Power Theft Detection on Distribution Line and Meter Tampering

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Abstract: Now-a-days the energy consumption and energy distribution has become a major concern for discussion because of huge energy pilferage. Hence the need has come to think in this line and a solution has to be emerged out. The system prevents the illegal usage of electricity and also system is used to detect an unauthorized tapping on distribution lines and on meter tampering. Existing system is not able to identify the exact location of tapping. The major purpose of the system is to provides simple way to detect an electrical power theft without any human interface. This design incorporates effective solutions for problems faced by India's electricity distribution system such as power theft, and transmission line fault.

Keywords: PowerTheft, Location, MeterTampering.

I. INTRODUCTION

OBJECTIVE:

Power Theft is that crime which cannot ignorable crime that is highly prevented, and at the same time it directly affected the economy of a nation. Electricity theft is a social evil, so it has to be completely eliminated. As technological development is on raising slope so the problem of illegal usage of electricity can be solved electronically without any human control .The implementation of that system will save large amount of electricity, and there by electricity will be available for more number of consumer then earlier by using Microcontroller (8051).

DESCRIPTION:

Science and technology with all its miraculous advancements has fascinated human life to a great extent that imagining a world without these innovations is hardly possible. While technology is on the raising slope, we should also note the increasing immoral activities. With a technical point of view power theft cannot ignore and at the same time it directly affects the economy of a nation. This project is designed to find out such power theft in the normal distribution lines. Even though there are certain practical problems in implementing this kind of systems in Future there is a scope for development of these types of systems. This project is using the principle of the differential protection scheme for the identification of the power theft.

The differential protection scheme consists of two CT'S connected at both the terminals of the load. If there is no fault in the load then the secondary currents of both the CT's will be same. Using the same principle one ct is connected at the starting end of the distributor and the remaining other CT's are connected to the different loads which are legal. If there is no power theft in the line then the vector sum of all the ct's which are connected to the load will be equal to the current in the main ct. if there is a difference then we can make out that it should either be the power theft or a fault in the line. There are various modes of power theft such as

1. Bogus seal and tampering of seals
2. Meter tampering, meter tilting, meter interface and meter bypassing.
3. Changing connection.
4. Direct tapping from line.
5. By using remote sensing device.

II. LITREATURE REVIEW

Isizoh A. N. [1] proposed the work to detect power theft using the concept of electro-optical sensor. The major aim of that system was to developed a system which monitors and detects incidences of power theft in ways like whether in the form of connecting load directly to the power line or bypassing the energy meter so the consumer have to pay less than they consumed or by changing connection of lines. Operation of the system is done by using AT89C52 microcontroller and GSM module.

Kalaivani.[2] dealt with abnormity in measurement value of electricity was observed that current time, initial time of stealing and its information will be sent to field man using GSM network. Electricity theft has been increased especially in developing countries, due to which power industries suffers from large financial loss. In this system whenever

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
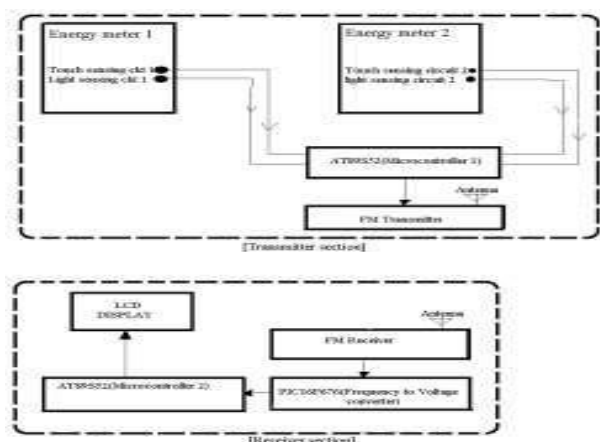**Vol 4, Issue 4, April 2017**

abnormity in measurement value of electricity is observed that current time , initial time of stealing and its information will be sent to field man using GSM network.

Mohite [3] proposed the work in which use of current transformer which will act as input to Microcontroller. Microcontroller will compare the value of input and output current, as soon as negative value is observed SMS will send through GSM network. This system reduces involvement of human being. The system implements GSM technology used to transmit the meter reading to the customer and government with the required cost, which would happen when needed that means if SMS was received from authorized server mobile transmission between customer and government.

Patil [4], proposed the use of detecting unauthorized tapping done on distribution line. It describes operational losses on generation, transmission and distribution of electrical energy. Implementation of this system is carried out with the help of wireless data transmission and receiving technique. This system not only detects the tapping but will also facilitate with wireless meter reading operation.

