Wireless Power Theft Monitoring System Using Zigbee

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ABSTRACT:- The demand of electricity is much more than the electricity being generated. In many countries either developed or developing, its economic growth is hampered by mismanagement of electricity generation, transmission and distribution. With the electric industry go through change, expanded attention is being focused on power supply reliability. Power producers and users alike are worried about reliable power, whether the focus is on interruptions and disturbances or extended outages. Monitoring can provide information about power flow and demand and help to identify the cause of power system disturbances. In this system to monitor the power consumed by a model institution such a household consumers from a centrally located point. Observing the power means calculating the power consumed exactly by the user at a given time. The power consumed by the user is measured and communicated to the controlling substation whenever needed by the person at the substation. The feedback from the user helps in identifying usages between authorized and unauthorized users which helps in controlling the power theft, one of the major challenges in current scenarios. Communication between user/household and substation can be of wired and wireless.

1. INTRODUCTION

According to the survey, Indian Power System faces loss of about 30% of its total production of electricity. This loss is very high which takes place because of transmission losses, electricity theft, etc. Major portion of its losses is due to power theft. Power theft is done by taking tapping or hooking from transmission line or by from the meters. As per the aim of the project main problem is that no indication is being provided at substation in regional distribution of the power line. If this power line gets off no any massages are given by any devices that particular power has been get off particular regional distribution in order to overcome this problem a project is introduced with an RF massaging system which has an ID of 98.5 MHz received by the substation when the line gets off and the transmitter is operated battery backup fact. This battery is been charge by power line when the power line is live system. this project is beneficial for identification of the live power line and off power line and where fault has been occurred can be identified by the substation now at the present time the fault is occurred at anywhere and this will identify while taking the whole line through the employee of the electrical department or by informing the common public through telephonic massage or by personal configuration.

2. PROBLEM IDENTIFICATION

According to the Indian atmosphere, it is a great problem to blame any personality against the theft of power line from the power distribution system. this can only by overcome by an experienced method that the total load of distributed may be fixed and if any person may create any theft against this load the power may get off of the whole position which is been distributed so that the whole person living in that locality it is to be located they may refuse for power theft otherwise the employee cant able to blame any person against power theft. This system has been experienced in khurshipaar area placed in Chhattisgarh India where plenty of power theft is being occurred by the personality living in that locality this has been controlled through our control system and it has a better result on controlling and monitoring the theft against the personality in that area, then by Zigbee based RF transferring of signal to the substation and at the substation it is being received and monitored that the tripping function has been performed.

