

PREPAID ENERGY METER WITH AUTO POWER THEFT DETECTION

Akash Kharat¹, Chetan Bachhav², Sugat Sonawane³, Prof. S.S Shingare⁴

¹ Akash B. Kharat, Electrical Engineering, AISSM'S IOIT, Maharashtra, India

² Chetan P. Bachhav, Electrical Engineering, AISSM'S IOIT, Maharashtra, India

³ Sugat M. Sonawane, Electrical Engineering, AISSM'S IOIT, Maharashtra, India

⁴ Prof S.S. Shingare, Electrical Engineering, AISSM'S IOIT, Maharashtra, India

ABSTRACT

The theft of the electricity is the major concern of the transmission and distribution losses in the supply of the electricity worldwide. Mainly the electricity is being stolen via bypassing the poles therefore this system is utilized to overcome this type of the theft of the electricity and is very beneficial for the authorized agency to control its revenue loss as all of us know that the cost of fuel is increasing day by day hence the intensity of stealing the electricity and using it as a substitute is also increasing therefore it is needed much to design a system that can detect the theft of the electricity. It is a known fact that every investment made by either individuals or government should yield a positive profit returns in order to continue with different projects in other sectors of the economy. But it has always been a difficult task for the government of the day and the Electricity Company to achieve their aim due to power theft activities. A recent research conducted indicates that about 30-35 percent of the profit generated by the electrical board goes waste due to power theft. Previous attempt to monitor the activities has not yielded positive results due to the corrupt practices of some of these personnel. This project aims at eliminating all these difficulties by designing a simple device to send a message whenever there is a power theft activity at a certain cluster of an area.

Keyword : - Electrical Power Theft , Wireless data transmission and receiving.

1. INTRODUCTION

Power theft is the biggest problem in recent days which causes lot of loss to electricity boards. In countries like India, these situations are more often, if we can prevent these thefts we can save lot of power. Now in India, there is not any technique to detect the specific location of the fault immediately. Power theft is another major problem faced by Indian electrical system. The aim of this project is to detect the power theft and prepaid energy meter using RFID. Power theft has become a great challenge to the electricity board. The dailies report says that Electricity Board suffers a total loss of 8 % in revenue due to power theft every year, which has to be controlled. . Microcontroller is giving control signals to tripping various equipment provides controlling feature. Output can then be displayed in the LCD (Liquid Crystal Display). The difference with other existing system is that even transmission line theft can also be detected apart from the meter bypassing .The additional feature of this system is that there is no need of manual interface as the entire system is fully automated and also meter reading also accurately calculated in this system, which overcomes the traditional manual meter reading. Now a days the traditional manual meter reading was not suitable for longer duration operating purposes as it spends much human and material resource. It brings additional problems in calculation of readings and billing manually. The human error can open an opportunity for corruption done by the human meter reader. So the problem which arises in the billing system can become inaccurate and inefficient.

2. OBJECTIVES

- This system would provide a simple way to detect an electrical power theft without any human interface.
- It will indicate exact zone and distribution line on which unauthorized tapping is done in real time.
- It will determine transmission line faults.
- To maximize revenue generation by the power utility companies.
- Its cost is less as compare to other present system.

3. LITERATURE SURVEY

In the paper [3], they said that wireless electricity theft detection system using ZigBee technology present an efficient and less costly way to adulterate the wireless technique used in this research paper. This wireless system is used to overcome the theft of electricity via bypassing the energy meter and hence it also controls the revenue losses and utility of the electricity authorized agency.

In the paper [4], they provide insight into the illegal use or abstraction of electricity in the Netherlands. The importance and the economic aspects of theft detection are presented and the current practices and experiences are discussed. The paper also proposes a novel methodology for automated detection of illegal utilization of electricity in the future distribution networks equipped with smart metering infrastructure. The necessary data requirements for smart meters and distribution substations are defined, in order to unlock this feature in distribution network.

In the paper, [7] they described that Electrical power theft detection system is used to detect an unauthorized tapping on distribution lines. Implementation area of this system is a distribution network of electrical power supply system. Existing systems are notable to identify the exact location of tapping. This system actually finds out on which electrical line there is a tapping. This is a real time system. Wireless data transmission and receiving technique is used. This will protect distribution network from power theft done by tapping. In the recent past, several techniques were proposed for detecting the location of direct tapping on a feeder and identifying illegal consumers. On a parallel track, some non-technical measures, such as inspection of customers with suspicious load profiles and campaigning against illegal consumption, were also implemented to control electricity theft. Some of the techniques (proposed worldwide) are described in this section.

