ISSN: 0975-766X
CODEN: IJPTFI
Available Online through **Research Article**
www.ijptonline.com

POWER SAVING INVERTER SURVEY

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Received on: 15.08.2016 *Accepted on: 20.09.2016*

Abstract

Power saving inverter is the electrical device which save the usage of power in the home. In this device we use a de-mux and object detecting sensors. This paper describes the whole working of power saving inverter

Key word: Power inverter, object detecting sensors, De mux.

1. Introduction:

In this power saving inverter power inverter is the important device. So we going to consider the performance of the power inverter. The runtime of an inverter is dependent on the battery power and the amount of power being drawn from the inverter at a given time. As the amount of equipment using the inverter increases, the runtime will decrease. In order to prolong the runtime of an inverter, additional batteries can be added to the inverter.

When attempting to add more batteries to an inverter, there are two basic options for installation:

1(a):Series configuration:

If the goal is to increase the overall voltage of the inverter, one can daisy chain batteries in a series configuration. In a series configuration, if a single battery dies, the other batteries will not be able to power the load.[1] .

1(b):Parallel configuration

If the goal is to increase capacity and prolong the runtime of the inverter, batteries can be connected in parallel. This increases the overall ampere-hour (Ah) rating of the battery set.

If a single battery is discharged though, the other batteries will then discharge through it. This can lead to rapid discharge of the entire pack, or even an over-current and possible fire. To avoid this, large paralleled batteries may be connected via diodes or intelligent monitoring with automatic switching to isolate an under-voltage battery from the others.

1(c): Applications

DC power source usage

Inverter designed to provide 115 VAC from the 12 VDC source provided in an automobile. The unit shown provides up to 1.2 amperes of alternating current, or enough to power two sixty watt light bulbs.An inverter converts the DC electricity from sources such as batteries or fuel cells to AC electricity. The electricity can be at any required voltage; in particular it can operate AC equipment designed for mains operation, or rectified to produce DC at any desired voltage.

1(d):Un interruptible power supplies

An un interruptible power supply (UPS) uses batteries and an inverter to supply AC power when mains power is not available. When mains power is restored, a rectifier supplies DC power to recharge the batteries.

1(e): Electricmotor speed control

Inverter circuits designed to produce a variable output voltage range are often used within motor speed controllers. The DC power for the inverter section can be derived from a normal AC wall outlet or some other source. Control and feedback circuitry is used to adjust the final output of the inverter section which will ultimately determine the speed of the motor operating under its mechanical load. Motor speed control needs are numerous and include things like: industrial motor driven equipment, electric vehicles, rail transport systems, and power tools. (See related: variable-frequency drive) Switching states are developed for positive, negative and zero voltages as per the patterns given in the switching Table 1.The generated gate pulses are given to each switch in accordance with the developed pattern and thus the output is obtained.

2: Description:

An electromechanical switch and automatic equivalent auto-switching device implemented with two transistors and split winding auto-transformer in place of the mechanical switch.

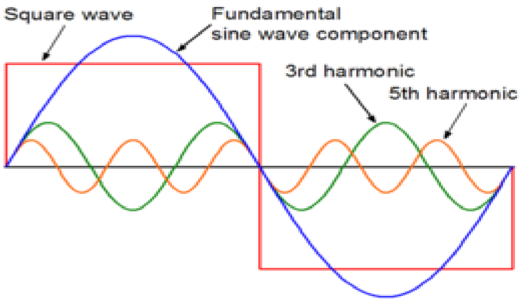


Fig-1: Wave form of power.

Square waveform with fundamental sine wave component, 3rd harmonic and 5th harmonic

2(a): Basic design

In one simple inverter circuit, DC power is connected to a transformer through the center tap of the primary winding. A switch is rapidly switched back and forth to allow current to flow back to the DC source following two alternate paths through one end of the primary winding and then the other. The alternation of the direction of current in the primary winding of the transformer produces alternating current (AC) in the secondary circuit.