3. METHODOLOGY MODEL

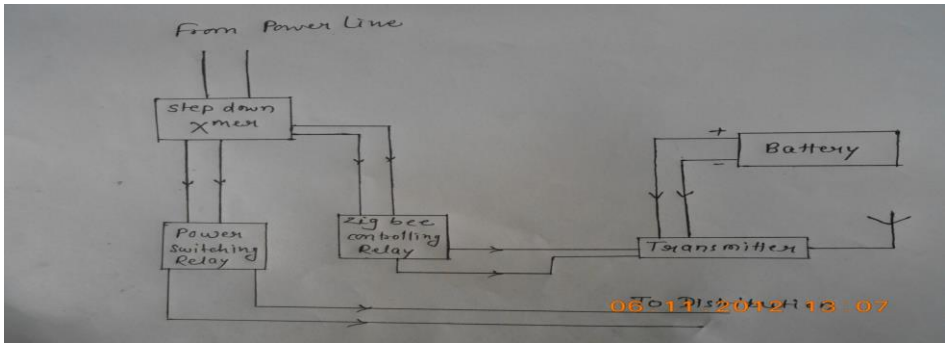


Fig.1 Distribution area

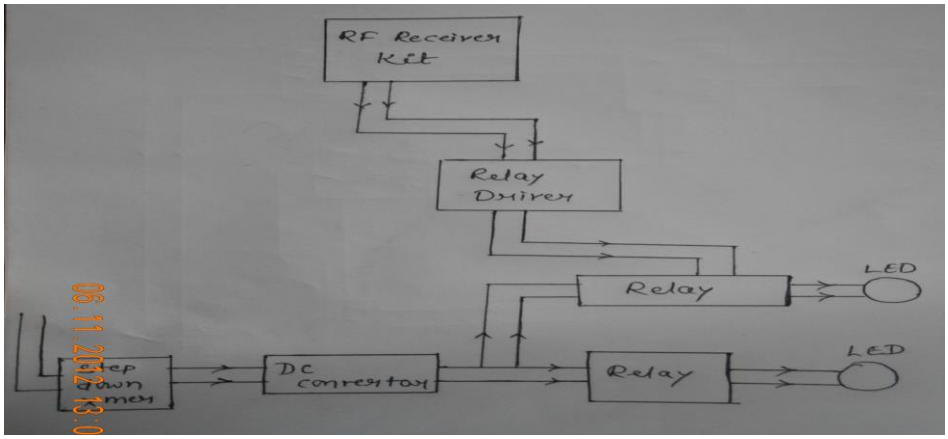
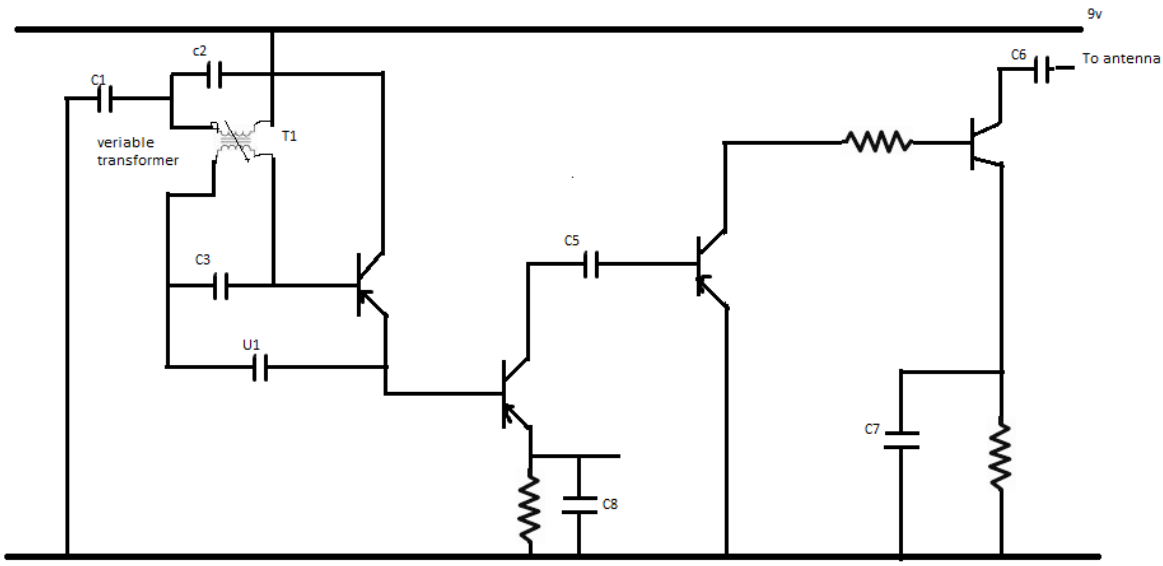


Fig.2* Substation *area

According to block diagram the whole process is been describe in short block initially. The power sensing is done by power step down transformer, which convert 220v ac to 12v and a converter is added to convert the ac to dc. Two relays are operated one for power distribution and other relay to control the zigbee transmitter kit when the power system gets off the zigbee get start transmitting. Due to the battery backup for zigbee transistor kit is being provided very neatly. if the load protector is being connected through this process, any person may connect any extra line the trips the relay and the relay gets off, then zigbee start working at the substation and a receiver is connected with step down transformer and it is converted ac to dc convertor, then it is been feeded to 2 relays which operate and indicate the line of from the substation or the line off in particular area. This operation is done by led conversion. Red light for off indication and green light for on indication.

