total harmonic distortion(THD) and conduction losses are reduced. superlift converter is advanced voltage techniques helps to increase the voltage in arithmetric and geometric progression.In boost converter the output voltage more than input voltage and in buckboost converter has free output voltage(ie.,higher or lower than the input voltage)beyound this super lift luo converter has a great techniques that is output voltage increase in geometric progression.Multilevel converter(MLC) has a selective harmonic reduction of pulse width modulation compared to superlift luo converter.This method used to eliminate the output ripple and intensify the output voltage level.The conventional DC-DC converter is a switching converter in this ripple formation is minimized by filter at a higher current the components size is increased with increased components losses so that the efficiency will decreases but superlift luo converter increase efficiency level and reduces the output ripple and conduction losses.Sum of power of total harmonic components are lowered by this techniques.Efficiency level is shown in simulation results.Simulation is performed in MATLAB/SIMULINK software.The simulation results are proved with experimental results.

KEYWORDS: Total harmonics distortion(THD),Super lift luo converter(SLLC),Multi level converter(MLC).

I.INTRODUCTION

Super lift converter will increase the output voltage in geometric progression and it will reduce the output ripple voltage. **[1]**Three phase induction motor an active front end(AFE) is required and it fed by the voltage source inverter(VSI).So that it will increase the derive quality of current in utility end without PF(power factor).In this AFE using the super lift converter for three phase IM drives.In this experimental results is 0.5HP IM drives with speed feedback and voltage/frequency(V/F) control.SLC(super lift converter) will convertes rectified ac supply to ripple free dc supply. Variations are 0% and 100% loading conditions.In this total harmonic distortion in current supply is below 4% in the presents of AFE and uses the SLC with three phase VSI (voltage source inverter).[2]Solar energy sorce is most important in environmental option and it is competitive with conventional power energy generation.

New technology is developed in this solar energy field.Always photo voltaic cells are most expensive among the solar powered generation of electrical system. By using this PV arrays the size,weight and cost are reduced in power system.The battery is needed to store the energy and to used in night time when solar power is low.DC-DC

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converter is utilized to make the voltage in spectified value.[3]By using DC-DC converter this paper will deals with ripple free output voltage.Battery will supply DC voltage in the form of high voltage ripple and will have constant voltage enough so that it is not applicable for electric vehicle controllers.To overcome the ripple free voltage the luo converter is inserted in DC-DC converter.In this filters are additional used to reduce the ripple.DC-DC converter are used in all computer hardware and industrial circuits.By these converter efficiency will be high and reduce the total harmonic distortion and power density is high.[4]Direct sunlight is converted in electricity by using the photo voltaic cells.Solar energy is highly perferred compared to all other renewable energy sources.In electronic design the voltage lift method is most important.DC-DC converter will produce the voltage in stage by stage order of arithmetric progression.Super lift DC converter will reduce the harmonic distortion.

To lift positive output and input voltage for increase of power quality the super lift converter is used.In this photo voltaic energy is a source of energy .Luo converter will produce high output voltage in industrial applications.[5]Photo voltaic cells are most important for MPPT(Maximum Power Point Tracking).Photo voltaic energy is important energy resources and it is clean and pollution free in environment.It will supply the maximum amount of power to load at a point that is Maximum Power Point(MPP).It will produce the efficiency and maximum power . Luo converter will reduce the current level and output ripple voltage. Oscillations are reduced by the converters used in this method.By using photo voltaic systems it will decrease the PV array cost and reduce the count of PV panels to achieve the desired output power in this system.[6]This paper represents the compensation method of a DC-link voltage ripple.The developement of converter topologies, control and monitoring method over last two years has a great increase in the voltage source converter of a power system.HVDC,STATCOM,SSSC,UPFC controllers are most common in modern power system.Three phase,five level FC based ANPC converter is used in this paper.