The electromechanical version of the switching device includes two stationary contacts and a spring supported moving contact. The spring holds the movable contact against one of the stationary contacts and an electromagnet pulls the movable contact to the opposite stationary contact. The current in the electromagnet is interrupted by the action of the switch so that the switch continually switches rapidly back and forth. This type of electromechanical inverter switch, called a vibrator or buzzer, was once used in vacuum tube automobile radios. A similar mechanism has been used in door bells, buzzers and tattoo machines. As they became available with adequate power ratings, transistors and various other types of semiconductor switches have been incorporated EDDspecially for large systems (many kilowatts) use thyristors (SCR). SCRs provide large power handling capability in a semiconductor device, and can readily be controlled over a variable firing range. The switch in the simple inverter described above, when not coupled to an output transformer, produces a square voltage waveform due to its simple off and on nature as opposed to the sinusoidal waveform that is the usual waveform of an AC power supply. Using Fourier analysis, periodic waveforms are represented as the sum of an infinite series of sine waves. The sine wave that has the same frequency as the original waveform is called the fundamental component. The other sine waves, called harmonics, that are included in the series have frequencies that are integral multiples of the fundamental frequency. Fourier analysis can be used to calculate the total harmonic distortion (THD). The total harmonic distortion (THD) is the square root of the sum of the squares of the harmonic voltagesdivided by the fundamental voltage:

2(B): Advanced designs:

There are many different power circuit topologies and control strategies used in inverter designs. Different design approaches address various issues that may be more or less important depending on the way that the inverter is intended to be used. The issue of waveform quality can be addressed in many ways. Capacitors and inductors can be used to filter the waveform. If the design includes a transformer, filtering can be applied to the primary or the secondary side of the transformer or to both sides. Low-pass filters are applied to allow the fundamental component of the waveform to pass to the output while limiting the passage of the harmonic components. If the inverter is designed to provide power at a fixed frequency, a resonant filter can be used. For an adjustable frequency inverter, the filter must be tuned to a frequency that is above the maximum fundamental frequency.

Since most loads contain inductance, feedback rectifiers or antiparallel diodes are often connected across each semiconductor switch to provide a path for the peak inductive load current when the switch is turned off. The antiparallel diodes are somewhat similar to the freewheeling diodes used in AC/DC converter circuits.

Fourier analysis reveals that a waveform, like a square wave, that is anti-symmetrical about the 180 degree point contains only odd harmonics, the 3rd, 5th, 7th, etc. Waveforms that have steps of certain widths and heights can attenuate certain lower harmonics at the expense of amplifying higher harmonics. For example, by inserting a zero-voltage step between the positive and negative sections of the square-wave, all of the harmonics that are divisible by three (3rd and 9th, etc.) can be eliminated. That leaves only the 5th, 7th, 11th, 13th etc. The required width of the steps is one third of the period for each of the positive and negative steps and one sixth of the period for each of the zero-voltage steps.[8] Changing the square wave as described above is an example of pulse-width modulation (PWM). Modulating, or regulating the width of a square-wave pulse is often used as a method of regulating or adjusting an inverter's output voltage. When voltage control is not required, a fixed pulse width can be selected to reduce or eliminate selected harmonics. Harmonic elimination techniques are generally applied to the lowest harmonics because filtering is much more practical at high frequencies, where the filter components can be much smaller and less expensive. Multiple pulse-width or carrier based PWM control schemes produce waveforms that are composed of many narrow pulses. The frequency represented by the number of narrow pulses per second is called the switching frequency or carrier frequency. These control schemes are often used in variable-frequency motor control inverters because they allow a wide range of output voltage and frequency adjustment while also improving the quality of the waveform. Multilevel inverters provide another approach to harmonic cancellation. Multilevel inverters provide an output waveform that exhibits multiple steps at several voltage levels. For example, it is possible to produce a more sinusoidal wave by having split-rail direct current inputs at two voltages, or positive and negative inputs with a central ground. By connecting the inverter output terminals in sequence between the positive rail and ground, the positive rail and the negative rail, the ground rail and the negative rail, then both to the ground rail, a stepped waveform is generated at the inverter output. This is an example of a three level inverter: the two voltages and ground.[2]