4. CIRCUIT DIGRAM

TRANSMITTOR CIRCUIT



CIRCUIT DISCRIPTION

Transmitter circuits mainly consist of a tank oscillator which is formed by wien bridge oscillator. When wien bridge oscillator which consist of a variable inductor, a fixed inductor and 2 capacitors along with a transistor then it form tank oscillator. It perform many functions one of them is that it is used to generate carrier wave.

In a tank oscillator a ceramic capacitor U1 is used for variation of operating frequency. Capacitor C1 and C2, which are in order of .22 Pf and .1 microfarad respectively. These capacitors are used for oscillation. A transistor is basically a current

amplifier. Say we let 1mA flow into the base. We may get 100mA flowing into the collector. The currents flowing into the base and collector exit through the emitter (sum off all currents entering or leaving a node must equal zero).

The gain of the transistor will be listed in the datasheet as either βDC or Hfe. The gain won't be identical even in transistors with the same part number. The gain also varies with the collector current and temperature. Because of this we will add a safety margin to all our base current calculations

(I.e. if we think we need 2mA to turn on the switch we'll use 4mA just to make sure). In this transmitter circuit we are using frequency driver transistor to drive the frequency in the circuit.

In the circuit of transmitter, for the amplification of frequency feedback amplifiers are being used. Feedback plays an important role in almost all electronic circuits. It is almost invariably used in the amplifier to improve its performance and to make it more ideal.

WORKING

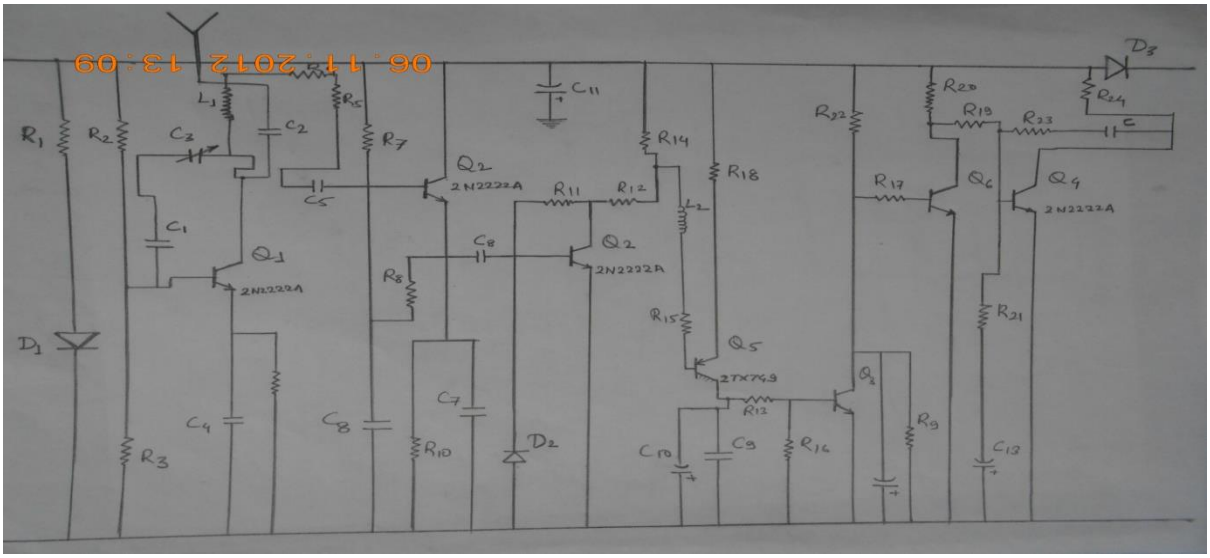
In the transmitter circuit, the tank oscillator consist of variable inductor, variable capacitor. Variable, Variable inductors are being used for adjusting the bandwidth and variable capacitor for adjusting the frequency.

In the transmitter circuit firstly by the tank oscillator, oscillation is produced using two capacitors that is C1 and C2.This oscillation becomes carrier frequency .A frequency at which voltage is being produced. This is completely based on carrier wave frequency. Carrier frequency is result of make and break means charging and discharging of these two capacitors.

