Design and Implementation of Real Time System to Eliminate Power Theft in Distribution System

[1]Ashwini M. Badakundri, [2]Pramod M. Murari, [3]Purushottam A. Jarali, [4]Swapnali G. Vhatkar, [5]Sheetal B. Vadrali

[1,3,4,5]Student, [2]Assistant Professor
Department of Electrical and Electronics Engineering
Hirasugar Institute of Technology
Belagavi, India, 591236

Abstract

Electricity theft is one of the non ignorable crime and one of the growing problem worldwide. Nation, utility company loses crores of rupees due to illegal usage of power. It is important to prevent or eliminate power theft for the efficient use of electrical energy. By implementing the proposed system unauthorized usage of electrical energy can be detected in the distribution network. Power theft can be in the form of meter tampering, illegal connection (stealing), billing irregularities and unpaid bills. As electrical energy is one of the major constraint for the developing countries, the energy should be used in optimized way. India is highly populated country, due to power theft consumer faces insufficient supply of electrical energy. This is a real time system which aims at eliminating all these difficulties by designing a simple device to send an alert signal through wireless communication whenever there is a power theft activity at a certain cluster of an area.

***Keywords*- Electricity theft, Illegal usage, Real time system, Wireless communication.**

1. INTRODUCTION

Process of Generation, transmission and distribution of electricity involve many losses. Whereas, losses in generation can be technically resolve, but transmission and distribution losses cannot be quantified with the sending end information. Overall technical losses occur and are caused because of power dissipation of energy in transmission lines, transformers, and other components. 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 no of electricity thefts across domestic electricity connections as well as industrial electricity supply, which results in loss of electricity companies energy and because of which we are facing the frequent problems of load shading in urban as well as rural area so as to overcome the need of electricity for whole state. 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.

2. LITERATURE SURVEY

Electricity theft includes illegal tapping of electricity from feeder, by grounding neutral wire as it does not measures readings and avoid payment of bills. In early system there wasn't any device to detect theft over line so anyone can use electricity without purchasing it. The system stops the illegal usage of electricity.

[1] The theft of the electricity is the major concern of the transmission and distribution losses in the supply of the electricity worldwide. Theft also may occur by rewiring circuits to avoid an electric meter, or by tapping into another customer's electrical lines. 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.

Siddhartha S. & Ayush B. [2] states that losses due to power theft, experts say, are currently 29% of the total generation, which equals a shocking ₹45,000crore in the fiscal year 2009-10.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.

3. BLOCK DIAGRAM

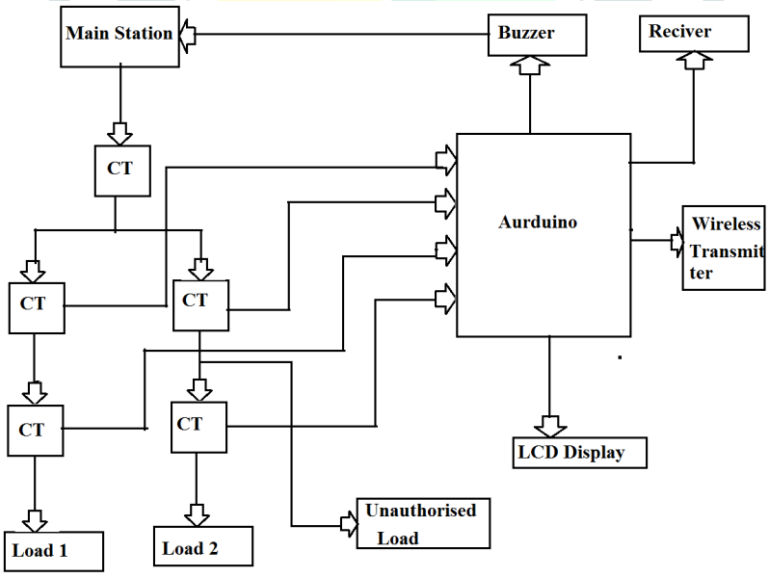
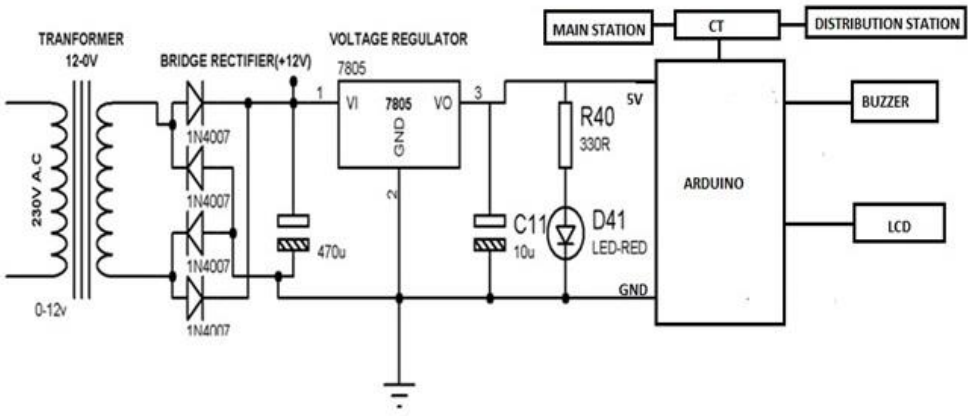


