SIMULATION ANALYSIS OFA DC-AC CONVERTER

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Abstract: The power electronics device which converts DC power to AC power at required output voltage and frequency level is known as inverter. Inverters can be broadly classified into single level inverter and multilevel inverter. Multilevel inverter as compared to single level inverters have advantages like minimum harmonic distortion, reduced EMI/RFI generation and can operate on several voltage levels. A multi-stage inverter is being utilized for multipurpose applications, such as active power filters, static-var compensators and machine drives for sinusoidal and trapezoidal current applications. The drawbacks are the isolated power supplies required for each one of the stages of the multi converter and it's also lot harder to build, more expensive, harder to control in software.

I. INTRODUCTION

In electrical engineering, to convert the power into one form into another is mandatory. The conversion here is between DC to AC or changing the voltage and its frequency; or some combination of this. A power converter is an electrical or electro-mechanical device to convert the electrical energy. This can be as simple as transformer to convert the voltage in AC power. The phenomena can refer to electrical machinery that can be used to convert one frequency into the alternating current. Power inverter, motor generator, Rotary converter and SMPS (Switch mode power supply) this device can be used to convert direct current into alternating current.

1.1 CONVERTER TOPOLOGIES

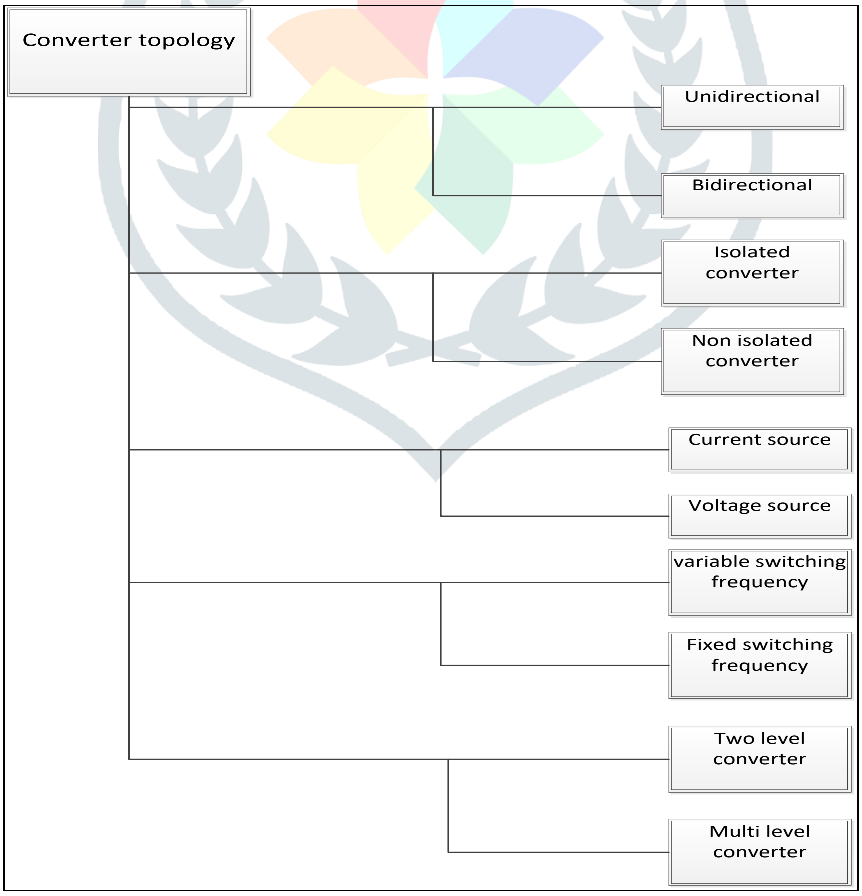

Fig: 1.1 Different Converter topologies

1.2 TWO LEVEL DC-AC CONVERTER

The converters which produce an output voltage or current with level either zero or +ve /-ve are known as two level converters. In high power and high voltage applications this two level inverter however have some limitations in operating at high frequency mainly due to switching losses and constraints of device rating. In high power and high voltage application, these two level inverters have some limitations in operating at high frequency mainly due to switching losses and constraints of device rating. The three level converter produces output voltage or a current with three levels. The unique structure of three level voltage source converters allows them to reach high voltages with low harmonics without the use of transformer. This results in smaller harmonics. As compare to two level converters, three level converters have smaller output voltage.

1.3 THREE LEVEL DC-AC CONVERTER

Three level converters are highly adopted solution in application with a high input voltage and high switching frequency [3-5]. The converter switches are stressed on half of the total dc bus voltage. This phenomenon allows us to utilize very low voltage rated switches that have better switching and conduction performance as compared to the switches rated on the full blocking voltage. Therefore the converter overall performance, including everything means cost and efficiency can be significantly improved when compared to two level converters, especially when the switching frequency is above 20 kHz or MOSFET are used.

