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GSM based Power Stealing Detection Controlling and Monitoring

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Abstract - *Electricity theft is a very common problem in countries like India, where population is very high and the users of electricity are ultimately tremendous. In India, every year there is a very increasing number of electricity thefts across domestic electricity connections as well as industrial electricity supply, which results in loss of electricity companies as well as facing the frequent problems of Load shedding in urban as well as rural area. Also the ways using which theft can be done are also innumerable so we can never keep track of how a theft has occurred, and this issue is needed to be solved as early as possible*.

***KeyWords*: Electricity theft, problem, correction, analyse, Monitor**

1. INTRODUCTION

Power theft is the criminal but widespread practice by common people of stealing electric power. It is a crime and punishable by heavy fines and, in some cases, imprisonment. The name takes its origins from how some Indians refer to stealing power as flashing the Government. Electric Power theft is a burning issue in Indian power sector. Statics show that on average about 22% of the overall power generated is wasted during distribution, and about 30% power produce in our Country is lost to power theft making the distribution network weak and inefficient. "It is the use of electrical power without a contract with a supplier with total or partial bypassing of the Metering system or interfering with this system in such a way so as to adulterate its measurements." Electricity theft is at the center of focus all over the world but electricity theft in India has a significant. Effect on the Indian economy, as this figure is considerably high. The losses, experts say, are currently 29 % of the total generation, which equals a shocking Rs 45,000 crore in the fiscal? Year 2009-10 According to experts, if not for these losses over a decade now, India could have built two mega power plants of around 4,000 MW capacities every year. The facts of power theft In India as well as in western countries it is treated like criminal offense. Huge gap between ACR&ARR Due to of it customer should have to pay higher Energy Charge. Cannot Segregate Technical losses and Power theft losses the system finds out the power theft by monitoring the total power consumption, receiving the delivered power data that includes data delivered to a number of users. Determining the amount of difference between them, thus finding out if power theft has occurred. But there lies no specific way to find out where the power theft has occurred. Recently in India from the last to last year the fundamental of Smart Metering has been come in very few areas. Ineffective and inefficient present methods of detecting and preventing power theft cause revenue loss along with damage to personal and public property large amount of power shortage is caused due to power theft one of the challenges in stopping power theft is the difficulty in detecting power theft. In particular it is difficult to find the exact location where power theft is occurring.

1.1 Types of Electricity stealing

Slowing down the Energymeter

Inverting the Energy meter

Bypassing the Energy meter

Illegal hookups from line

Slowing down the Energy meter

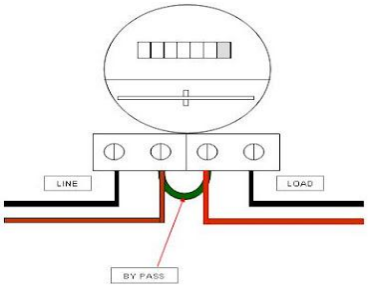
A common method of tampering older meters is to attach magnets to the outside of the meter. When this happens, the rotor disc is exposed to a high magnetic field. Hence, the resultant opposing magnetic field to the rotor is highly increased leading to slowing down of rotor or perfect stopping of the disc rotation. The electricity meter is thus manipulated and ultimately power is consumed without being paid for the outer seals appearing on the meter cup board and meter are carefully opened to have an access to the internal mechanism of the electricity consumption meter. This mode of theft is prevalent both in industrial as well as domestic electricity consumers. The consumer can insert any foreign material inside the meter to obstruct the free movement of the rotating disc. There is a gap between the disc and the magnet. The temporary objects used to slow down the movement of the disc are pin, Middle etc.

Ex: Neodymium magnets installed close to rotating discs may effectively give boost braking torque

Inverting the Energy meter

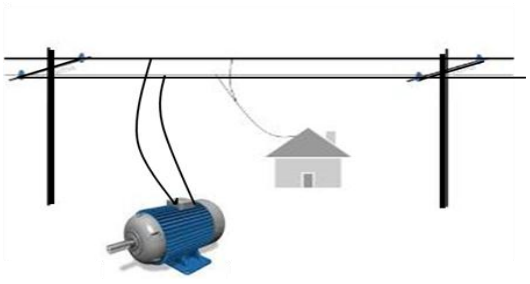
Another common form of electricity theft is to invert the meter pull the meter out of the socket and Plug the meter back in upside down, which causes the meter to run backwards and the kWh register to Count down instead of up. The meter inverted for a number of days to shave usage off of the bill and the meter is then reinstalled before a meter reading. In the industry have historically employed tamper detection tools to alert utilities that a meter is inverted.

