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Comparative Performance Analysis of Boost Converter and Super Lift-Luo Converter

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ABSTRACT

The paper proposes the advance DC-DC converter by Super Lift-Luo Converter (SLLC). In conventional method Boost Converter (BC) complexity of DC link voltage level control. The proposed method Super Lift-Luo Converter (SLLC) drive wide range of DC link voltage level control by Sinusoidal Pulse Width Modulation (SPWM). SPWM to generate gate pulses to Voltage Source Inverter (VSI). SPWM used for controlling the output frequency and voltage of Voltage Source Inverter (VSI). To validate the effectiveness of Super Lift Luo Converter, the comparative analysis of Boost Converter and Super Lift Luo Converter in the façade end of drives. The simulation work is concluded using MATLAB /Simulink software and results such as DC link voltage and Inductor Current are presented.

Key-words: -SPWM, SLLC, BC, DC link Voltage and Inductor Current.

INTRODUCTION

Power electronic converters are getting better the performance and reduce the energy utilization in industrial application. The main application of the boost converter is motor control in drives. The advancements of modern high performance drives is characterized by a continuous increase in the dynamic of torque, speed and position response is characterized. PWM Techniques for reconstructing converter line currents using single current sensor implemented. The dynamic control AC machine line current with improved accuracy by measuring only the current of DC link. A single phase controller is based on the three individual and adaptive phase current observers, which guarantee very accurate phase current estimates even at low modulation. Though the vital DC link single current sensor method proposes special challenges because the duration of vigorous voltage vectors must be long enough to gauge the DC link current consistently during every PWM switching interval. A new single current sensor algorithm for reconstructing the phase current called the measurement vector insertion method (MVIM). The motor drive system with an active IGBT rectifier (i.e) AFE (active front end) converters the AC line input into a forbidden DC link voltage which is then second-hand as input enthusiastic to a 3 phase drive. The influences of DC link variation on the drive under each of these modulation strategies. A close loop speed control z source converter fed induction motor drive with crest DC link voltage control. The peak DC link voltage control. The peak DC link voltage employed in order to attain exceptional transient routine which enables rejection of power disturbance. The control algorithm for step-up boost converter for purpose to minimizes influence of voltage drop to electric drive with VSI and drive. Implement a PV power scheme driven by a single panel for lower power and be as cost efficient. A proposed topology which is composed of an indirect matrix converter (IMC) and DC/DC boost converter that connects to natural point of the motor. The DC link part is utilized in connection with a boost up chopper with batteries as a secondary input source [13]. Boost converter, which provides the link between the output DC link voltage and instantaneous output power, is mentioned. Voltage lift technique has been successfully employed in design of DC/DC converter. However the output increases in arithmetic progression method.

Importance of DC-DC conversion in drives: A DC-to-DC converter in which converts a source of direct current (DC) from one voltage level to another. Most DC to DC converters also adjust the output voltage. Some exceptions include high- efficacy drive sources, which are a type of DC to DC converter that control the current during the drive, and easy accuse pumps which twice or triple the crop voltage. Electronic switch-mode DC to DC converters change one DC voltage stage to one additional, by storing the input energy in the short term and then releasing that energy to the output of a dissimilar voltage. The storage can be in also magnetic field storage elements inductors, transformers or electric field storage elements capacitors. This conversion method is more power efficacy often 75% to 98% than linear voltage imperative, which dissipates surplus power as heat. DC-to-DC converters, energy are occasionally stored into and free from a magnetic field in an inductor or a transformer, classically in the range from 300 kHz to 10 MHz By regulating the duty cycle of the charging voltage that is, the relation of on/off time, the quantity of power transfer can be controlled. Regularly, this is functional to organize the output voltage, while it could be practical to organize the input current, the

output current, or maintain a constant power. Transformer-based converters may give isolation between the input and the output. In common, the term "DC-to-DC converter" refers to switching converters.

Boost Converter in drives: The Boost Converter is a step-up DC/DC voltage. It works in second quadrant operation. The output voltage increases in arithmetic progression. Boost converter which has the limitation over DC link voltage level and complexity of control circuit.