4. BLOCK DIAGRAM

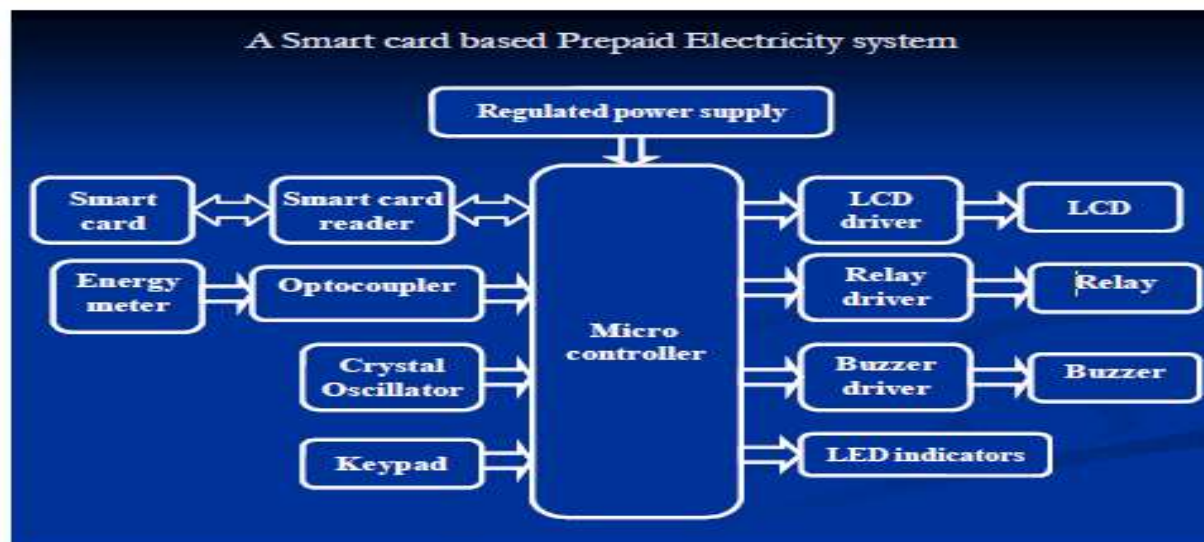


Fig.1:Block diagram

In our system, a micro controller is interfaced with an EM reader circuit, buzzer circuit, LCD(16x2) & load through relay. In normal condition, micro controller reads energy pulses & current signals. If current is drawing & energy pulses are normal, then no power theft is being done & buzzer is off. If balanced is finished and load is operating, then it indicates power theft. Whenever power theft is detected, then micro controller will send this meter

information to buzzer circuit through buzzer driver. And this controller also disconnects power to the loads to avoid power theft.

This project uses regulated 5V, 750mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/18V step down transformer.

RFID reader reads EM4100 family transponder tags that are brought in proximity to the reader and output the unique tag identification number through RS232 serial port @9600 bps. The reader output 12 byte including one start, stop byte and 10 unique data byte. The start byte and stop byte are used to easily identify that a correct string has been received from the reader (they correspond to a line feed and carriage return characters, respectively).

4.1 ENERGY METER:

Energy meters, the only direct revenue interface between utilities and the consumers, have undergone several advancements in the last decade. The conventional electro-mechanical meters are being replaced with electronic meters to improve accuracy in meter reading. Asian countries are currently looking to introduce prepaid electricity meters across their distribution network, buoyed up by the success of this novel methodology in South Africa. The existing inherent problems with the post-paid system and privatization of state held power distribution companies are the major driving factors for this market in Asia. When the card is inserted, the energy meter reads it, connects the supply to the consumer loads, and debits the value. The meters are equipped with light emitting diodes (LED) to inform consumers when 75 percent of the credit energy has been consumed. The consumer then recharges the prepaid card from a sales terminal or distribution point, and during this process any changes in the tariff can also be loaded in the smart card.

4.2 GSM MODEM:

This GSM modem is a highly flexible plug and play quad band GSM modem for direct and easy integration to RS232. Supports features like Voice, Data/Fax, SMS, GPRS and integrated TCP/IP stack.