Bypassing the Energy meter



In this method the input terminal and output terminal of the energy meter has been shorted by a wire. So energy cannot be registered in the energy meter. Energy theft goes by several names but typically occurs in two ways-diversions and tampering. Meter diversion involves bypassing energy around the meter such as tapping into utility conductors before the revenue meter or jumpering around, Tampering causes the revenue meter to create false consumption information. Examples include impeding the meter from making an accurate reading, weekend meter swaps, or turning the meter upside-down (inverted) temporarily to make it run backwards as shown below. Usually, the bypass supplies power to large and stable loads which will not trip fuses in the case of overloads. Ex- jumper cables.

Illegal hookup from lines



It is the most used method for theft of power. 80% of total power theft all over the world is done by direct tapping from line. The consumer has tapped supply from a point ahead of the energy meter. This energy is totally unmeasured energy. It is taken from the consumer premises with or without switches.

1.2 Methodology

In this paper the methodology can be divide into three sections

1. Recording the power supplied from the distribution transformer:

In our system we are using recording type energy meter on the secondary of the distribution transformer which records the total amount of power supplied to the load centre. Recording type energy meter is a specialized energy meter which reads the number of units of power supplied and also stores it in the memory.

Let, the total energy supplied by the distribution transformer = X kWh

2. Recording the power consumed by the different load centers:

The power consumed by the consumer is recorded by the energy meter located at the load side conventionally. We need to integrate a memory circuit to the energy meter so that it stores the amount of energy consumed and then it is send to the processing unit via distribution line.

3. Processing, Detecting and Monitoring unit:

Once the inputs from the load side energy meters is received at the processing unit, the overall power consumed is calculated as a summation of power consumed by the individual consumer connected to that distribution transformer, then it compared with the power supplied from the distribution transformer if there is huge difference in the power supplied and power consumed then the embedded controller send an signal to the GSM module , which inturn send the information regarding the fault or theft in the system to the vigilance team of the electricity board through an SMS along with the location of fault (like distribution transformer pole number or recording energy meter unique identification number). The system is flexible to operate and it can be operated from the main station in the emergency case with suitable commands to the embedded controller via wireless network.

If $\mathbf{y_1}$, $\mathbf{y_2}$, $\mathbf{y_3}$ are the energy consumed by the 3 load centers connected to the distribution transformer, and if $\mathbf{y_1}$ the distribution loss,

Then, fault or theft power consumption is detected by,

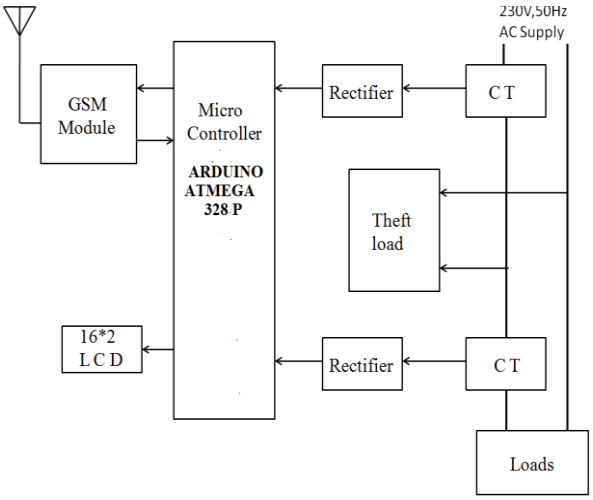
Theft power = $X - (y_1 + y_2 + y_3 + y_L) = \mathbf{Y}$