3: More on achieving a sine wave

Resonant inverters produce sine waves with LC circuits to remove the harmonics from a simple square wave. Typically there are several series- and parallel-resonant LC circuits, each tuned to a different harmonic of the power line frequency. This simplifies the electronics, but the inductors and capacitors tend to be large and heavy. Its high efficiency makes this approach popular in large uninterruptible power supplies in data centers that run the inverter continuously in an "online" mode to avoid any switchover transient when power is lost. A closely related approach uses a ferro resonant transformer, also known as a constant voltage transformer, to remove harmonics and to store enough energy to sustain the load for a few AC cycles. This property makes them useful in standby power supplies to eliminate the switchover transient that otherwise occurs during a power failure while the normally idle inverter starts and the mechanical relays are switching to its output.

3(a): Enhanced quantization

A proposal suggested in Power Electronics magazine utilizes two voltages as an improvement over the common commercialized technology which can only apply DC bus voltage in either directions or turn it off. The proposal adds an additional voltage to this design. Each cycle consists of sequence as: v1, v2, v1, 0, −v1, −v2, −v1.[7]

Three-phase inverters

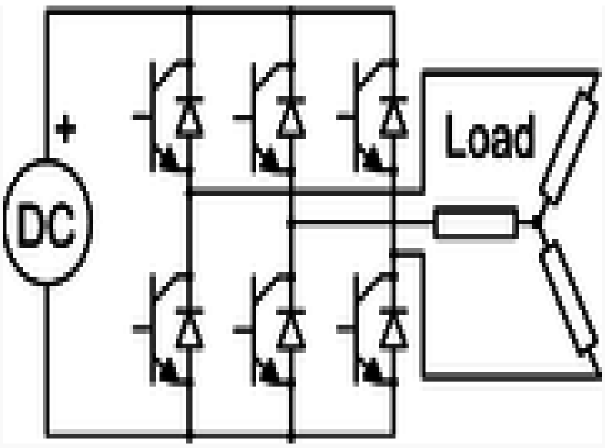
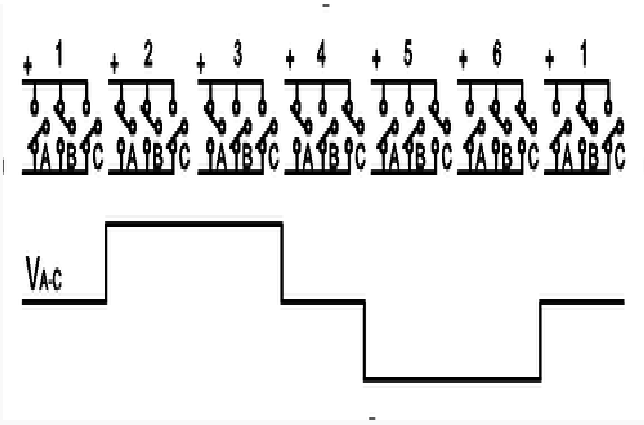


Fig 2.three phase inverter

Three-phase inverter with wye connected load

Three-phase inverters are used for variable-frequency drive applications and for high power applications such as HVDC power transmission. A basic three-phase inverter consists of three single-phase inverter switches each connected to one of the three load terminals. For the most basic control scheme, the operation of the three switches is coordinated so that one switch operates at each 60 degree point of the fundamental output waveform. This creates a line-to-line output waveform that has six steps. The six-step waveform has a zero-voltage step between the positive and negative sections of the square-wave such that the harmonics that are multiples of three are eliminated as described above. When carrier-based PWM techniques are applied to six-step waveforms, the basic overall shape, or envelope, of the waveform is retained so that the 3rd harmonic and its multiples are cancelled.



