

## Electrical Power Line Theft Detection

Mr.M.V.N.R.P.kumar<sup>1</sup>, Mr.Ashutosh kumar<sup>2</sup>, Mr. A.V. Athalekar<sup>3</sup>, Mr. P.G. Desai<sup>4</sup>, Mr. M.P. Nanaware<sup>5</sup>,  
*Department of Electronics and Telecommunication*  
*Late Narayandas Bhavandas Chhabada Institute of Engineering and Technology, Raigaon, Satara.*  
*Email:- mvnrpk@yahoo.com<sup>1</sup>, ashutosh.kumar635@gmail.com<sup>2</sup>, aathalekar@gmail.com<sup>3</sup>, pareshd555@gmail.com<sup>4</sup>,  
nanaware2mahadev@gmail.com<sup>5</sup>*

**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 utilizes 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.

**Index terms:** -Electrical Power Theft, GSM Technology, Wired Techniques.

### 1. INTRODUCTION

Generation, transmission and distribution of electrical energy involve many operational losses. Whereas, losses implicated in generation can be technically defined, but transmission and distribution losses cannot be precisely quantified with the sending end information. This illustrates the involvement of nontechnical parameter in transmission and distribution of electricity. Overall technical losses occur naturally and are caused because of power dissipation in transmission lines, transformers, and other power system components. Technical losses in T&D are computed with the information about total load and the total energy bill. While technology in on the raising slopes, we should also note the increasing immoral activities.

With a technical view, Power Theft is a non ignorable crime and at the same time it directly affected the economy of a nation. Electricity theft a social evil, so it has to be completely eliminated. Power consumption and losses have to be closely monitored so that the generated power is utilized in a most efficient manner. The system prevents the illegal usage of electricity. At this point of technological development the problem of illegal usage of electricity can be solved electronically without any human control. The implementation of this system will save large amount of electricity, and there by electricity will be available for more number

of consumer then earlier, in highly populated country such as INDIA.

There are two types of techniques to deliver the information to the authorized agency to control the theft of the electricity.

#### Wired techniques

- Electrical cables
- Coaxial cable
- Optical fiber

#### Wireless techniques

- Zigbee technology
- GSM technique
- WI-FI
- Infra Red
- Wi-max
- Bluetooth

Here this system utilizes the technique named GSM because all the problems associated with the wired techniques. There are a lot of problems related with the wired techniques such as installation problem, complexity and cost also matters in the case of long haul. The main problem associated is about the rural areas where it's really very much difficult to install the wired system to convey the information. The GSM module provides an efficient way to convey this information to the authorized official. The other wireless techniques such as Bluetooth, infrared etc are having the limitations of range and also of the efficiency.

### 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. PROPOSED SYSTEM

Consider a distribution system shown in conceptual diagram. Three wires 1 phase supply, 1 neutral & 1 street light are connected between the two poles. They are two C.T are placed on the phase wire for measuring incoming & outgoing current. By processing these two incoming & outgoing current we can detect the unauthorized tapping.

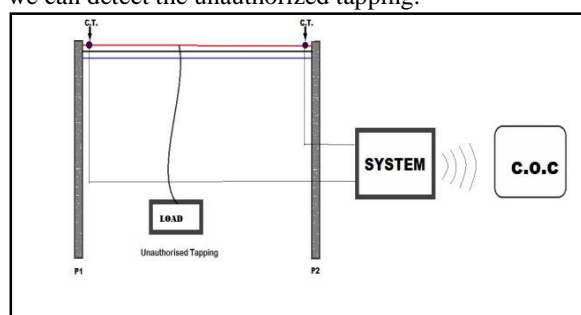


Fig 1: Conceptual Diagram

Those current ratings are detected by the system and that system microcontroller based contacted by the GSM technology that is send the SMS through the center observer system so they will easily find the exact location power theft.

### 4. 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 system is 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.

