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A NOVEL 31 LEVEL CASCADED H- BRIDGE INVERTER

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***Abstract*— Multilevel converter is the high-tech technology for high power medium voltage applications. Inverters are made up off power electronic devices that convert DC quantity into AC quantity. But these devices harvest non-sinusoidal signal and this signal holds harmonics. So as to overcome this problem a multilevel inverter especially in our case we have developed a cascaded multilevel inverter (CMLI) topology in 31-level. We have drafted the recommended inverter topology with the minimum switch count and lower total harmonic distortion [THD]**

Keywords— Multilevel converter, harmonics, CMLI, THD

I. INTRODUCTION

The concept of multilevel inverter is a trending concept in the field of power converters. Many researchers start doing their work in this area because of the future scope in industries. It also has a vital role in power electronic drives applications without which the world cannot be driven forward. Also the academicians show their interest and initiate their effort in multilevel inverter. Though it is not available that much in the market it is sprouting in various fields day by day. It spreads it branches with awful advancements. Initially there were two types of multilevel converters. 1. Cascaded H Bridge converter 2. Neutral Point Clamped (NPC) converter. Most recently another type called modular multi-level converter (MMC) came into picture. MLCs are used mainly in medium voltage, high voltage and high power applications. Cascaded H Bridge (CHB) converter Neutral Point Clamped (NPC) converter both are used in medium voltage level. CHB converter is also used in high voltage level like STATCOM in transmission systems. MMCs are mostly used in HVDC applications. They are also introduced in the market in motor drive applications in the lower voltage level.

One of the main applications of the Multilevel Converter (MLC) is motor drive applications where they can produce highly sinusoidal voltage at medium or high voltage range by using many low voltage reliable power devices that are working together.

Initially the development of any power semiconductor devices begins with the low voltage level. For example, when the IGBT was introduced in the market, its voltage rating was 600V. Then subsequently the voltage capability of the device was increased. Now the voltage rating of the IGBT is around 6500V. Since the lower voltage level devices were in practice, the researches and engineers had the better understanding of the properties of the low voltage devices rather than a very high voltage devices. The low voltage power devices were more familiar in concerned with the operation of the device and the design of the gate driver circuit etc. The 600V IGBTs are very popular than 6500V IGBTs. So, low voltage device is better choice for mass production. So present multilevel converters with very high voltage can be developed by using many of these low voltage devices that are working together. This is one of the primary reasons for the multilevel inverter to become popular.

Additionally, with the usage of multilevel converters, filters can be reduced or eliminated. Medium voltage generally starts from 2.3 kV to 33kV beyond which it is said to be the high voltage. So multilevel converters are very popular in this range. Power range may be several MW to several hundreds of MW. MMCs are very popular for HVDC applications where the voltage range is from several hundreds of kW to GW.

Apart from the usage of low voltage devices and the elimination of filter size, the other advantages of multilevel converter are high modularity by which many identical rated devices can be used, redundancy and fault tolerant capacity. Multilevel converter can be operated even when some of the modules are bypassed. This is very advantageous feature. Consider a case, where a huge amount of devices in the multilevel inverter are used and there is a fault in one device, then the whole converter should be shut down. Then it is not very advantageous. It is not good design. So with fault tolerant capacity the faulty module can be bypassed and the converter can be run. The technologies for multilevel converter are matured. They are commercially produced by different manufacturers for different applications like oil & gas, renewables, transport etc. [1].

Multilevel inverter is growing significantly a fascinating option in numerous commercial applications like oil power plant, gas power plant and power quality devices, etc. In 1990s, several researchers started to show more interests on multilevel converters and expressed their ideas in technical papers. Nevertheless, the concept of MLC actually had already started its growth in 1979 and 1983 itself. The main tactical purpose of a multilevel inverter is to integrate a sine wave output voltage from multilevel voltage. The dominant issue with multilevel inverter is the widespread harmonics contained in the output voltage waveform. It is because of the character of the multilevel inverter performance. But the integrated output waveform absolutely imitates a pure sine wave obtained from a multiple cascaded square waves.

The amount of THD in the output waveform is quite the opposite to the count of output voltage levels. So, to lower the THD of the output waveform, the output voltage levels must be enlarged. But to enlarge the output voltage levels, mainly