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Paper on SIMULATION OF MULTIPULSE CONVERTOR USING CONTROL RECTIFIER

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Abstract - Power quality concerns are now a major concern area of research in the power sector. With the invention of technology, it is now possible to keep the power sector free from pollution. Over the past few years, much effort has been put into reducing overall harmonic distortion using a variety of concepts and applications. This project deals with the reduction of total harmonic distortion using a multi-pulse AC to DC conversion scheme. Each such converter provides 6-pulse AC for DC conversion, so to create more sets of 6-pulse systems, a coherent phase-shift is required and therefore produces multi-pulse systems with appropriate phase-transfer angles. Is gone. The performance of a multi-pulse converter is received for overall harmonics distortion (THD) in the pre-deliver modern-day. All simulations were done for the same rating for all multi pulse converters configurations. Results are obtained for arbitrary converters for R load.

1.INTRODUCTION

Power machine harmonic distortion has existed for the reason that early 1900s, so long as AC strength itself has been to be had. The earliest harmonic distortion issues were associated with 0.33 harmonic currents produced through saturated iron in machines and transformers, so-known as ferromagnetic masses. A better know-how of power gadget harmonic phenomena can be done with consideration of a few essential concepts, especially, the nature of nonlinear masses, and the interplay of harmonic currents and voltages inside the electricity machine. By definition, harmonic (or nonlinear) hundreds are the ones devices that evidently produce a non-sinusoidal modern-day whilst energized by a sinusoidal voltage supply Each "waveform" on proper, represents the version in on the spot cutting-edge over time for 2 special masses each energized from a sinusoidal voltage supply. Both contemporary waveforms had been produced through turning on a few kind of load device. In the case of the contemporary on the left, this tool changed into probable a resistance heater. Power electronic switching device in conjunction with nonlinear loads causes serious harmonic problem in power system due to their inherent property of drawing harmonic current and reactive power from AC supply mains. They cause voltage unbalance and neutral currents problem in power system. With the distortion of current and voltage waveform due to presence of harmonic effect the power system equipment that are connected to maintain steady and reliable power flow in the power system.

2. LITERATURE SURVEY

1. **"The Impacts of Harmonics Reduction on THD Analysis in HVDC TransmissionSystem using Three-phase Multi-Pulse and higher Level Converters,Gbadega Peter . A A.K Saha.978-1-7281-0369-3/19/$31.00 ©2019 IEEE** In this paper eliminating the glitches confronted by High Voltage Direct Current (HVDC)transmission systems such as converting station and harmonic cost can therefore make it morerealistic. Generally, total harmonic distortion can simply be lessen up to the allowable limits, justby increasing the pulses number in a multi-pulse converter.

2." Power Quality Enhancement Using Current Injection Technique in a Zigzag Configured Autotransformer Based 12-Pulse Rectifier" R Kalpana,. Khimavath Sai Chethana This paper proposes a DC side circuit configuration that improves the harmonic suppressionability of a 12-pulse diode bridge rectifier (DBR) using a zigzag configured autotransformer. TheDC side circuit uses a 1-phase DBR along with interphase transformer which generates therequired circulating current thereby modifies the DC currents at the DBR output, in turn shapesthe input line current near to a sine wave. The proposed 1-phase DBR is connected in parallelwith the load which enables to reuse the harmonic energy thus improving the energy conversion efficiency.