### 5. BLOCK DIAGRAM

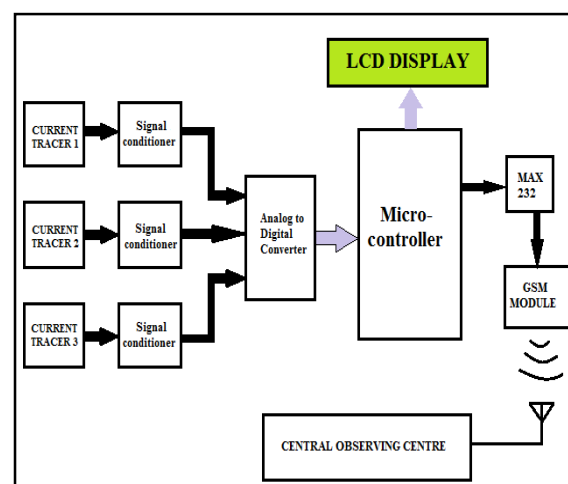


Fig 2: Main Block Diagram

### 6. GSM MODULE

The GSM module is used to send a sms when electricity theft or any line problem is generated in a transmission line. The microcontroller detects any power theft or fault in transmission line and give the command to GSM module to send a respective message. The GSM Modem consumes a lot of current during transmission, make sure your power supply can handle large currents without giving substantial voltage drops at the output. If the GSM Modem is unable to connect to the network, try coming to a place with clear.

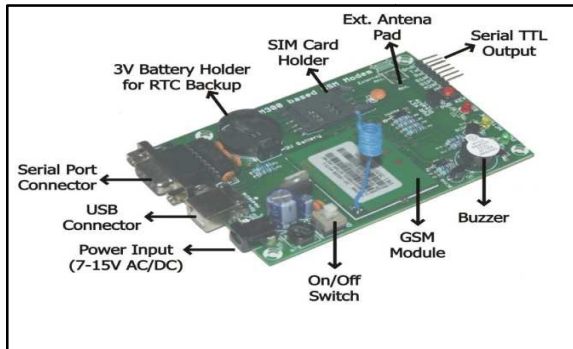


Fig3: GSM Module

### 6.1 Interfacing of GSM module

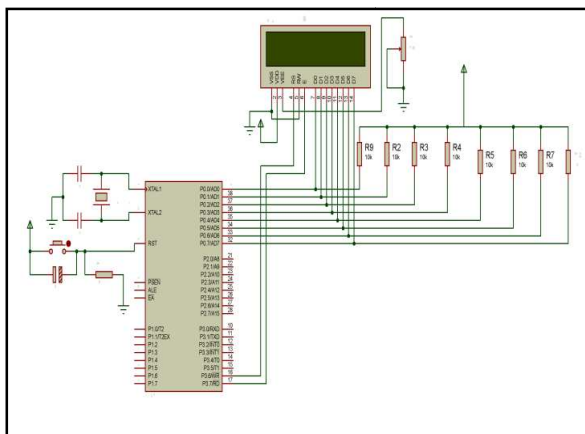


Fig 4: Interfacing of GSM module

Fig. shows how to interface the GSM with microcontroller. The GSM module is communicate the microcontroller with mobile phones through UART. To communicate over UART or USART, we just need three basic signals which are namely, RXD (receive), TXD (transmit), GND (common ground). GSM modem interfacing with microcontroller for SMS control of industrial equipments. The sending SMS through GSM modem when interfaced with microcontroller or PC is much simpler as compared with sending SMS through UART. Text message may be sent through the modem by interfacing only three signals of the serial interface of modem with microcontroller i.e., TxD, RxD and GND. In this scheme RTS and CTS signals of serial port interface of GSM Modem are connected with each other. The transmit signal of serial port of microcontroller is

connected with transmit signal (TxD) of the serial interface of GSM Modem while receive signal of microcontroller serial port is connected with receive signal (RxD) of serial interface of GSM Modem. The SMS messages in text mode can contain max. 140 characters.

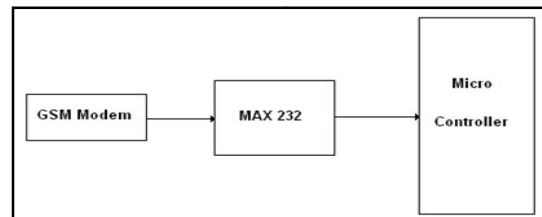


Fig 5: Block Diagram of GSM Interfacing

We now want to display a text in mobile from 8051 Primer Board by using GSM module through UART. In 8051 Primer Board contains two serial interfaces that are UART0 & UART1. Here we are using UART0. The GSM modem is being interfaced with the microcontroller 8051 Primer Board for SMS communication. The SMS can be sending and receiving for the data sharing and situation information and control.