3-phase inverter switching circuit showing 6-step switching sequence and waveform of voltage between terminals A and C ($2^3 - 2$ states)

To construct inverters with higher power ratings, two six-step three-phase inverter

3(b): Controlled rectifier inverters

Since early transistors were not available with sufficient voltage and current ratings for most inverter applications, it was the 1957 introduction of the thyristor or silicon-controlled rectifier (SCR) that initiated the transition to solid state inverter circuits.

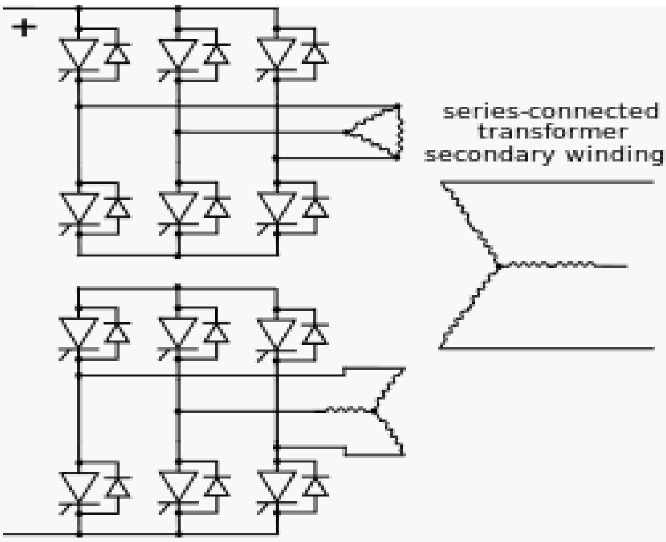


Fig 3. line-commutated inverter circuit

The *commutation* requirements of SCRs are a key consideration in SCR circuit designs. SCRs do not turn off or *commutate* automatically when the gate control signal is shut off. They only turn off when the forward current is reduced to below the minimum holding current, which varies with each kind of SCR, through some external process. For SCRs connected to an AC power source, commutation occurs naturally every time the polarity of the source voltage reverses. SCRs connected to a DC power source usually require a means of forced commutation that forces the current to zero when commutation is required. The least complicated SCR circuits employ natural commutation rather than forced commutation. With the addition of forced commutation circuits, SCRs have been used in the types of inverter circuits described above.[3] In applications where inverters transfer power from a DC power source to an AC power source, it is possible to use AC-to-DC controlled rectifier circuits operating in the inversion mode. In the inversion mode, a controlled rectifier circuit operates as a line commutated inverter. This type of operation can be used in HVDC power transmission systems and in regenerative braking operation of motor control systems. Another type of SCR inverter circuit is the current source input (CSI) inverter. A CSI inverter is the dual of a six-step voltage source inverter. With a current source inverter, the DC power supply is configured as a current source rather than a voltage source. The inverter SCRs are switched in a six-step sequence to direct the current to a three-phase AC load as a stepped current waveform. CSI inverter commutation methods include load commutation and parallel capacitor commutation. With both methods, the input current regulation assists the commutation. With load commutation, the load is a synchronous motor operated at a leading power factor.

As they have become available in higher voltage and current ratings, semiconductors such as transistors or IGBTs that can be turned off by means of control signals have become the preferred switching components for use in inverter circuits.