This carrier frequency is in range of 69.0 MHz. A ceramic capacitor which produce operating frequency in the range of30.5 MHz .Theses two frequencies carrier frequency and operating frequency are being added together at the base of the transistor Q1 that makes a total of 99.5 MHz frequency.

After the generation of this frequency, we need to amplify this frequency. This is done by the use of feedback amplifier. After the amplification of frequency, it is passes through the resistor for smoothen purpose. Then finally this frequency is transmitted to the antenna. To transmit the frequency in the form of current or voltage we need to use transmit.

RECEIVER CIRCUIT



5. CIRCUIT DIAGRAM

In the receiver circuit, a tank oscillator is added with an antenna to receive the transmitted frequency by the transmitter. This transmitter and receiver is a synchronize type of a FM modulator. With the help of the antenna and the tank oscillator, a tank oscillator consist of a variable inductor for adjusting the bandwidth and variable capacitor for adjusting the frequency.

The received signals consist of so many distortions. To filtrate, a high pass filter and low pass filter are used. A high pass filter allow to passing only high frequencies and low pass filter allow to passing only low pass frequencies and blocking

high pass frequencies. After filtration, amplification is required. Amplification is necessary because we cannot operate any operation in this signal.

Two times negatively amplification is done with the help of Q1 and Q2 transistor which has a feedback effect of a 2K resistor and .002Pf capacitor. But it is not sufficient to convert because both transistors are same because of that its characteristic are same. Phase shift oscillator are being used for more amplification with positively. Now two times amplification is being done to convert it into voltage form that is approximately 6V. But because of low ampere rating, relay will not operate. So a relay driver is used to operate the relay and buzzer get respond.

WORKING

In the receiver, the receiving capacity of receiver is max 100 Hz and is adjusted and synchronizes with that of transmitter. The receiver has a tank oscillator which receive frequency from the transmitter. The tank oscillator is used to synchronize the transmitted frequency with that of oscillator.

In the tank oscillator of receiver a Pf capacitor of 20 Pf receives the signal through variable inductor and variable capacitor 0.1 Pf capacitor works as a high pass filter and 0.1 microfarad capacitor works as a low pass filter. This is drive through oscillation between transistor through an RF transistor 2 & 222A. A feedback effect is given at the time with the help of R6 & C4 in order to get maximum output through the collector.

This is then amplified negatively two times with the help of same RF driving transistor i.e. Q1 Q2. In Q2 the feedback effect is provided to emit max. emission through emitter. A zener diode is added between two biasing to prevent the over voltage and over current. Finally, the limit of the transistor exceeds for further amplification, so a phase changing amplifier is added to amplify the signal positively. Finally, two times positively amplification is done by the same no. of transistor and it is converted to voltage through a voltage driving transistor. At last from the calculation, 6V voltage is produced. This 6V is finally added to the LED indication and To the buzzer. So the lamp will glow and buzzer will respond.

6. WORKING:

The total project is based on zigbee transmission that is RFID based AM modulation method is known as zigbee transmission. RFID means using of a particular frequency which is being synchronise with that of receiver kit and doesn't has to match the frequency time to time. This system is connected in particular transmitter area for indicating the power off in the particular area that is performed by the battery backup provided through the zigbee. Two functions can be provided by this system. This system can be identifying the supply travels from the substation and travels to the particular area. Both the system works with the help of two relay operation which is being control by a step down power supply system and connected to the power line for distribution. The working of whole project is to identify the power off due to theft or due to any fault occurred in the distribution side can be monitor at once without informing by any personality to the employees of substation.

In this project two relay are present which are works simultaneously one relay work for transmitting and another one for receiving. In relay we have NO and NC because if we use relay always in on condition then relay may be get damaged. When line is on relay will be off and whenever our line get off because of any fault or any other reason than relay become on and transmitter also goes in on condition. Here in this project overload transformer is use which has to sense the over load and change into direct current. This direct current goes to comparator. In comparator we fixed a particular value of load. If load is more than the fix load at distribution side then relay will get on and output supply goes off so transmitter too turn off and buzzer will on.