3. " Modeling and Simulation of Multi-Pulse Converter for Harmonic Diminution", Urmil Desai, Darshan Rajesh Vo ra 978-1-5090-4715-4/17/$31.00 ©2017 IEEE The concern of power quality now days is a major anxious area of research in the power sector.With the innovation in the technology now it is possible to keep power sector free for thereduction of Total Harmonic Distortion using different concepts and applications**.** This researchpaper deals with the diminution of Total Harmonic Distortion using Multi-pulse AC to DCConversion scheme. Every such converter provides 6-pulse AC to DC conversion, so in order tocreate more sets of 6- pulse systems, a consistent phase-shift is required and hence with properphase-shifting angle, 6, 12, 24, and higher pulse systems have been produced. The performanceadvance of multi pulse converter is achieved for total harmonics distortion (THD) in supplycurrent. All the simulations have been done for similar ratings for all the multi pulse converterconfigurations. The results are obtained for uncontrolled converters for R Load**.**

4.“ Harmonic Reduction Technology at DC Link in Star-Connected-Autotransformer-Based Multi-Pulse Rectifier”,Zhe Liu, Fangang Meng,978-1-5386-2894-2/17/$31.00 ©2017 IEEE. In this paper, In order to improve the harmonic reduction ability of the multi-pulse rectifier, thispaper proposes a multi-pulse rectifier based on harmonic reduction technology at DC link. The proposed rectifier employs two diode bridges, each followed by a Boost converter. By controlling the inductor current of Boost converter, the input line current of the proposed rectifier can be approximated to sinusoidal waveform. A star-connected autotransformer is used to be phase-shift transformer and the winding of the autotransformer are interconnected, which can significantly decrease the equivalent kVA rating of the transformer and improve the power density. This paper also calculates the theoretical inductor current waveform of Boost converter when the input line current is sinusoidal, and presents the applicable current waveform.

3. PROBLEM DEFINITION

Project The present work is an effort in the direction of analyzing the distinctive multi-pulse AC to DC converters in solving the harmonic trouble in a 3-section converter system. The impact of growing the number of pulses on the performance of AC to DC converters has been analyzed. For performance comparison the most important elements taken into consideration are the ripple percent, shape aspect and the overall harmonic distortion (THD). The consequences of load variation on multi-pulse AC to DC converters have also been investigated

A. The Augmented Multi pulse system Method

Multi-pulse techniques involve more than one converter linked so that the harmonics generated by means of one converter are cancelled by means of harmonics produced with the aid of different converters. By this means, sure harmonics related to range of converters are removed from the strength supply. In multi-pulse converters, reduction of AC enter line current harmonics is important close to the impact the converter has at the power machine. Multi-pulse techniques are characterized by way of the use of a couple of converters or more than one semiconductor devices with a common load given beneath depict the diverse strategies used broadly for the reduction of harmonics. This project is regarding to three section converters

B. The Converters Mechanism

These 3 segment converters are used for variety of programs inside the industrial environment. This project work is coping with multiple pulse or multi-pulse three section thyristors converters for excessive voltage and excessive electricity applications. This multi-pulse scheme reduces the harmonics generated in the output voltage so avoids the requirement.

C. Concept of Multi-pulse Converters

Multi pulse converters are converters presenting greater than six pulses of DC voltage according to cycle from AC enter. Or the converter having more steps in AC input current than that of six pulse bridge rectifiers deliver current. Bridge rectifier is the simple block required for AC- DC conversion, however, full- wave and half wave rectifier also are used up to 120kW ratings. Phase shifting transformers are used to derive a couple of segments deliver from three phase AC mains the usage of distinct combos of transformer windings which include superstar, delta, zigzag, fork, polygon.

4.HARMONIC LOADS

By definition, harmonic (or nonlinear) loads are thosedevices that naturally produce a non-sinusoidal currentwhen energized by a sinusoidal voltage source (Figure).

Each “waveform” on right, represents the variation ininstantaneous current over time for two different loadseach energized from a sinusoidal voltage source. Bothcurrent waveforms were produced by turning on some typeof load device. In the case of the current on the left, thisdevice was probably a resistance heater.