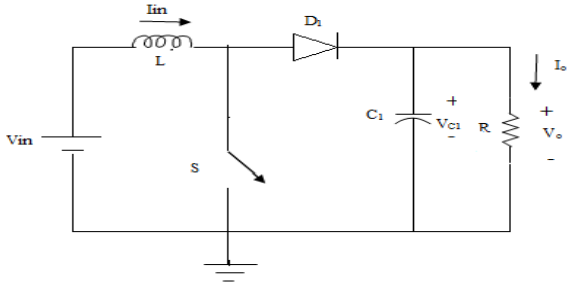

Fig.1.Boost Converter

The output voltage is calculated by the formula,

$$V_0=\frac{T}{T-t_{on}}V_{in} \quad (1)$$

$$=\frac{1}{1-G}V_{in} \quad (2)$$

The average output current is,

$$I_0= I_{in}(1\text{-}G) \quad (3)$$

The voltage transfer gain is,

$$K =\frac{1}{1-G} \quad (4)$$

The ripple current in the inductor 'L' is,

$$\delta I = (\frac{V_{in}}{L}G)T \quad (5)$$

Where T is the repeating period $T = 1/f$, f is the chopping frequency, t_{on} is the switch-on time,

Duty cycle of conduction period is,

$$G =\frac{t_{on}}{t_{on}+t_{off}}=\frac{t_{on}}{T}. \quad (6)$$

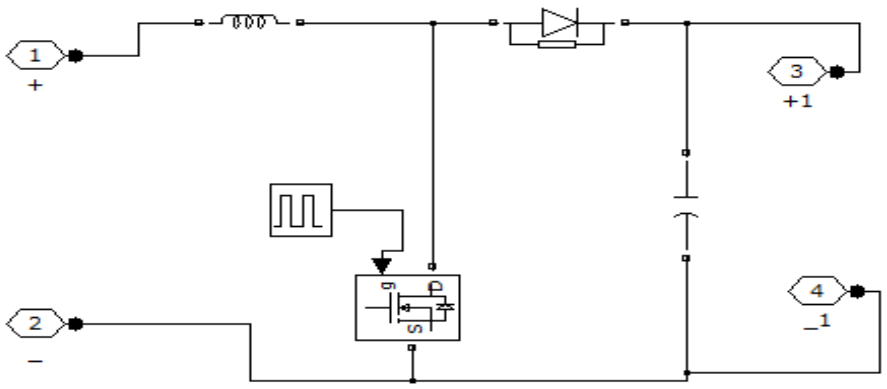

Fig.2.Simulink model for Boost Converter

Super Lift Luo Converter in drives: The Super Lift- Luo Converter is a step-up DC/DC voltage. It works in second quadrant operation. The output voltage increases in geometric progression. SLLC at the front end, which Boost up the DC link voltage level in a wide range and also the control to the inverter using SPWM for controlling the output frequency and voltage of Voltage Source Inverter (VSI).

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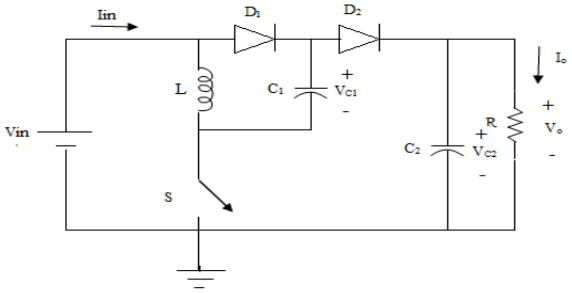