4.3 LIQUID CRYSTAL DISPLAY:

LCD stands for Liquid Crystal Display. LCD is finding wide spread use replacing LEDs (seven segment LEDs or other multi segment LEDs) because of the following reasons:

1. The declining prices of LCDs.
2. The ability to display numbers, characters and graphics. This is in contrast to LEDs, which are limited to numbers and a few characters.
3. Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU to keep displaying the data.
4. Ease of programming for characters and graphics.

These components are “specialized” for being used with the microcontrollers, which means that they cannot be activated by standard IC circuits. They are used for writing different messages on a miniature LCD.



A model described here is for its low price and great possibilities most frequently used in practice. It is based on the HD44780 microcontroller (*Hitachi*) and can display messages in two lines with 16 characters each. It displays all the alphabets, Greek letters, punctuation marks, mathematical symbols etc. In addition, it is possible to display symbols that user makes up on its own. Automatic shifting message on display (shift left and right), appearance of the pointer, backlight etc. are considered as useful characteristics.

4.4 EM READER:

RFID reader reads EM4100 family transponder tags that are brought in proximity to the reader and output the unique tag identification number through RS232 serial port @9600 bps. The reader output 12 byte including one start, stop byte and 10 unique data byte. The start byte and stop byte are used to easily identify that a correct string has been received from the reader (they correspond to a line feed and carriage return characters, respectively)

4.5 RELAY

It is on/off switch which uses 12V supply. A relay is an electrically operated switch. A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core, an iron yoke which provides a low reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts.

4. CONCLUSIONS

This research paper demonstrates the concept and implementation of automatic trip control system for energy management using embedded controller and GSM. It mainly focused on industrial purpose. The similar idea can be implemented for domestic areas for avoiding the illegal usage of electricity. This paper is aimed at reducing the heavy power and revenue losses that occur due to power theft by the customers. By this design it can be concluded that power theft can be effectively curbed by detecting where the power theft occurs and informing the authorities. Also an automatic circuit breaker may be integrated to the unit so as to remotely cut off the power supply to the house or consumer who tries to indulge in power theft. The ability of the proposed system to inform or send data digitally to a remote station using wireless radio link adds a large amount of possibilities to the way the power supply is controlled by the electricity board. The system design mainly concentrates on single phase electric distribution system, especially. 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. It facilitates for vigilance squad to control theft quickly and easily. With its usage, the crime of stealing power may be brought to an end and thereby a new bloom may be expected. This proposed work will help us in conserving energy so that our nation will be improved. This research work can make a great change in assessment of electricity bill and can give the benefits to the government by reducing the man power and time consumption. Experimental results show that the designed system is fast enough to reduce theft of electricity and to reduce the bill collection overload. The monopolistic power distribution market in asia is gradually transforming into a competitive marketplace. Differentiation in service is going to be the key competitive factor to the improve market share in the deregulated power markets prepaid meters with their advantages over conventional ones are likely to help power distributors to differentiate and offer value –added services to consumers. Encourage consumers to opt for prepaid meters on a voluntary basis and offering tariff or non-tariff incentives to those consumers who prepaid their power changes would help the utilities to implement this system

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BIOGRAPHIES

Author Photo-1	Akash Kharat is a student of BE Electrical, ALL INDIA SHRI SHIVAJI MEMORIAL SOCIETY'S INSTITUTE OF INFORMATION TECHNOLOGY, PUNE,01.working on power theft detection by using prepaid energy meter.
Author Photo-2	Chetan Bachhav is a student of BE Electrical, ALL INDIA SHRI SHIVAJI MEMORIAL SOCIETY'S INSTITUTE OF INFORMATION TECHNOLOGY, PUNE,01.working on power theft detection by using prepaid energy meter.
Author Photo-3	Sugat Sonawane is a student of BE Electrical, ALL INDIA SHRI SHIVAJI MEMORIAL SOCIETY'S INSTITUTE OF INFORMATION TECHNOLOGY, PUNE,01.working on power theft detection by using prepaid energy meter.
Author Photo-4	Prof. S.S.Shingare, ALL INDIA SHRI SHIVAJI MEMORIAL SOCIETY'S INSTITUTE OF INFORMATION TECHNOLOGY, PUNE 01