DOUBLE CONVERSION ONLINE UPS

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ABSTRACT
This paper based on the modeling, simulation and analysis of a dual AC-DC converter based PWM IGBT rectifier. The ability to control the system to obtain power factor operation is an important feature of the system. In very short time improvement in power semiconductor devices, the utility of power electronic systems has extract to variety applications that includes residential, commercial and SMPS. The current gives by power semiconductor equipment that line is fluctuation Resulting in a very high harmonic distortion and low PF. Hence the PF improvement is very necessary and decreases the current harmonics.
This project aims to develop a PF correction circuit, using only IGBT controlled rectifier without transformer. How one UPS design addressed the efficiency issue and control the losses to produce a product with efficiency up to 97 percent, Maximizes Active power leading to reduced electricity bill, reduce wires, switchboard, fuse, generator need to reduced investment cost. This double conversion true online UPS is unique for environments where electrical isolation is necessary for device that is respond to power inconsistency.

Keywords: *Total Harmonic Distortions, Neutral point clamped, Power Factor correction, Power Supply, Uninterruptible Power Supply.*

I. INTRODUCTION

In dual conversion UPS, the batteries connected to the inverter, hence no need of power move to exchange. When power loss appears, the IGBT rectifier simply dash out of the circuit and the battery is the power reliable and no change. When power is repaired, the rectifier digest give most of the load and begins charging the battery, the charging current can be finite to avoid the high-power rectifier from overheating the battery. The benefits of an on-line double conversion UPS is its capability to give an electrical firewall among the incoming utility power and sensitive electronic equipment.
In our modern, digital world we all have an assumption that power decline or disturbance is not an option. Most of us are depends on easily accessible and reliably functioning demanding business, telecommunication, banking, medical, and other applications. We expect to access information or the ability to carry out commercial transactions on demand, every day of a year. There is a fundamental need to have an electrical and power supply that has a more than merely adequate resilience and availability incorporated to support critical applications. It is possible to achieve a high quality power supply by eliminate single points of failure and utilizing UPS systems with superior availability.
The initial cost of the online UPS may be higher, but its total cost of ownership is generally lower due to longer battery life. The online double conversion UPS is important for the power environment is has much more noise, when utility power dip, outages and other deviation are constant, when operation from an extended-run backup generator is necessary.
Double conversion online UPS system provide reliable power protection for critical application because IGBT based techniques to give clear, balance power to conscious loads, protecting critical power, excellent achievement, and extended life of the protected equipment. Our main approaches towards implement this system are that improve power factor, increase efficiency and reduce Total Harmonics Distortion lower than 5 percent. This system is actual useful for industrial purpose because of it reduce their electricity bill. Double-conversion UPS have the rectification process at the input side and can accommodate large fluctuations in supply frequency to provide regulated, balanced output frequency, without the use of the battery. Further, the large UPS manufacturers have misuse input current distortion reduction techniques that greatly improve the compatibility of UPS with generators to allow closer load sizing

II. NECESSITY

Recently UPS systems are becoming important due to greater in critical loads such as telecommunication system, computer sets and hospital equipment system is very essential for provide clean and continuous power to load under several input line condition. When power

from the utility power lines, it draws sinusoidal input current at high power factor.

In large business environments where reliability is of great importance, a single huge UPS can also be a single point of failure that can disrupt many other systems. To provide greater reliability, multiple smaller UPS modules and batteries can be integrated together to provide redundant power protection equivalent to one very large UPS. True double conversion online operation protects connected equipment from all of the most common power problems. High efficiency design saves money on operating costs across all load levels.

III. METHODOLOGY

Power factor is defined as it is the ratio of real power that used to do work and apparent power. In a linear system, the load draws a purely sinusoidal current and voltage; hence the power factor is determined only by the phase difference between voltage and current.

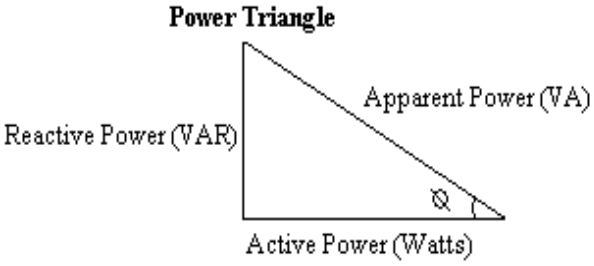


Fig 1: Power Triangle.[2]

In non-linear systems like power electronic systems, due to the non-linear behavior of the active switching of power devices, For technical and Non-technical people with limited understanding of power conversion technology this paper introduces the basic definitions of power factor and harmonic distortions of low power factor will be discussed with emphasis on non-linear load such as switch mode rectifier.

