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Power Efficiency of Mini Inverter

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Abstract-
Inverters are widely used in the domestic as well as industrial environments to serve as second line of source in case of power cut form the electricity utility grids. Inverter is the device that powers the electric appliances in the event of the power failure. Inverter as the name implies first converts AC to DC for charging the battery and then inverts DC to AC for powering the electric gadgets. So here is the power efficient inverter which is small in size and which can give output voltage of 220v-230 /150w. this power efficient mini inverter can be used to power up devices such as Wifi routers, mobile chargers, Lights etc.

Keywords: Transformer, inverter , AC Load etc.

1. Introduction

Inverter Circuits are very helpful during the power cuts and for portable power source. If the load connected to the inverter circuit is very small means we don't need pure sine wave inverter or bulk inverter with high power. But for the large power conversion the power inverters are used. A power inverter can be entirely electronic or may be a combination of mechanical effects such as a rotary apparatus and electronic circuitry.

The method, in which the low voltage DC power is inverted, is completed in two steps. The first being the conversion of the low voltage DC power to high voltage DC source, and the second step being the conversion of the high DC source to an AC waveform using pulse width modulation. Another method to complete the desired outcome would be to first convert the low voltage DC power to AC, and then use a transformer to boost the voltage to 240 volts. This project focused on the first method described and specifically the transformation of a high voltage DC source into an AC output. Of the different DC-AC inverters on the market today there are essentially two different forms of AC output generated modified sine wave, and pure sine wave. A modified sine wave can be seen as more of a square wave than a sine wave, it passes the high DC voltage for specified amounts of time so that the average power and RMS voltage are the same as if it were a sine wave. These types of inverter are much cheaper than pure sine wave inverters and therefore are attractive alternatives.

2. Problem Definition

- When the sudden power cut in the house and even shut down of a UPS system, at that time mini inverters are very useful. The mini inverters can be operated using a small batteries.
- These types of mini inverters are very useful in emergency time. Using the mini inverters a small bulb can be operated and also mobile phones can be charged.
- It is portable, so that it can be used for charging electronic gadgets while trekking in hills in case of emergency.

3. Objective

The main objective of this project is to uninterrupted power supply during emergency case .The specific objectives of this project were,

1. At the time of total shutdown due to any natural disaster it provides a good back up power.
2. While travelling, the electrical gadgets can be charged using small batteries
3. To design an efficient impedance-based mini inverter.

4. Literature Survey

AC electrical power supply can be used most electronic devices. It will be difficult to use these devices that electric goes off. This problem can be solved by the use of inverter.

DC to AC converter known as an inverter. This function of inverter is to change DC input voltage to a symmetrical AC output voltage of desired magnitude and frequency. There are various kind of watt in the inverter according to P=VI. Watt is dependent on the current. The using of watt gets form transformer, coil wire depending on the ampere.

There are various types of inverter, and they are classifies according to the No. of the phases. Use of power of semiconductor devices, communication principles and output waveforms. We will first look single phase inverter. Secondly, we will discuss voltage source inverter(VSI) and current source inverter(CSI).Inverter are used many different industrial applications including the speed control of induction and synchronous motors, induction heating, aircraft power supplies, uninterruptible power supplies(UPS) and high voltage DC transmission.

Town and countries which have no sufficiently light use inverter. It is an essential device to increase for lives. So,

we study inverter and then we can know electrical and electronic knowledge.

- ***Abhisekh Banerjee et. al.2018,*** This paper demonstrates the design and layout of novel controlled inverter using majority gate based on Quantum Dot Cellular Automata with minimum complexity in comparisons to previous designs. The stability of the circuit has been determined by calculating the kink energy. The simulation results are captured and verified using QCA Designer tool.

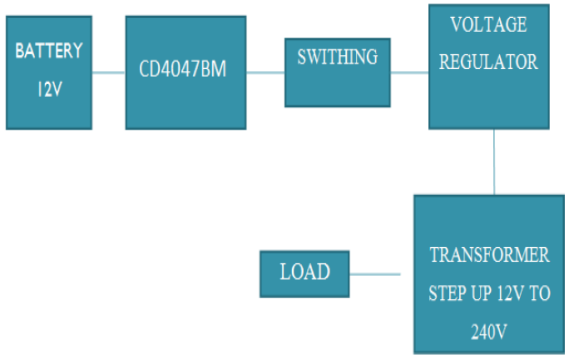
- ***Tajeddine Khalili et. al. 2015,*** The study uses Matlab Simulink platform as a tool of simulation, and aim to choose the most qualified inverter, for a potential insertion on a hybrid renewable energy platform (wind-solar). In all the simulations we use the same PWM control type (SPWM).