1.4 COMPARISON BETWEEN DIFFERENT CONFIGURATIONS

The UPS System used in our project is mainly used for Voltage control for flywheel system. So the UPS system is integrated with boost converter as shown in fig5.1 below. The input is given 24 v a.c single phase supply and then it convert into d.c using Rectifier and then boost up using boost converter and then fed to inverter for d.c to a.c conversion.

CONVERTER CONFIGURATIONS	NO. OF. POWER SWITCHING DEVICES	NO. OF MAGNETIC COMPONENTS	NO. OF CAPACITORS	MODULATOR COMPLEXITY	COMMENTS
Dual H-bridge Converter	8	2	2	low	• Simple modulation • lowest components count • Limited ZVS range • Very large RMS current
H-bridge BDC with push–pull	6	2	2	High	• Low Power switches count • Ineffective transformer utilisation • Voltage ratings of the push–pull switches are twice the voltage ratings of the switches utilised for the dual H–bridge configuration
Half-bridge and push–pull	4	2	4	high	• Low Power switches count • Ineffective transformer utilisation • High L &C count • High RMS current
Dual H-bridge resonant BDCs	8	More than 3	More than 3	Low	• slightly reduced switch stresses compared to the Dual H-bridge • Simple modulation • Large L & C • High circulating current • Limited soft-switching operation
Multiport BDCs	12	6	2	High	• Low capacitor RMS current • Low circulating current • Limited soft-switching operation • High components count
Three level DC-DC BDC converter	4	1	2	High	• High frequency operation • lowest components count • small value of L

II. SIMULATION OF DC-AC CONVERTER

A Power inverter, or inverter, is an electronic device or circuitry that changes direct current (DC) to alternating current (AC). The input voltage, output voltage and frequency, and overall power handling depend on the design of the specific device or circuitry.

The inverter does not produce any power; the power is provided by the DC source. A power inverter can be entirely electronic or may be a combination of mechanical effects (such as a rotary apparatus) and electronic circuitry. Static inverters do not use moving parts in the conversion process. Circuitry that performs the opposite function, converting AC to DC, is called a rectifier