2. IMPLEMENTATION

Block diagram

Working Procedure

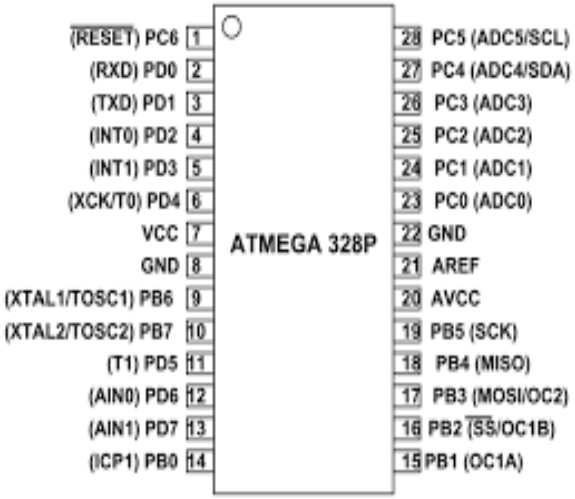
Now consider the single phase power line of 230V which is connected to the single phase loads. The load starting drawing current. The current taken by the load is extracted with the help of current transformer which is connected in series with the line at load side. The current transformer connected at the source side will measure the current supplied to the load and the current drawn by the theft load. The output of the current transformers varies according to the load consumption. The output of the current transformers will be fed to the high precision rectifier. The rectifier allows only positive half signals output to the ADC. In ADC, the rectified analog signals are converted into digital signals. These signals are sent to the microcontroller. This value varies according to the load consumption. The microcontroller compares the output of two ADC's and sends an SMS to the GSM number saying that LINE THEFT detected



3. HARDWARE UTILIZATION

The hardware utilized in this project are Arduino Microcontroller, Current Transformer, Liquid crystal display, Precision Rectifier, Global system for mobile communication, Regulated power supply, Regulator

Arduino Microcontroller



Features

Operating voltage	:	5V
Input voltage	:	7-12V
Total pins	:	28
Digital Input pins	:	14
Analog Input pins	:	6
DC current	:	40mA
Flash memory	:	32KB
SRAM	:	2KB
EEPROM	:	1KB
Clock Speed	:	16 MHz
Temperature Range	:	-40°C to 85°C

Current Transformer

A current transformer (CT) is used for measurement of alternating electric currents. Current transformers, together with voltage transformers (VT) (potential transformers (PT)), are known as instrument transformers. When current in a circuit is too high to directly apply to measuring instruments, a current transformer produces a reduced current accurately proportional to current in the circuit

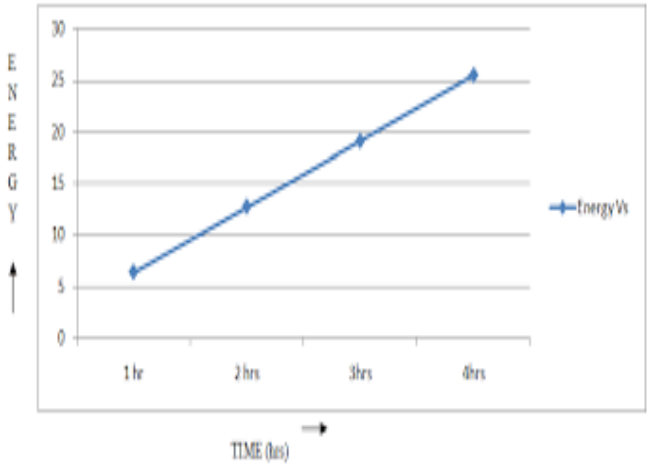


Fig detection of tampering in power line

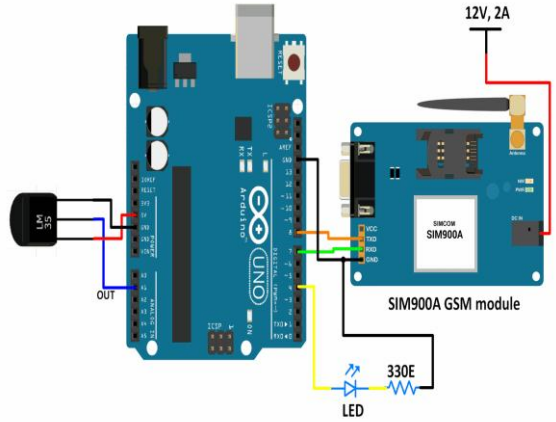


Fig interfacing microcontroller and GSM

3. CONCLUSION

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.

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BIOGRAPHIES

Prabhudev B S obtained BE Degree in Electrical & Electronics Engineering from VTU Belgaum in the year 2013. He is working as a Lecturer in DSDN polytechnic shimoga.His teaching experience is more than 8 years of this relevant field. He guided so many projects in the electrical field And area of interest is Electrical Machines