5. Proposed Detailed Methodology

An inverter is nothing but a DC to AC converter. Inverters are very useful electronics products for compensating emergency power failure, as it performs DC to AC conversion. AC can't be stored for future use but DC can be stored for future use in a battery. The stored DC can be converted back to AC by using power inverters. It is the simple inverter circuit diagram using 555 timer IC.

The astable multivibrator mode operation of 555 timer utilized here for AC oscillations and these oscillations are switched via transistor TIP41A to a transformer. The transformer step ups the voltage to 220V AC. Use a 9V battery for this project.

6. Block Diagram



7. Working

- In this block diagram we show that we give 12V supply to complimentary MOS astable/bistable multi vibrater. Then we take output 180 in phase and 180 outphas. And it given to switching transistor TIP 122 transistor given in it base. And collector supply is given to high power level tranistor TIP3055.
- We used TIP3055 in place of 2N3055 complimentary high power tranistor. It goes to voltage regulator. It is regulate the voltage level. Through the zenor diode and capacitor. And step-up transformer converts 12V to 240V and it is give to load.

8. Advantages power efficient inverter

- It can be an energy-efficient way of changing voltage.
- Can step voltage up or down.
- It can provide electrical isolation between input and output.
- It can provide an AC voltage from a DC source.
- It can smooth out random variations in input voltage.
- It can be used to produce 50 Hz from a 60 Hz supply or vice versa.

9. Disadvantages power efficient inverter

- Require rectification and smoothing on the output if the output is to be DC.
- May produce radio interference or audible tones.
- May produce AC at a non-specific frequency.
- In certain types of UPS, the inverter may need to phase synchronized to the input AC power to ensure a spike free switchover.
- May produce excess output voltage under no load or very light load conditions.

10. Applications

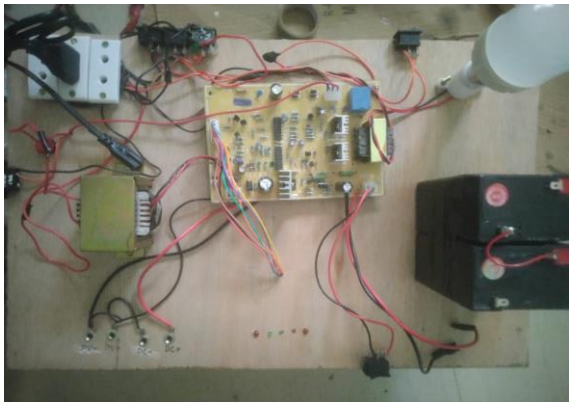
Power inverters are used today for many tasks like powering appliances in a car such as cell phones, radios and televisions. They also come in handy for consumers who own camping vehicles, boats and at constructing sites where an electric grid may not be as accessible to hook into. Inverters allow the user to provide AC power in areas where only batteries can be made available, allowing portability and freeing the user of long power cords.

On the market today are two different types of power inverters, modified sine wave and pure sine wave generators. These inverters differ in their outs puts, providing varying levels of efficiency and distortion that can affect electrons devices in different ways. A modified sine wave is similar to a square wave but instead has a "stepping" look to it that relates more in shape to a sine wave. The waveform is easy to produce because it is just the produce of the product of switching between 3 values at set frequencies, thereby leaving out the more complicated circuitry needed for a pure sine wave. The modified sine wave. The modified sine wave inverter provides a cheap and easy solution to powering devices that need AC power. It does have some drawbacks as not all devices work properly on a modified sine-wave, products such as computer and medical equipment are not resistance to the distortion of the signal and must be run off a pure sine wave power source.

11. Results

AC can't be stored for future use but DC can be stored for future use in a battery. The stored DC can be converted back to AC by using power inverters.

Here is the simple inverter circuit diagram using 555 timer IC. The astable multivibrator mode operation of 555 timer utilized here for AC oscillations and these oscillations are switched via transistor to a transformer. The transformer step ups the voltage to 220V AC. Use a 12V battery and Battery charger circuit for this project.



12. Conclusion

The first to create this project, we search all about already existing inverter systems in world. For example an inverter is an electrical device that converts direct current (DC) to alternating current (AC) the converted AC can be at any required voltage and frequency with the use of appropriate transformers, switching, and control circuits.

Solid-state inverters have no moving parts and are used in a wide range of applications, from small switching power supplies in computers, to large electric utility high-voltage direct current applications that transport bulk power. Inverters are commonly used to supply AC power from DC sources such as solar panels or batteries. The inverter performs the opposite function of a rectifier.

The major skill or we are learning about this project is inverter to generates the outputs supply and get the output voltage. What we get from this is electronic soldering and wiring, single phase wiring circuits in connection, size cable use.

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