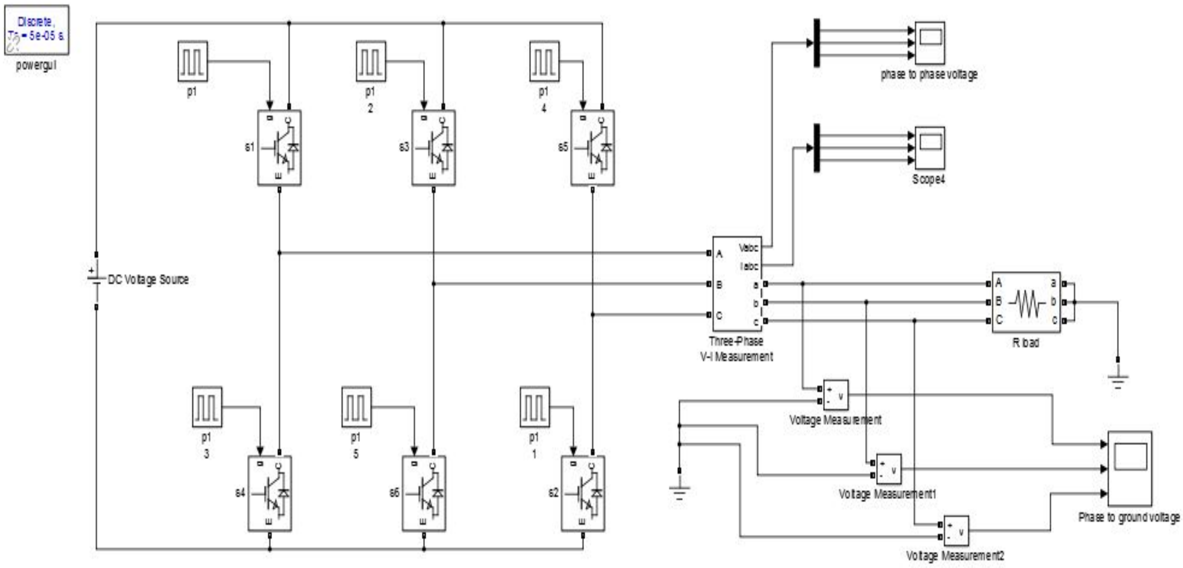

Fig: 2.1 DC-AC Converter

III. SIMULATION RESULTS

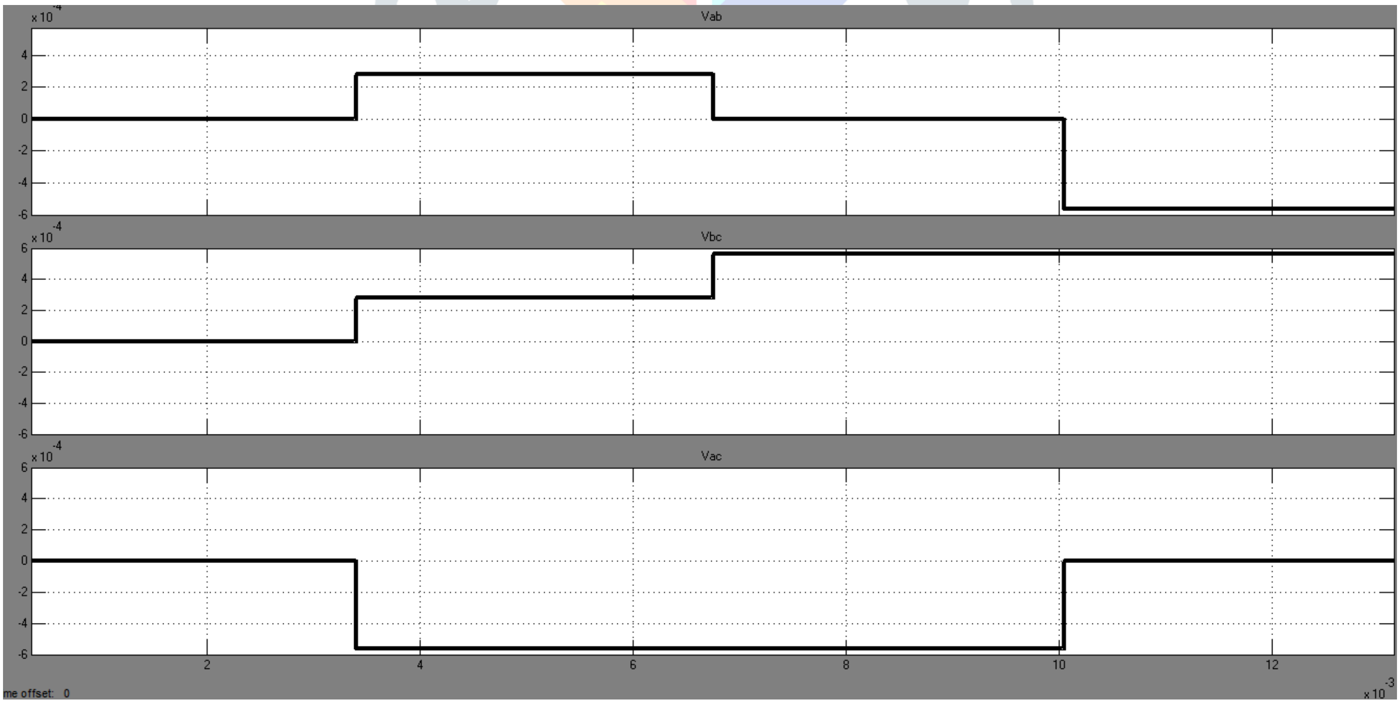

Fig: 3.1 Phase to ground voltage