In this system four led are here in which two led are red and another two are green. 1 pair of green and red are connected at the substation and another 1 pair is connected at distribution side. If power line will get off from substation side then both red light will glow else if power line will get off from distribution side then red light of distribution side and green light at substation side will glow.

7. RESULT:

Ultimately we are getting the fault signal at power line directly at substation. This system is indicating the power off in the particular area that is performed by the battery backup provided through the zigbee. Two functions can be provided by this system. This system can identify the supply travels from the substation and travels to the particular area. Both the system works with the help of two relay operation which is being control by a step down power supply system. The project is identify the power off due to theft or due to any fault occurred in the distribution side can be monitor at once without informing by any personality to the employees of substation.

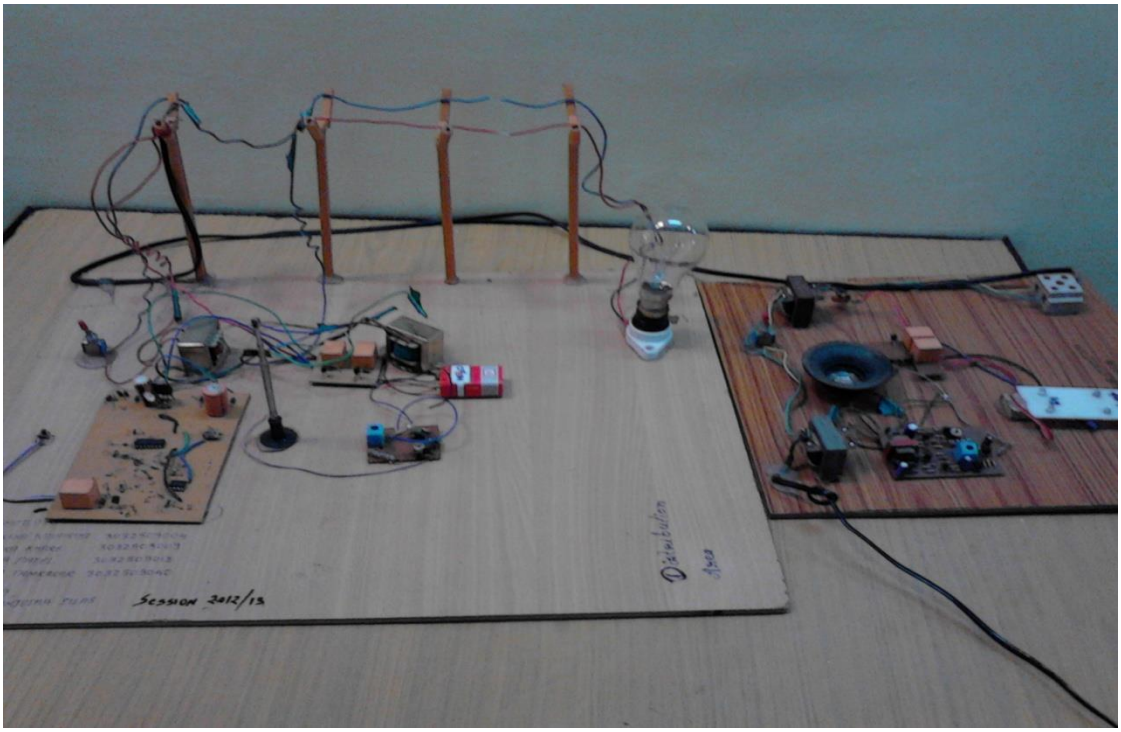


Fig. 3 Model of Project

8. CONCLUSION:

This project concludes that after using this system one can simply monitor the load consumption by every consumer. And one can also control the power theft by this project.

Scope for further work:

In future if one tripping circuit can be connected in this system then if load exceeds than fixed load so the tripping circuit will get trip and power will get off of that particular area.

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