Water Level Indicator

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***Abstract*— This paper comprehensively analyzes the locus comparison of SVPWM and PWM. The comparison involved,. In PWM methods such as sine-triangle PWM, three phase reference modulating signals are compared against a common triangular carrier to generate the PWM signals for the three phases. In SVPWM methods, a revolving reference voltage vector is provided as voltage reference instead of three phase modulating waves. The magnitude and frequency of the fundamental component in the line side are controlled by the magnitude and frequency, respectively, of the reference vector. The highest possible peak phase fundamental is very less in sine triangle PWM when compared with space vector PWM. Space Vector Modulation (SVM) Technique has become the important PWM technique for three phase Voltage Source Inverters for the control of AC Induction, Brushless DC, Switched Reluctance and Permanent Magnet Synchronous Motors.**

Keywords: - PWM, SVPWM, SVM, THD, FFT

I. INTRODUCTION

The total amount of water available on Earth has been estimated at 1.4 billion cubic kilometers, enough to cover the planet with a layer of about 3 km. About 95% of the Earth's water is in the oceans, which is unfit for human consumption. About 4% is locked in the polar ice caps, and the rest 1% constitutes all fresh water found in rivers, streams and lakes which is suitable for our consumption. A study estimated that a person in India consumes an average of 135 litres per day. This consumption would rise by 40% by the year 2025. This signifies the need to preserve our fresh water resources.

As rural areas have limitations that they are aware about the technology used nowadays this makes the lifestyle very simple. Water level indicator is an instruments which can be easily implement which can be use by rural people to their households. It is an electronic device which consists of electronic elements like resistance, PCB plate, buzzer, LED's, etc. They are connected in such a manner, so that different levels are decided and as one of its level reach by the water, corresponding LED glow. Similar for all the levels. A buzzer is also connected for extreme level. As the container is completely filled with water, last LED will glow and also the buzzer gets activated.

II. COMPONENTS USED

a.) Rectifier
b.) Transformer
c.) Battery
d.) Buzzer
e.) Prototype of water container
f.) LED's
g.) PCB plate
h.) Electrical components (Resistances, wires, etc.)

Above are the required components which are assembled together to form a water level indicator.

A Rectifier

The full wave bridge rectifier consists of four diodes. It is used to convert the AC supply into pulsating DC format. As four diodes are used, in first half of cycle, two diodes will be in forward bias and other two will be in reverse bias. The condition will be vice versa in second half of cycle.

According to the diagram shown in figure-1 which consists of four diodes, all are arranged in such a manner so that it forms a bridge. Hence, it is so called the bridge rectifier. During positive half of input cycle, the diode D2 goes to forward bias condition and the diode D4 goes in reverse bias mode. Hence, current will flow through diode D2 and output will obtain for positive half cycle of input signal. Now, during the negative half of input cycle, diode D4 goes to forward bias condition and diode D2 turns in reverse bias mode. Hence, again circuit forms a closed loop and the current will flow through diode D4, hence the output will obtain for negative half cycle of input.

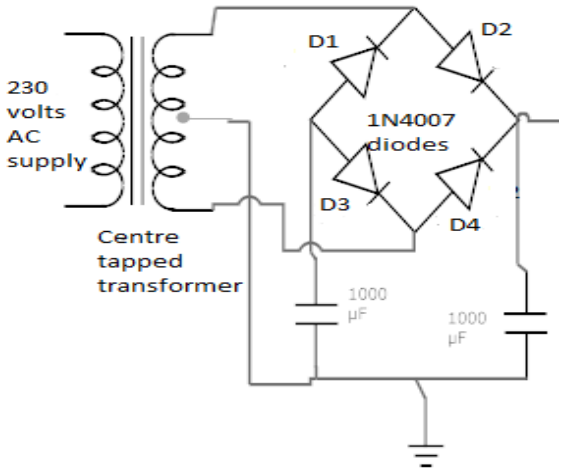

Fig.1 Full wave bridge rectifier

B Transformer –

A transformer is a electrical device which transfers the energy between two or more circuits through electromagnetic induction.

It consist of two windings, they are primary and secondary winding. The type of transformer can be judged or predicted by the number of turns made in both the windings.

As the varying voltage is applied to the input winding, it results to the flow of varying current through primary winding of the transformer. A varying current creates a varying magnetic flux in the core and a varying magnetic field impinging on the secondary winding. Magnetic flux flow through the core and an e.m.f. is induced in secondary winding. The polarity of the secondary winding is decided by using Lenz law. Hence, magnetic flux is induced because of this induced e.m.f. in secondary winding. This induced flux flows through the core and opposes to the flux flowing through primary side. This results to decrement in resultant flux. To maintain the constant flux flow, there is a need to make the increment in input source which increases the flux in primary side, so that the flux generated in secondary side get cancelled out and a constant flux flows through the entire core.

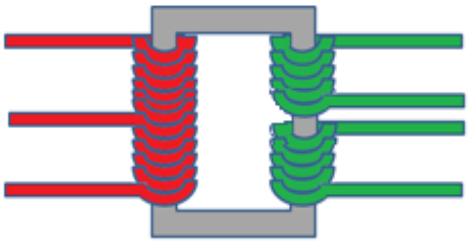

Fig. 2 Transformer

C LED

A Light emitting diode (LED) is essentially a p-n junction diode. When carriers are injected across a forward-biased junction, it emits incoherent light. Most of the commercial LEDs are realized using a highly doped n and p junction.