	UART DB-9 Connector	8051 Lines	Serial Port Section
UART0 (P1)	TXD-0	P3.0	
	RXD-0	P3.1	
UART1 (P2)	TXD-1	P1.2	
	RXD-1	P1.3	

Table1: Signaling Of GSM Module

## 7. MATHEMATICAL MODEL

Whenever input power is passing from supplier to the receiver, at that time if the total amount of power is not received by the receiver then there is possibility of theft of energy.

$$\Sigma P_{sent} = \Sigma P_{consumed} + Loss \dots No Theft$$

$$\Sigma P_{sent} \neq \Sigma P_{consumed} + Loss \dots Theft Occurred$$

Here;

$P_{sent}$  = Power measured by pole side energy meter

$P_{consumed}$  = Power measured by load side energy meter.

## 8. FLOW CHART

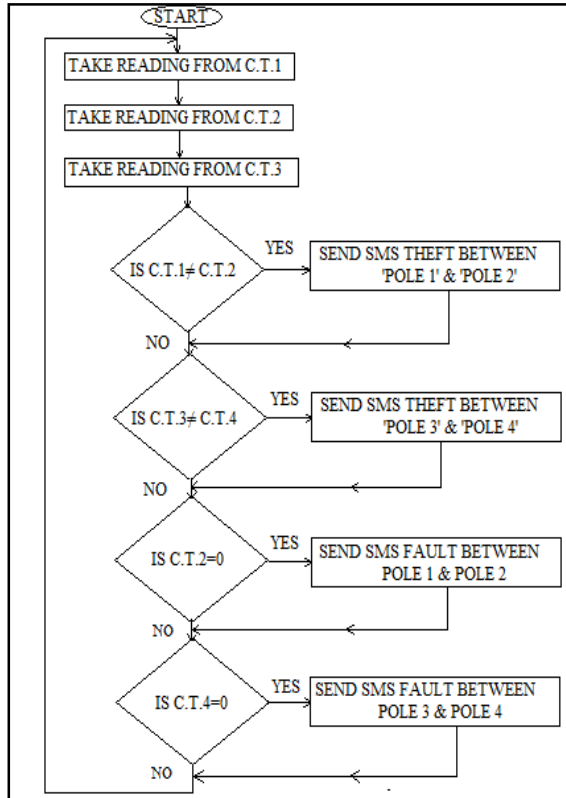


Fig 6: Flowchart of system

## 9. RESULT

The successful development of the prototype hardware has been done and correctly tested for the purpose it is being implemented. When there is fault like broken cable or grounding the system informs the COC about that fault, same as in the case of illegal tapping this module sends intimation COC about the theft with proper location and amount of energy is stolen in terms of units.