The objective of this paper is to represent a DC-link compensation method of DC link voltage ripple.By using feed forward scheme which modifies the modulation index in order to the voltage ripple.This changes brings a alternate switching function which leads to elimination of lower order harmonics as an output due to DC link voltage ripple.[7]This paper is based on the control design method by using two stage boost inverter for the reduction of DC-link voltage ripple .This control was sucessfully implemented in the system.Where the ripple is around one third of the original magnitude.Easy way to decrease the ripple is to higher the DC-link capacitance. It may causes some other complications.In this part,we put forward a new method for the reduction of output voltage ripple by removing the harmonics of the ripple.The basic control strategy for the reduction of voltage ripple which was proposed for a two stage inverter.Since it is achieved by the feedback control of boost converter.[8]One of the major power density barrier is bulk intermediate DC-link capacitor which is used for high frequency battery charger.This on-board battery charger is used for plug-in hybrid electric vehicle (PHEV).Like other passive components it cannot be reduced by increasing the switching frequency.Limitation can be find a way around by allowing the ripple current to flow directly to the battery.The influence of converter loss is analysed.Converter loss can cause imbalance ripple power.The input ripple equal to the output ripple of the strategy.The need for DC-link capacitance due to its ripple-power can be idealy reduced by sinusoidal charging.[9]DC-DC converter is a switching converter which introduces a small amount of ripple voltage and it is minimised by using a filter at the output terminals.The magnitude,cost,life of filter depand on type of converter.Power electronic circuits is DC-DC converter which is commonly used as an interface.It is between the voltage source and load.

This technology is used for several applications which is supplied by low power sources.The sepic converter has a high efficiency around 94% to 97%.This converter is tested and analyse,examined by R-load and motor load.The transformer turn ratio is used to increase the converter static gain.[10]The reduction of output voltage ripple technique for a AC/DC converter topology.It is based on a half bridge driven transformer.It is presented and studied practically.The power factor is high of the operating mode.The measurement of output voltage reduction is from 1.4(rms) to 0.3(rms) by using this principle.Beyound the output voltage ripple reduction there are many possible effect based on line current harmonics and

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EMI(Electro Magnetic Interface).The idea have been put forwarded.The effectiveness of sinusoidal charging to the point of significant voltage ripple.It will limit the reduction of the DC-link capacitance.