Fig.3.Super Lift Luo Converter fed IM drive

The output voltage is calculated by the formula,

$$V_0 = \frac{2-G}{1-G} V_{in} \quad (7)$$

The average output current is,

$$I_0 = \frac{1-G}{2-G} I_{in} \quad (8)$$

Voltage transfer gain is,

$$K = \frac{V_0}{V_{in}} = \frac{2-G}{1-G} \quad (9)$$

The ripple current in inductor 'L' is,

$$\delta I = \left(\frac{V_0 - 2V_{in}}{L}\right) t_{off} \quad (10)$$

Duty cycle of conduction period is,

$$G = \frac{t_{on}}{t_{on}+t_{off}} = \frac{t_{on}}{T}. \quad (11)$$

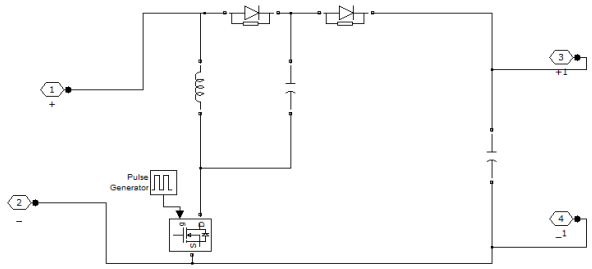

Fig.4.Simulink model for Super Lift Luo-Converter

Sinusoidal Pulse Width Modulation: Sinusoidal Pulse Width Modulation techniques three sinusoidal reference voltages are compared to carrier (triangular) are desired magnitude and frequency. Here compared output forms the gate pulses for three phase voltage source inverter. The main advantage of SPWM is that power loss in the switching devices is very low, there no voltage drop across the switch.

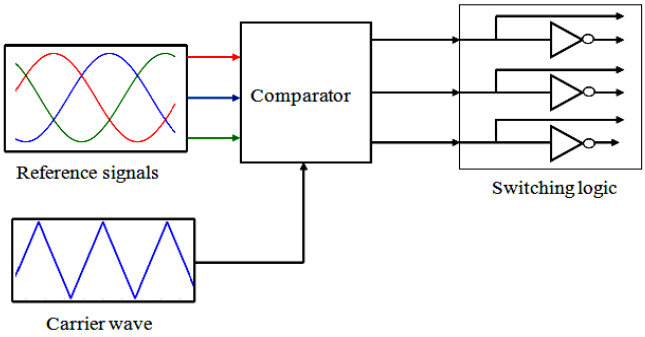

Fig.5.Sinusoidal Pulse Width Modulation

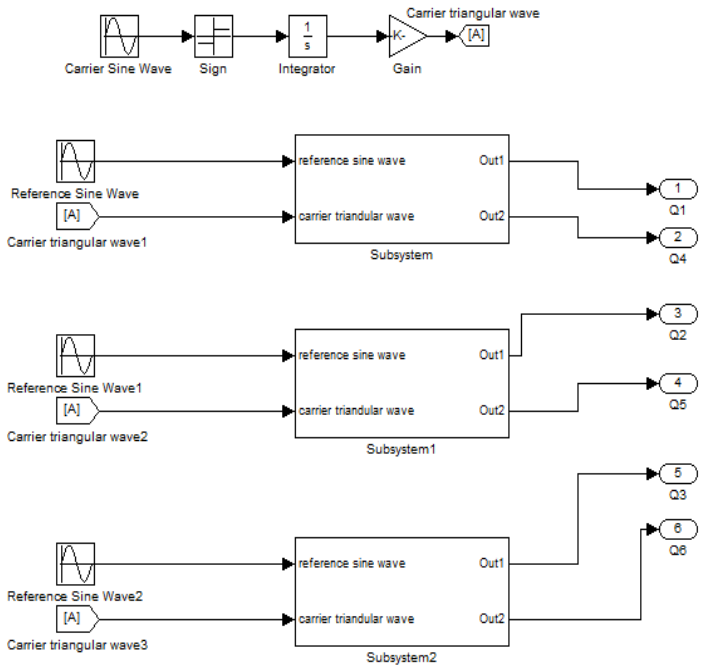

Fig.6.Simulink model for SPWM

Simulation Work and Result: To evaluate the performance of both Boost Converter and Super Lift Luo Converter of a simulation done by MATLAB 2010a software. The simulation parameters are tabulated in Table I

Table.1.Simulation Parameters

Parameter	Boost Converter	SLLC
Input AC Voltage	230V	230V
Switch 'S' used in DC-DC Converter	MOSFET	MOSFET
Conduction duty G of Switch 'S'	0.5	0.5
Inductor	0.5Mh	5mH
Capacitor	1500µF	1200µF
		1500µF
Voltage Source Inverter	IGBT Inverter	