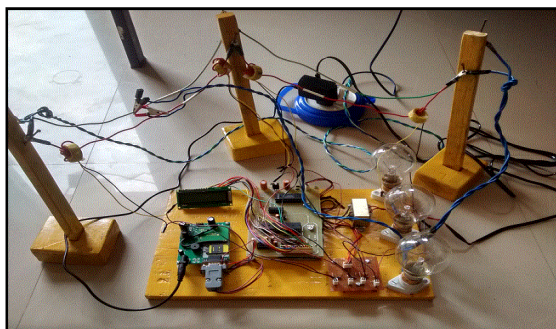


Fig 7: Experimental setup

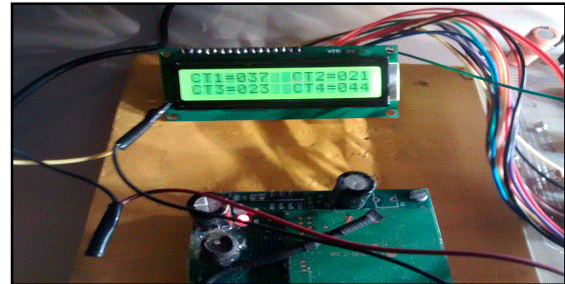


Fig8: Output on LCD display

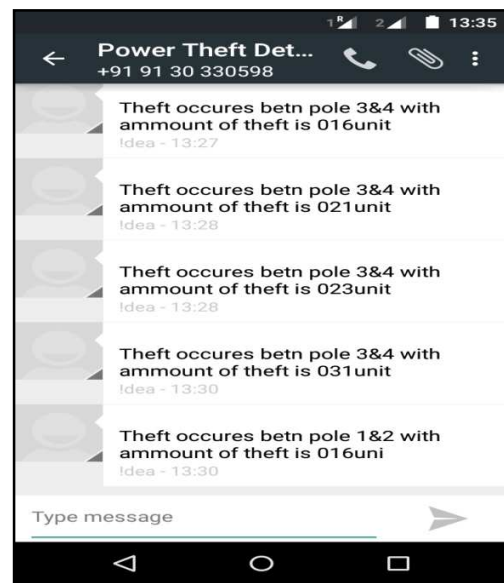


Fig 9: SMS received at C.O.C.

## 10. CONCLUSION

The successful development of the wireless automatic theft monitoring system described in this article is based on the high performance, extremely low power consumption, high level of integration, and low price of GSM technology. The technology has strong market competitiveness. GSM wireless theft monitoring system can use long-range wireless communication and computer network technologies to send SMS. Wireless communication links can be quickly built, engineering period significantly shortened, and it has better scalability compared to a wired system. If a fault occurs, simply checking wireless data module can quickly find it out and restore the system in normal operation.

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.

The progress in technology about electrical distribution network is a non-stop process. New things and new technology are being invented. The proposed system found to be little bit complex as far as distribution network is concerned, but it's an automated system of theft detection. It saves time as well as help to maximize profit margin for utility company working in electrical distribution network. Utility company can keep a constant eye on its customer.

## 11. FUTURE SCOPE

In future, this project can be implemented and validated in remote areas. Future enhancements can be incorporated to suit the system for three phase electric distribution system in India. Along with all this new architectural components can be incorporated, so that the system can be completely used for optimizing the energy consumption. This method will reduce the energy wastage and save a lot of energy for future use.

Instead of using wireless data transmission technique, one can use power line communication. In power line communication data signal is modulated on power signal and sent it through a same electrical distribution network. This will reduce the cost for separate communication line.

One can decide the resolution of this system. Due to economic consideration, instead of installing this system for each consumer utility company can install one system for one colony. Then power theft on any line in that colony will be identified by this system.

## REFERENCES

1] M.A.O liveira and C.C. Barioni, "Technical loss calculation by distribution system segment with corrections from measurements", Proc.20th international Conference and Exhibition on

Electricity Distribution, Prague, Czech Republic, June 2009

[2] C. J. Bandim, E. R. Alves ., A. V. Pinto, F. C. Souza, M. R. B. Loureiro, C. A. Magalhães and F. Galvez-Durand, "Identification of Energy Theft and Tampered Meters Using a Central Observer Meter: A Mathematical Transmission and distribution conference and exposition" 2003 IEEE PES, vol. 1, pp. 163-168,2003.

[3] "Wireless Electricity Theft Detection System Using Zigbee Technology" Virendra Pandey<sup>1</sup>, Simrat Singh Gill<sup>2</sup>, Amit Sharma<sup>3</sup> <sup>1</sup>(EC, final year), <sup>2</sup>(Assistant Professor), <sup>3</sup> (Assistant Professor) MIT, MORADABAD.

[4] "Theft detection and smart metering practices and expectations in the Netherlands" P.Kadurek, Student member, IEEE, J. Blom, J. F. G. Cobben, W. L. Kling, Member, IEEE<sup>1</sup>

[5] "Electricity Theft Localization Based On Smart Metering" Frank VAN DEN BERGH  
TU/e – NL

[6] "Electricity Theft Prediction on Low Voltage Distribution System Using Autoregressive Technique" A.I. Abdullateef, M.J.E. Salami, M.A. Musse, A.M. Aibinu, and M.A.Onasanya

[7] "Electrical Power Theft Detection and Wireless Meter Reading" presented by Sagar Patil, Gopal Pawaskar, Kirtikumar Patil"

[8] Donald G, Wayne H.Beaty, "Standard Handbook for Electrical Engineers" 11th Edition, McGraw Hill, 2003, New York

[9] Croft, Terrell, Summers, Wilford I, "American Electricians' Handbook" 11th Edition, McGraw Hill,2008 New York