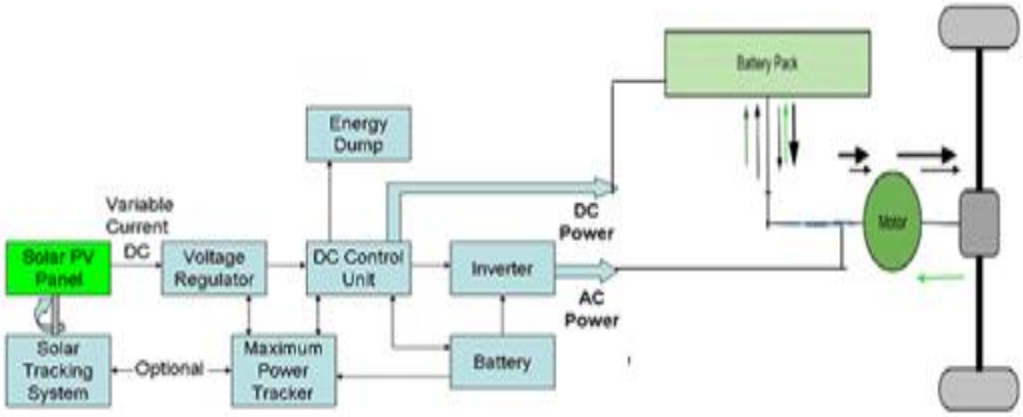

Figure 1: Reduction of DC link ripple voltage using superlift luo converter

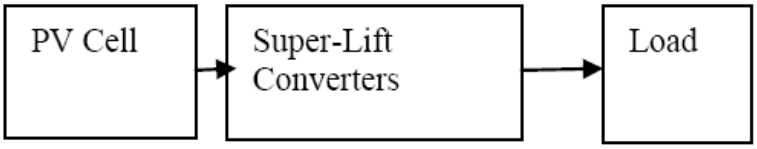

Figure 2: Connection of superlift converter

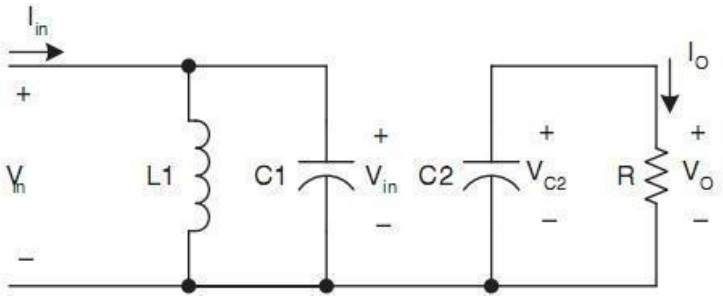

Figure 3: Elementary circuit diagram

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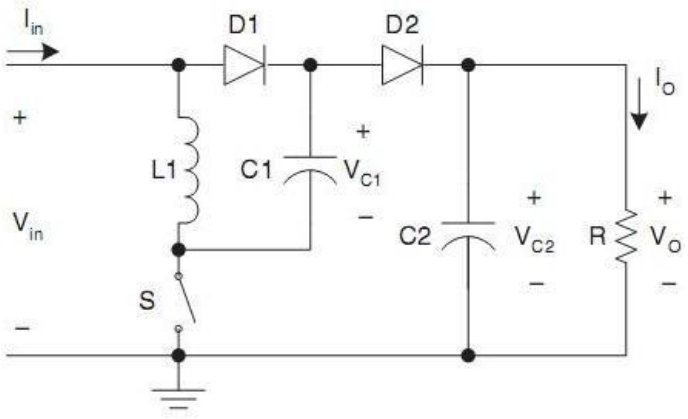

Figure 4: Equivalent circuit during switching on

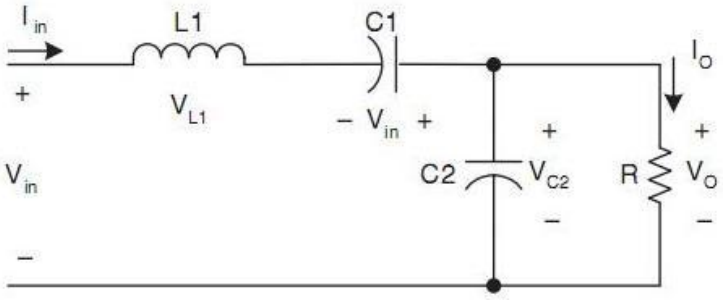

Figure 5:Equivalent circuit during switching off

II.ANALYSIS OF SUPERLIFT LUO CONVERTER:

Inductor current IL2,

IL2=1-a/a(IL1)

Duty cycle,

a=Ton/T

Output voltage equation

Vo=a/1-a(Vm) →...2...

Average voltage across the capacitor C1

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Vc1=a/1-a(Vm) →....3...

Peak to peak current

$$\nabla IL1 = \frac{aTVm}{L1} \rightarrow ...4...$$

sub equations ..4.. in L1 value

$$L1 = aTVin/\nabla IL1 \rightarrow ....5....$$

Peak to peak current L2 is

$$\nabla IL2 = aTVin/L2 \rightarrow ...6....$$

Sub equation...6... inductor L2 value

$$L2 = aTVin/\nabla IL2 \rightarrow ....7....$$

$$\nabla Vc1 = 1 - a/C1(TI1) \rightarrow ...8....$$

Sub C1 value in equation ..8....