Shikalgar [5] proposed the work with online detection of theft on distribution line. Detection is carried with the help of smart grid technology which works two way communications. This project is implemented to detect the theft at a time of under load and over load condition. First condition was to recognize that power theft or overload when actual load was more than sanctioned load distribution system

Malhotra [6] dealt with the system, which detects the theft using IR sensor when user tries to open the screw of meter. IR sensor acts as input to microcontroller which will help to send the message to government electricity board. AMR (Automatic Meter Reading) was to increase the accuracy reading and theft control system for customers and government. The AMR system consists of a current transformer to identify the reading and the calculated reading sends to the PIC Microcontroller for authentication.

In et al [7], G.L.Prashanthi, this system not only identifies theft but will also provide the calculated amount of power consumed by the user and time of theft occurrence. In thisproject ZIGBEE technology is used due to its good range by which it works on wi-fi internet and GPRS system.

III.METHODOLOGY

Consumer unit:

For demonstration purpose two replica meters are used, one is equipped with light sensing circuit and other one is equipped with touch sensitive circuit. Whenever person tries for energy theft or tries to break the seal of energy meter touch sensitive circuit will act and if touch sensitive circuit fails to detect any disturbing condition then light sensing circuit will act at that moment. Once person tries to open the meter light will fall on LDR which is already arranged inside the meter, which detects the theft. Detection of theft is performed by using versatile IC ST-RX02-ASK.

Transmitter section:

Two dummy energy meters are used for the demonstration of the project. Energy theft is done by using several methods such as meter tempering, bypass the energy meter and direct connection to the distribution line. Energy meter tempering technique is used in this project and prevention technique for this mention in this project.
This dummy energy meters are equipped with touch sensor and light sensor circuits. Whenever persons tries to touch the meter, touch sensor will sense the disturbance and will transmits the signal to receiver end. Now if the touch sensing circuit fails to detect the theft, so to prevent that LDR circuit is used.

Figure 1 Block Diagram of Meter Tempering

Figure 2 Block Diagram of Distribution Unit

Receiver section:

This receiver section is hypothetically behaves as the control room of Energy supplier company. Theft signal is detected by the RF433 receiver module and the communication signal is frequency signal, so for the digital operation we need to convert that frequency signal into digital signal. So to convert the frequency signal into digital signal PIC microcontroller is used and generates the digital signal and give it to the 89S52 Microcontroller. 89S52 microcontroller will identify the signal received from the PIC microcontroller and display it to the LCD.

Distribution unit:

The practical structure of the lines is not convenient for the presentation of this project, we use three bulb loads for the presentation purpose. Two bulbs will be the legal load or the actual load and the other bulb will be the power theft load. If the power theft load is switched on then the difference in the ct secondary current will occur showing the power theft this had happened. This method is suitable and convenient for the presentation.

The differential protection scheme is used to identify the theft on distribution line. Current of main bus is measured by CT (current transformer) and other two CT's measures the current of loads connected to the bus.
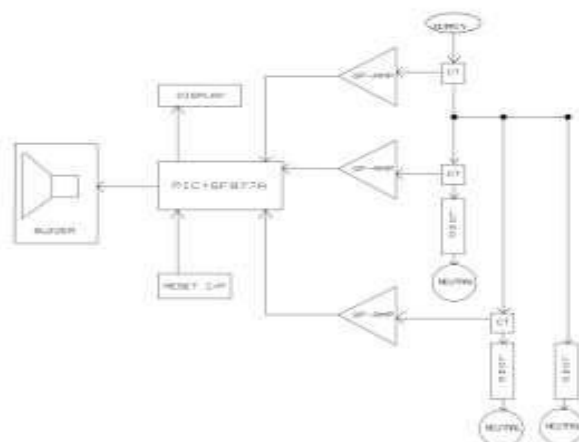
Advantages

• The proposed system provides the solution for some of the main problems faced by the existing Indian grid system, such as wastage of energy, power theft and transmission line fault.

• This method will reduce the energy wastage and save a lot of energy for future use.
• Optimized use of energy and Real time theft monitoring

Limitation

• Since the techniques employed in this module are based on simple electronics, the chances of making the system inoperative are more. But, if a Microcontroller chip is used for feeding the modulating input, we can make the system more efficient.
• One major disadvantage of this project is that it is not capable of detecting the exact location from where the power is being stolen.

Applications

• The system can be incorporated for almost all types of users. The concept is well suited especially for villages and interior areas.Can be used in distribution feeders, industries and complexes where the power theft load will be there.