Comparison of three-level, Neutral Point Clamped (NPC) type inverter with the more traditional 2-level version. The objective of this comparison is to demonstrate (in cost and benefit terms) that while a UPS with an NPC type inverter has a higher initial purchase outlay (due to its greater complexity and component count), this can be quickly recovered as a result of the far higher energy savings typically achieved.

A comparative evaluation of five topologies of single-phase AC-DC boosts converters having power factor correction (PFC). These converter topologies are evaluated the basis of performance and their silent features are discussed to analyze their applicability. The techniques not only help to develop a deeper understanding of these converters but also to evaluate performance and feasibility of control strategies and topological features without fabrication of an actual systematizes also describes techniques for minimizing the input current distortion of current controlled single-phase boost rectifiers. Performance of these converters is simulated and conformity of these converters is shown to relevant international standards. This work aims to provide an exposure of PFC converters to researchers and application engineers dealing with power quality issues.

The design of a transformer less UPS that uses two high frequency PWM power converters in series without sacrificing efficiency compared to their transformer forerunners. It has long been accepted, however, that high frequency PWM converter will have higher losses a diode rectifier or SCR phase control rectifier and that the loss in efficiency is simply one way to bear the cost for the increased performance. The scope of this paper is for 3 phase UPS in the 50 kVA to 200 kVA size range. Many of the users in this product range have some awareness of technology and what is new and what is old. For example, they are aware that and IGBT PWM converter has improved electronic filtering as compared to SCR converters with passive filters. It is constructive at this point to look at the old and new technologies and note some key differences. The terms old and new are simply statements of fact and are not intended to convey inferior and superior.

The Used of DSP and microprocessors in power electronic system has been a long term goal in development of control techniques for power systems.

There are various control functions in an on-line UPS system such as power on/off sequence control, frequency Synchronization, power factor control, PWM inverter control, battery charging control and many other monitoring functions.

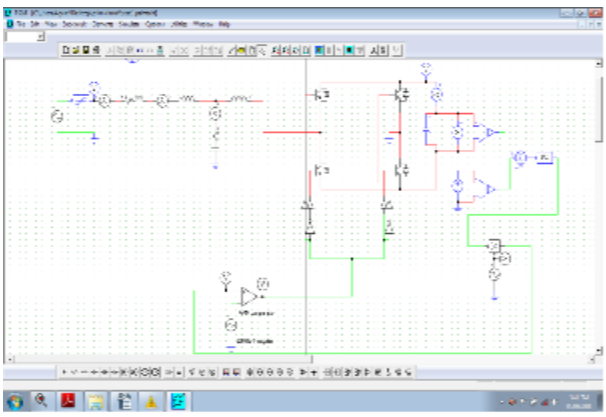


Fig 2: Simulation of Circuit

The voltage 150 volt and 50 hertz given to the input side as we know the power is the product of voltage and current so as voltage increases current increases also the distortions in the current waveform is also increase avoid this current distortion at input side we required the filter for removing the extra noise and the pulses in the current waveform the extra filtering topology is used at the output side.
The output waveforms:

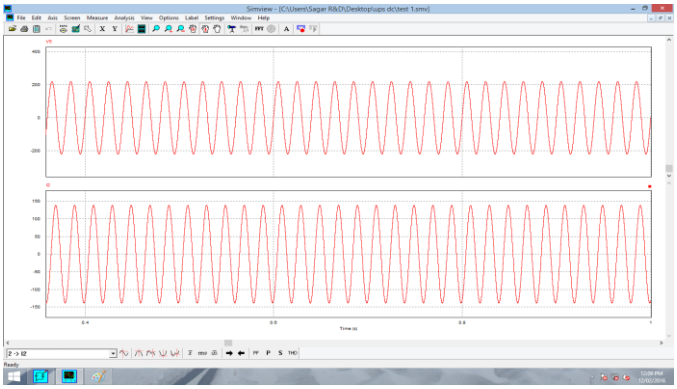


Fig 3: Output Waveform

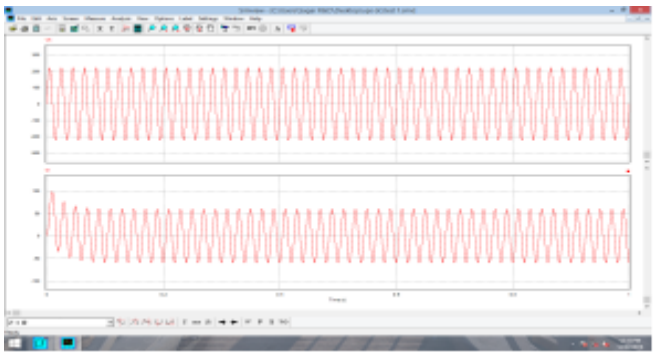


Fig 4: Output of Voltage and current

IV. RESULT AND DISCUSSION

I. PWM Wave Generation

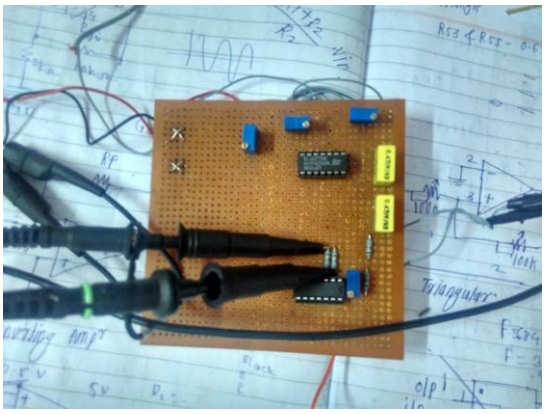
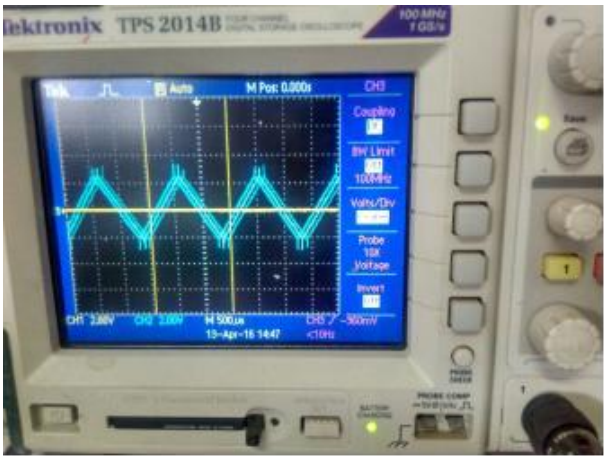


Fig 5 Integrator Circuit

In this figure shows that square wave generator circuit fed with integrator circuit for generation of triangular signal. At the output side we get triangular wave at 3KHzfrequency.

II. Results:



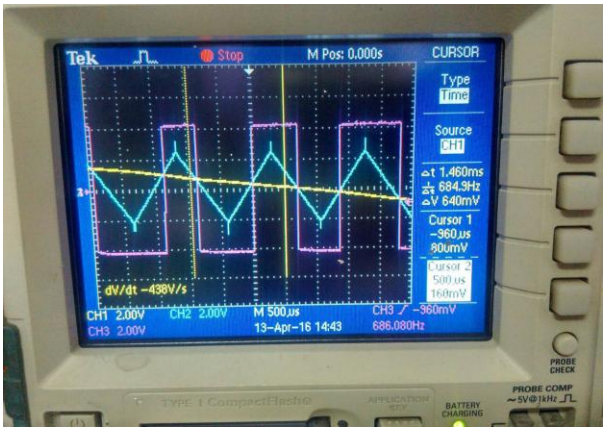


Fig 7: PWM Generation

In above waveforms shows that the frequency increases up to 3KHz and 4KHz.for achieve this output we used the capacitors for filtering and sharp PWM generation.

III. Future scope:
The double-conversion UPS is inherently dual-input, meaning that it has separate inputs for the rectifier and bypass circuits.
The customer may request a single-input model as a convenience for installation, but dual-input UPS products are incrementally more fault-tolerant.

IV. Advantages:
The critical load is completely isolated from the incoming AC input power.

It can continue to operate, without discharging the batteries.

V. Disadvantage:
This online doubles conversion ups has more cost than other types of UPS.

V. CONCLUSION

From the obtained results according calculations and simulations, it can be conclude that proposed aim and objectives of this system are achieved. Along with increase efficiency, lesser % THD (<5%) and unity power factor are achieve.
The simulating and test results have shown that the system has high efficiency and has high dynamic performance and has distortion well under 5%. The input current and voltage are in phase and even the input current is sinusoidal which the basic objectives of our work were. The double conversion UPS gives the best performance and safety against all power disturbances.

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