4: Rectifier and inverter pulse numbers

Rectifier circuits are often classified by the number of current pulses that flow to the DC side of the rectifier per cycle of AC input voltage. A single-phase half-wave repulsecircuitanda single with three-phase rectifiers, two or more rectifiers are sometimes connected in series or parallel to obtain higher voltage or current ratings. The rectifier inputs are supplied from special transformers that provide phase shifted outputs. This has the effect of phase multiplication. Six phases are obtained from two transformers, twelve phases from three transformers and so on. The associated rectifier circuits are 12-pulse rectifiers, 18-pulse rectifiers and so on. When controlled rectifier circuits are operated in the inversion mode, they would be classified by pulse number also. Rectifier circuits that have a higher pulse number have reduced harmonic content in the AC input current and reduced ripple in the DC output voltage. In the inversion mode, circuits that have a higher pulse number have lower harmonic content in the AC output voltage waveform.

5: Other notes

The large switching devices for power transmission applications installed until 1970 predominantly used mercury-arc valves. Modern inverters are usually solid state (static inverters). A modern design method features components arranged in an H bridgeconfiguration. This design is also quite popular with smaller-scale consumer devices.

6: Research

Using 3-D printing and novel semiconductors, researchers at the Department of Energy's Oak Ridge National Laboratory have created a power inverter that could make electric vehicles lighter, more powerful and more efficient. Photoelectric Sensors Special optical.

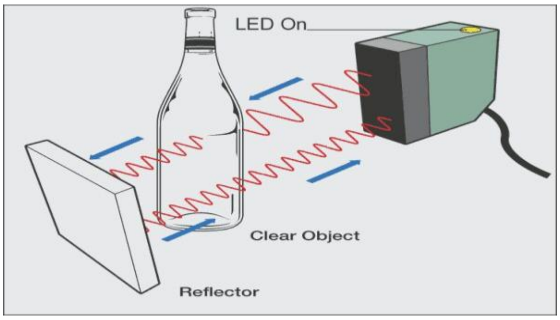


Fig 4. Sensors working.

sensors that check for presence, shape, colour, edge, distance, and thickness Photoelectric sensors provide non-contact accurate detection of targets. They emit infrared, red or laser light and the target breaks the light beam or reflects to the sensor to activate the sensor output. Photoelectric sensing modes are divided into three primary types, those being through-beam, retro-reflective and diffuse .Photoelectric sensors can check for presence, colour, distance, size, shape, and many more targets attributes. They can perform these functions at longer distances than other sensing methods while providing numerous mounting options and flexibility.

7. De Mux Working And Principle:

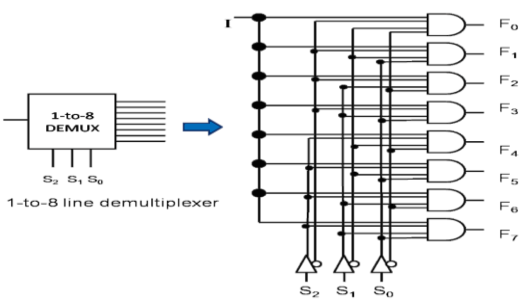


Fig 5.Demux circuit diagram.

A de-multiplexer (de-mux) is a device taking a single input signal and selecting one of many data-output-lines, which is connected to the single input. A multiplexer is often used with a complementary de-multiplexer on the receiving end. An electronic multiplexer can be considered as a multiple-input, single-out put switch, and a de-multiplexer as a single-input, multiple-output switch .The schematic symbol for a multiplexer is an isosceles trapezoid with the longer parallel side containing the input pins and the short parallel side containing the output pin .The schematic on the right shows a 2-to-1 multiplexer on the left and an equivalent switch on the right. The wire connects the desired input to the output.

8. Project Concept:

In general a power inverter works when we lost power then the stored power which is DC current is supplied to home or in work place. This project work on the power saving in inverter. When there is no one in the room the power supply will stop and by detecting the people in where they located.This helps to save power in inverter.

9. Working of Project:

When we come to the working of the project by connecting the electrical devices which are attached with object detecting sensors to the power inverter which are connected to De mux circuit. Then the power will be supplied to electrical device near to the object(Here object is known as human).

We have already discussed how a light sensor works. IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

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