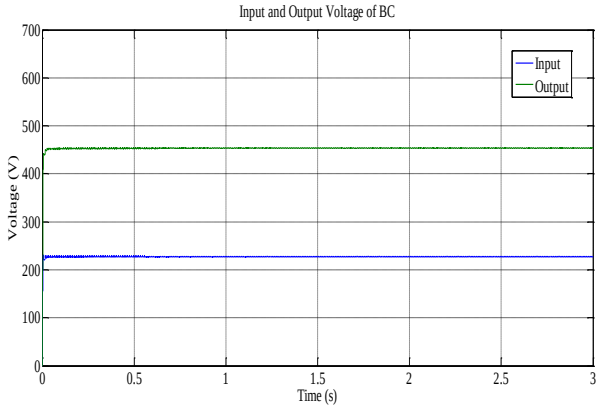

Fig.7.Input and Output Voltage of Boost Converter

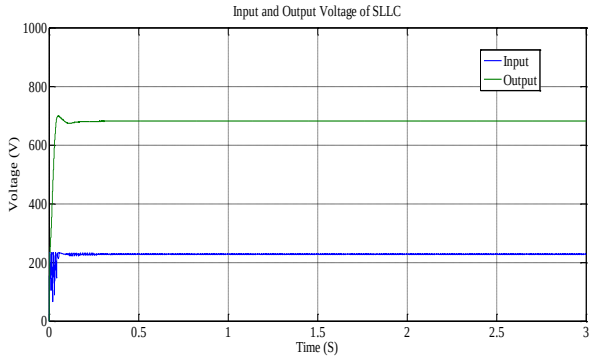

Fig.8.Input and Output Voltage of SLLC

(SLLC) Super-Lift Luo-Converter is used to step up voltage into three times of input voltage. (BC) Boost Converter is used to step up voltage into two times of input voltage. Fig shows that SLLC as better and smooth voltage than BC.

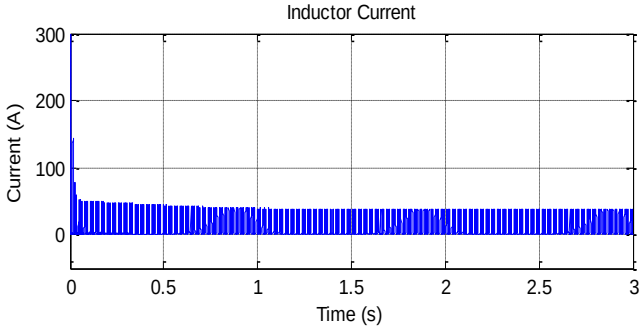

Fig.9.Inductor Current for BC

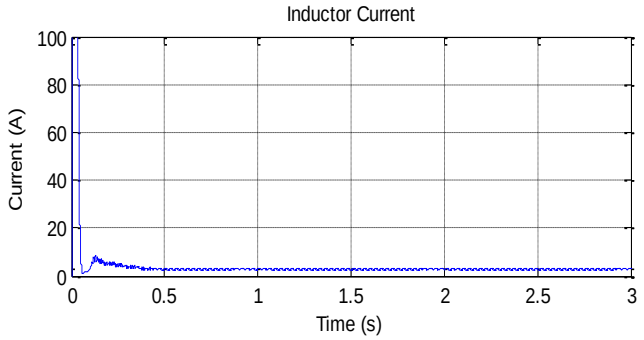

Fig.10.Inductor Current of SLLC

Inductor current of SLLC is fewer ripples current but Inductor Current of BC high ripple Current.

CONCLUSION

This paper presents the effectiveness of Super Lift Luo Converter (SLLC) over Boost Converter (BC) in front end drives. The simulation work has been concluded and results demonstrated the efficacy of SLLC over BC. It is concluded that the implementation of SPWM influences the raise time. Comparing the DC link voltage level, the performance of Super Lift Luo Converter dominates Boost Converter which adds mainly advantage of the proposed paper. Inductor Current SLLC is better than BC has been demonstrated.

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