When suitable voltage is applied to the leads, electons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of light is determined by the energy band gap of the semiconductor.

The first visible light LED's were of low intensity, and limited to red. Modern LEDs are available across the visible, ultraviolet, and infrared wavelengths, with very high brightness.

Early LEDs were often used as indicator lamps for electronic devices, replacing small incandescent bulbs. They were soon packaged into numeric readouts in the form of seven segment displays, and were commonly seen in digital clocks.

LEDs are usually built on an n-type substrate with an electrode attached to the p-type layer deposited on its surface. P-type substrates, while less common, occur as well. Many commercial LEDs, especially GaN/InGaN, also use sapphire substrate.

Most materials used for LED production have very high refractive indices. This means that much light will be reflected back into the material at the material/air surfaces interface. Thus, light extraction in LEDs is an important aspect of LED production, subject to much research and development.

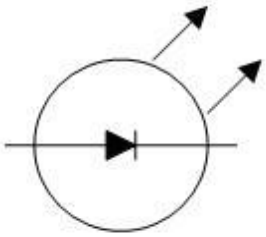

Fig. 3 LED

D PCB plate

A printed circuit board (PCB) mechanically support and electrically connects electronics components using conductive tracks, pads and other features etched from copper sheets laminated onto a non-conductive substrate. PCB's can be single sided or multi-layer. Conductors on different layers are connected with plated through holes called vias. Advanced PCBs may contain capacitors, resistors or active devices embedded in the substrate.

Following are the steps of PCB fabrication are:-

1. Print inner layers
2. Etch inner layers
3. Make the layout
4. Drilling the PCB
5. Image and etch the outer layers
6. Plating

7. Placing the components and soldering
8. Electrical test
9. Final inspection

E Resistance

Resistance is the property of the material which opposes the flow of electric current. It shows the relationship between the voltage and the current. The unit of resistance is represented by the symbol of one of the Greek word "Omega".

The resistance (R) of the material is defined as the ratio of voltage (V) across it to the current (I) through it.

$$R = V/I$$

A piece of conducting material of a particular resistance meant for use in a circuit is called a resistor.

Resistors contain number of color bands in its outer cover by which the value of the resistance can be measure or calculate. The resistance of the material depends on the two factors:

What material it is made of and its shape.

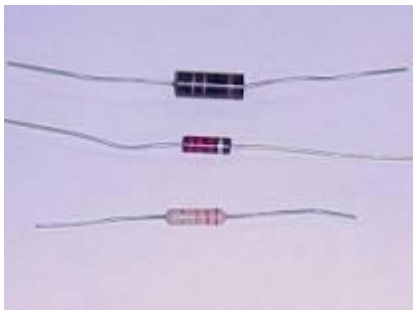

Fig. 4 Resistors

III. WORKING

This is a simple working of a water level indicator using IC4049. The IC4049 has 6 NOT gate inside it, these gates are simple invertor. The pin no. of IC 2,4,6,10,12 & 15 is connected with LED'S which gives us visual information. Pin no. 1 is used as supply pin and the other pins are used for various connector which is connected with the negative 100k resistance,(say as input low state) with which the output is in high state. But as the level of the water increases, the IC's first input pin information is high and the output goes at low level and the LED which is connected with that glow which shows the level of water and the process continuous.

All the connections between the components are shown in figure-5. It consists of IC4049, resistors, connecting wires, buzzer and LEDs. IC is interfaced with resistors and LEDs. LED will glow on or off as per the instruction given by IC to LED. If logic "1" is provided to LED, then it will glow. For logic "0", the LED will go to deactivate state and cannot glow.

One terminal of resistance is connected to IC and its other terminal is connected to the connecting wire which has to be dipped in a tank to measure the level of the water. As the connecting wire come in contact with the water, the value of resistance changes and this change in resistance informs to IC and hence IC change the state of LED according to the information received through the resistance. Hence, it results to glow the LED if water come in contact with connecting wire, otherwise LED will remain off.

One buzzer is also connected with the lastly placed LED. As the tank gets fully filled with water, IC sends signal to LED, so that LED glows, and as this LED is connected with buzzer also, hence buzzer also goes to its active state and blows.

IV. CIRCUIT DIAGRAM

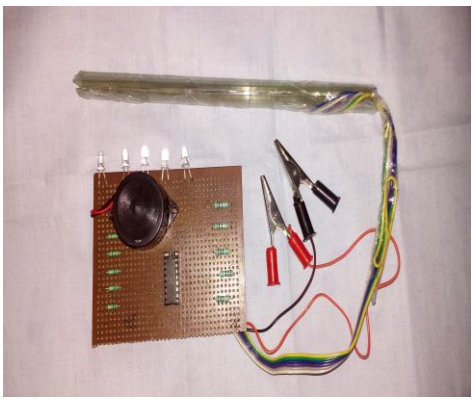

Fig. 6 Water Level Indicator

V. RESULT AND CONCLUSION

Hence, by use of this device, the level of water can be measured or determined with the help of simple technology i.e. by glowing of different LED at different level of water and also, a buzzer can activated at the peak level.

It can be adopted by rural people as it requires less maintenance and also the manufacturing cost is very low.

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