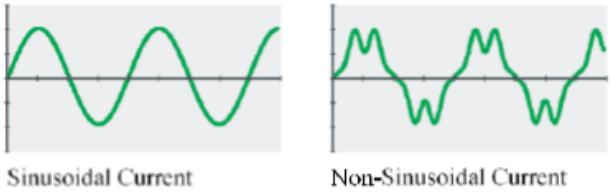

Fig. 1Current waveform in harmonic (or nonlinear) loads Conclusion

The current on the right could have been produced by an electronic variable-speed drive, in Figure 2. While the visual difference in the above waveforms is evident, graphical appearance alone is seldom sufficient for the power engineer required to analyze the effects of no sinusoidal loads on the power system. One method of describing the non-sinusoidal waveform is called its Fourier series. Jean Fourier was a French mathematician of the early 19th century who discovered a special characteristic of periodic waveforms.

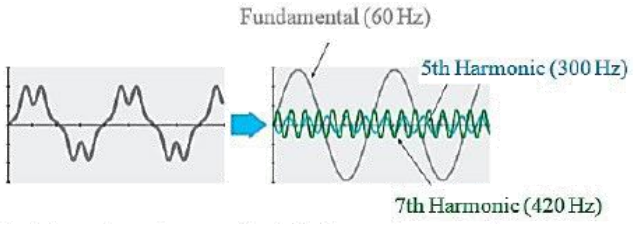

Fig.2 Current waveform in an electronic variable-speed drive

Fourier discovered that periodic waveforms could berepresented by a series of sinusoids summed together.

Frequency of these sinusoids is an integer multiple of thefrequency represented by the fundamental periodic waveform. The waveform on the left above, for example ,is described entirely by one sinusoid, the fundamental ,since it contains no harmonic distortion. This example waveform is represented by only three harmonic components, but some real-world waveforms (square wave, for example) require hundreds of sinusoidal components to fully describe them. The magnitude of these sinusoids decreases with increasing frequency. Equivalent harmonic components are just a representation the instantaneous current as described by the distorted waveform is what is actually flowing on the wire. This representation is necessary because it facilitates analysis of the power system The current drawn by non-linear loads passes through all of the impedance between the system source and load.

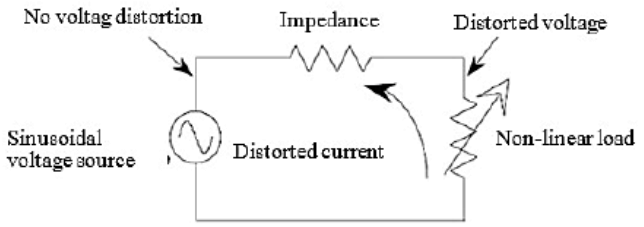

Fig. *Error! No text of specified style in document.* ***Creation of distorted current***

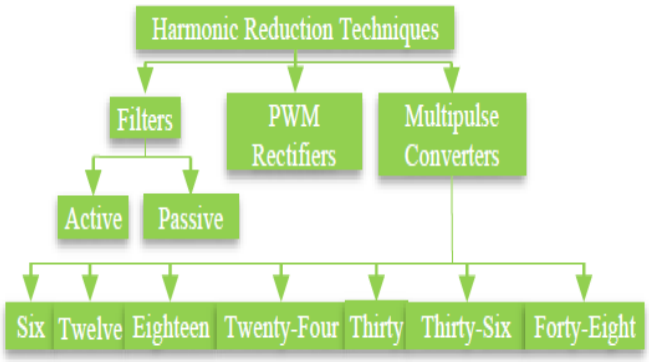

Fig. 4 Various Harmonic Reduction Techniques

CONCLUSION:

With the growth in wide variety of pulses of converter improves the power high-quality through reducing the enter modern harmonics from the ac mains. Hence pulse multiplication approach can play a vital function in electricity first-class development in diverse packages including energy distribution networks, HVDC transmission systems, critical commercial and industrial hundreds etc. The most important objective of the present work is to analyze the overall performance of managed multi-pulse converter. These converters are studied in phrases of harmonic spectrum of AC most important modern, Output voltage Ripple and Form Factor. It is Conclusion that in trendy that will increase the quantity of pulse in multi-pulse converter the overall performance of the converters is extensively progressed.

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