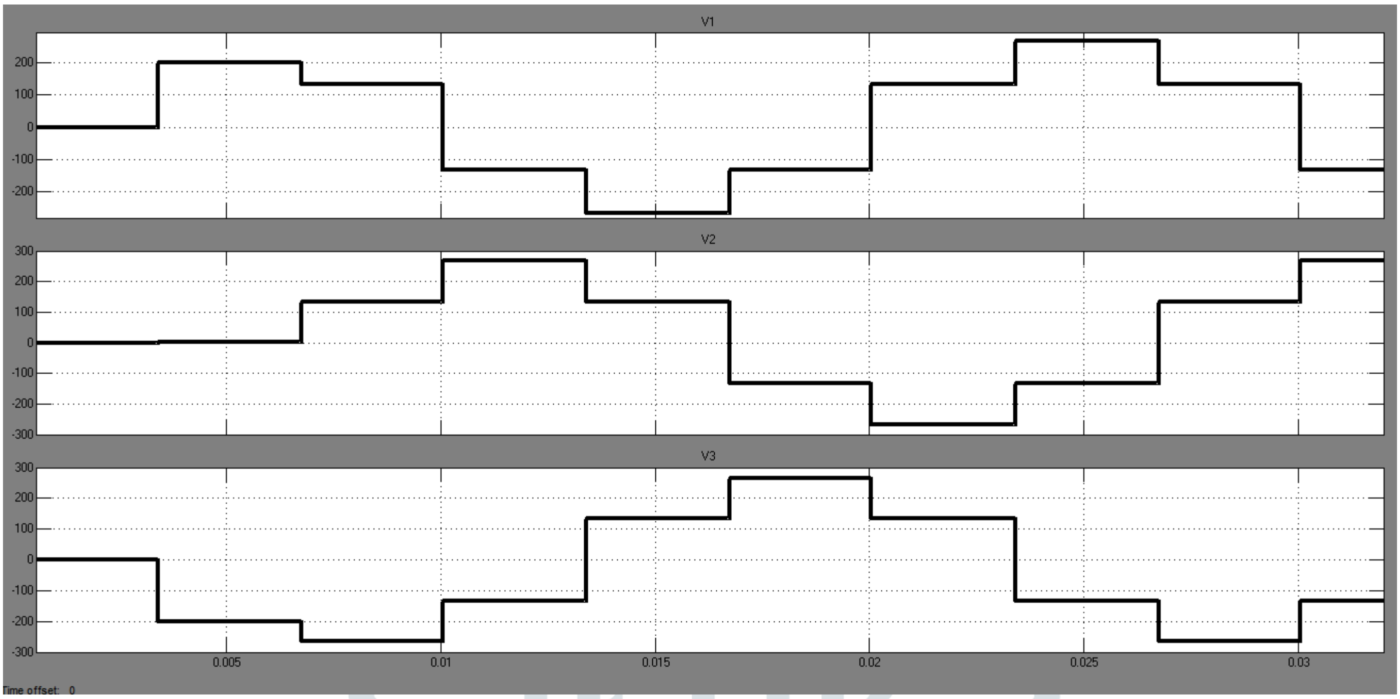

Fig: 3.2 Phase to phase current

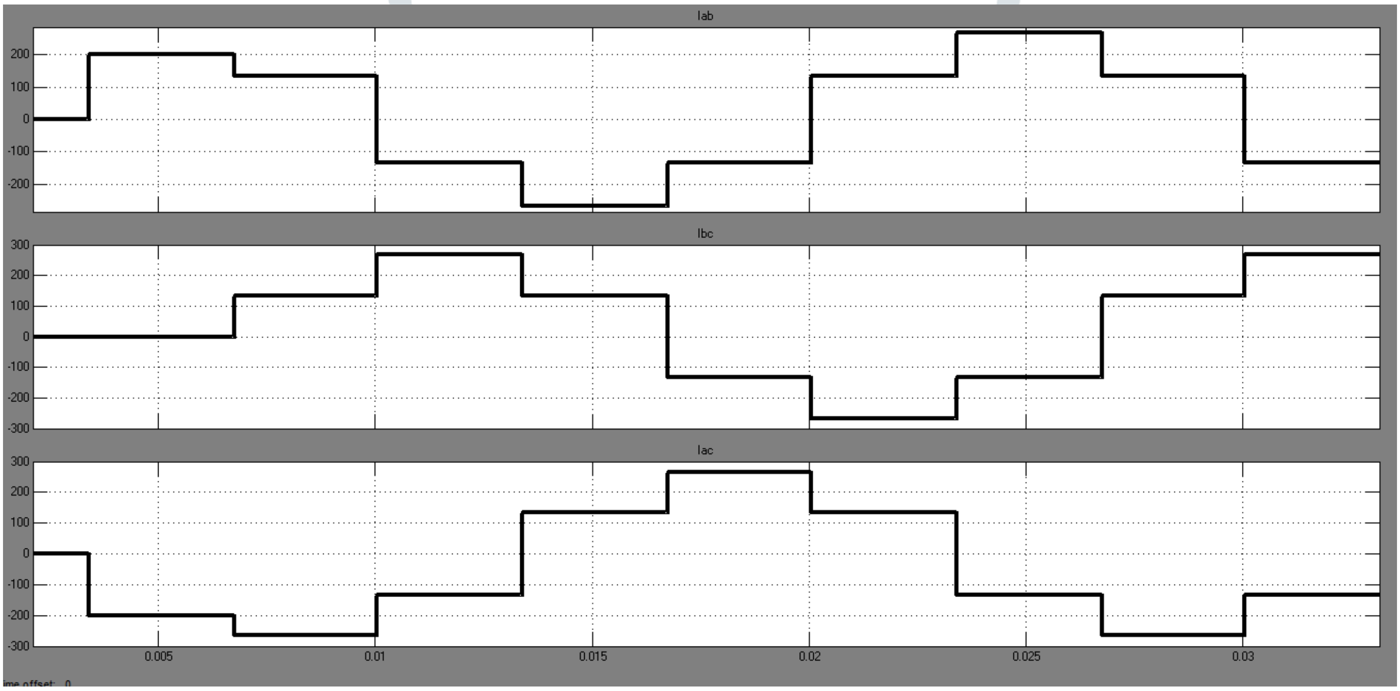

Fig: 3.3 Phase to phase voltage

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