Results :

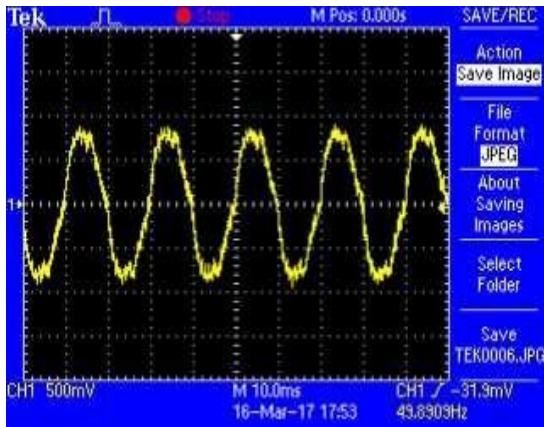(1)   Testing Of Touch Sensor Input

Figure 3: Touch Sensor Input When There Is No Input

This figure shows the waveform of touch sensor when touch is not applied. It has the 50 hz of frequency which the noise disturbance of the transmission lines.

In power system, the transmission lines are passing with communication line they can introduce a noise in the communication lines, so in this model transmission lines are connected with the energy meters so that they can introduce the noise in the system. So this available waveform which is shown in the above figure is due to the transmission line noise and its frequency is 50 Hz.
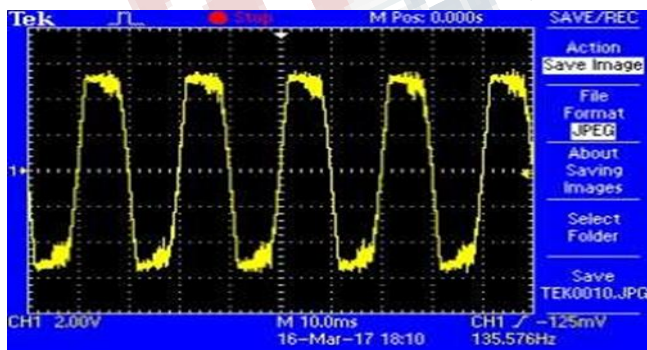
(2)

Figure 6.5: Touch Sensor Output When Touch Is Applied

This figure shows waveform of touch sensor when person touches the conducting material of energy meter. This waveform has some frequency which is due to human body noise environmental noise and transmission noise.

When the person touch the meter the BJT which is connected directly to the outer peripheral of energy meter, will get into the saturation mode and amplifies the touch input to several level and give to microcontroller.

(3)Ldr Charactristics
In this project LDR is connected with op-amp circuit. Op-amp is working as comparator and this whole unit works on the voltage division principle.

	Sunlight	Daylight	Dark
Resistance(Ω)	10-100	$100-10^6$	10^7

A variable resister and the LDR are connected to the op-amp circuit. We have adjusted the value of variable resister such that the voltage difference across the resister is 2.5V-3V. Now the variation in the resistance of LDR is changing the voltage level which is measured and given to the comparator (op- amp). So the threshold voltage of 3V is obtained by the variation of the variable resister.

Software Tools

A.Embedded C Programming Language
This course introduces the C programming language and specifically addresses the issue of embedded programming. It is assumed that you have worked with some other high levellanguage before, such as Python, BASIC, FORTRAN or Pascal. Due to the complexities of embedded systems, we begin with a typical desktop system and examine the structure of the language along with basic examples. All C programs must have at least one function: main ( )

•   Foundation of the C program.
•   Starting point for a program.
•   Lowest level task.
•   Typically
•   Contains a few initialization instructions.
•   Calls to other functions.

B.Keil Compiler

Keil compiler is software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.

C.Proload

Proload is software which accepts only hex files. Once the machine code is converted into hex code, that hex code has to be dumped into the microcontroller and this is done by the Proload. Proload is a simple programmer which itself contains a microcontroller in it other than the one which is to be programmed. This microcontroller has a program in it written in such a way that it accepts the hex file from the Keil compiler and dumps this hex file into the microcontroller which is to be programeed.

VI. CONCLUSION

It is found that overloading of the system, due to different reasons such as power theft, unbalance condition. Most of them are caused because of low maintenance as many localities are situated at remote areas so this system will help to prevent transformers from being damaged or overload condition. This will help to prevent the problem of electricity theft and transformer damage, as the failure rate is very high in INDIA, around 25% per annum, which is not favorably comparable to international norms of 1-2%.

ACKNOWLEDGMENT

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