$$C1=1 - a/\nabla Vc1(TL1) \rightarrow ...9.....$$

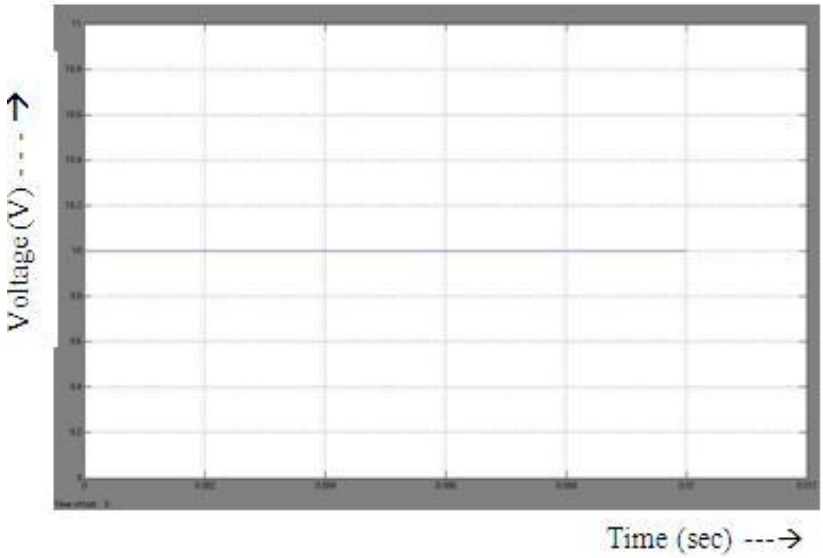

Figure 6: Input voltage

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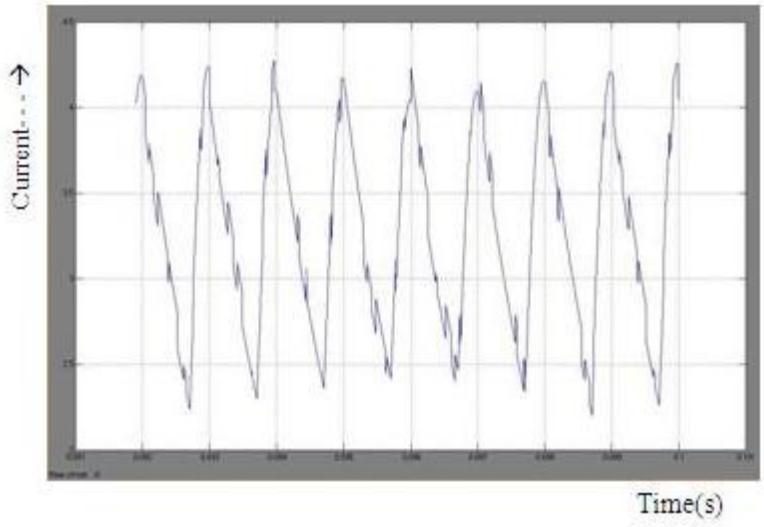

Figure 7: Output current of superlift luo converter

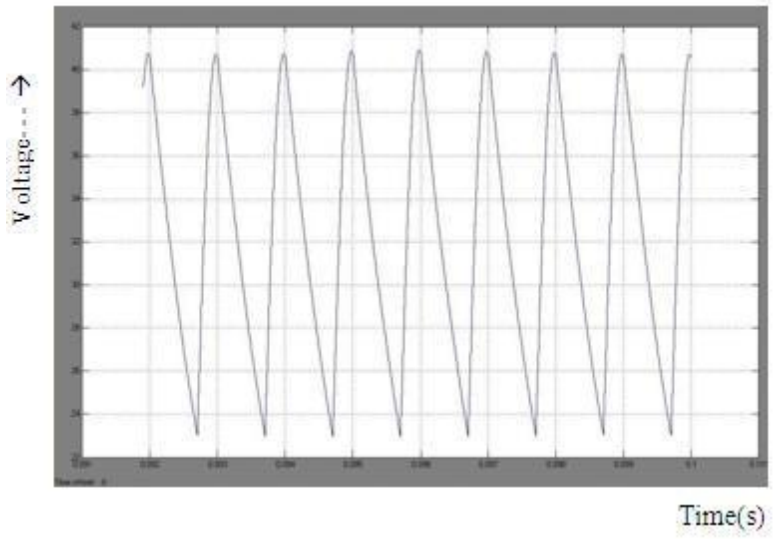

Figure 8: Output voltage of superlift converter

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IV.CONCLUSIONS

The experimental and simulated results are proved. In this work the superlift luo converter is connected to PV systems .The output voltage increased in geometric and arithmetric progression, then it is free from output ripple voltage .This paper has successfully demonstrated the analysis of the superlift luo converter.

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