Fig 1.Block diagram of implemented system

3.1. CIRCUIT DIAGRAM



3. METHODOLOGY

The distribution network of the proposed system is divided into main station, distributive panel & substations. Current transformer is the heart of the system. Each electricity pole will have a current transformer mounted over it. A current transformer used to produce an alternating current (AC) in its secondary which is proportional to the AC current in its primary. Another important component is the arduino. The system uses arduino is open-source, which means hardware is reasonably priced and development software is free. It is compatible on The Duemalinove board features an Atmel ATmega328 microcontroller operating at 5 V with 2 Kb of RAM, 32 Kb of flash memory for storing programs and 1 Kb of EEPROM for storing parameters. The clock speed is 16 MHz, which translates to about executing about 300,000 lines of C source code per second. The Arduino programming language is a simplified version of C. The system uses single phase power measurement. Now the current transformer measures power, current & voltage values of both the transmitter & receiver side. These reading are given to the main station. As the main station & load station having some distance between them then there are some transmission losses in the conductor joining these stations so that at main station we compare the power transmitted through station & the summation of the powers at the load sides, in comparison we have considered some tolerance due to the transmission losses. If by considering allowable tolerance the comparison is equal, then no theft has occurred. And if comparison is not equal, then theft has been occurred. So an alert signal will be sent to the operator through the Buzzer & message will be shown on the LCD display in the main station.

4. HARDWARE DISCRIPTION

4.1.Arduino

The Arduino is open-source, which means hardware is reasonably priced and development software is free. The Duemalinove board features an Atmel ATmega328 microcontroller operating at 5 V with 2 Kb of RAM, 32 Kb of flash memory for storing programs and 1 Kb of EEPROM for storing parameters. The clock speed is 16 MHz, which translates to about executing about 300,000 lines of C source code per second.

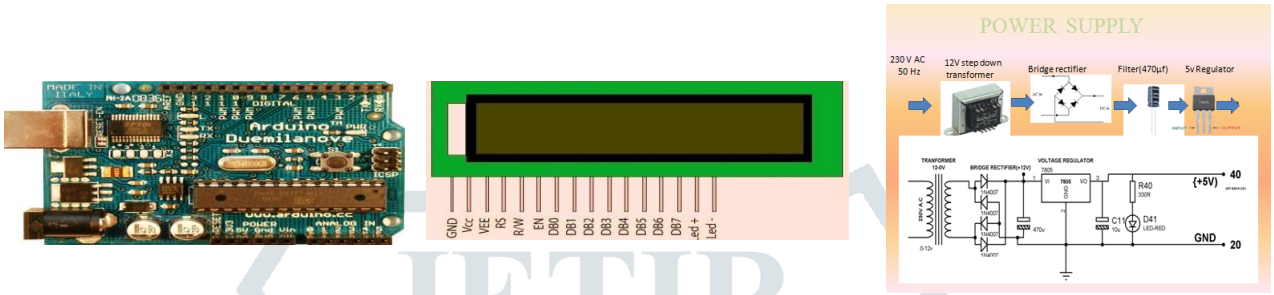


Fig.4.2.Arduino board,LCD Display, power supply

4.2. LCD DISPLAY

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications .A 16x2 LCD display is very basic module and is very commonly used. 16x2 LCD means it can display 16 characters per line and there are 2 such lines. This LCD has two registers, namely, Command and Data.

4.3. POWER SUPPLY

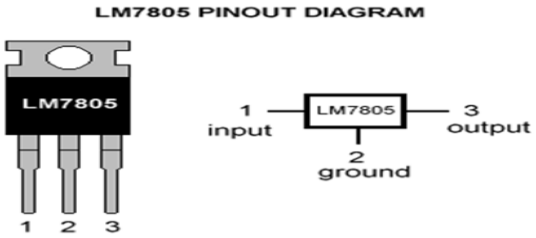
AC power supply of 230V is given to the step down transformer which gives 12V AC then it is given to the bridge rectifier to get DC voltage.Capacitor filters are used for the rectification. Regulators are used to get constant 12V,5V DC supply for the electronic devices.

4.4. CURRENT TRANSFORMER

A current transformer (CT) is a transformer that is used to produce an alternating current(AC) in its secondary which is proportional to the AC current in its primary. Current transformers, together with voltage transformers (VTs) or potential transformers (PTs), which are designed for measurement, are known as instrument transformers**.** We are using CT of Ratio 100/5A and Frequency 50Hz.

4.5. OTHER COMPONENTS

4.5.1 RESISTOR AND VOLTAGE REGULAOTR



4.6. SOFTWARE USED

- Programming language is a simplified version of C.
- More Freedom In Selecting Programming Languages.

5. RESULTS AND DISCUSSIONS

The results and output of a proposed system is discussed below.

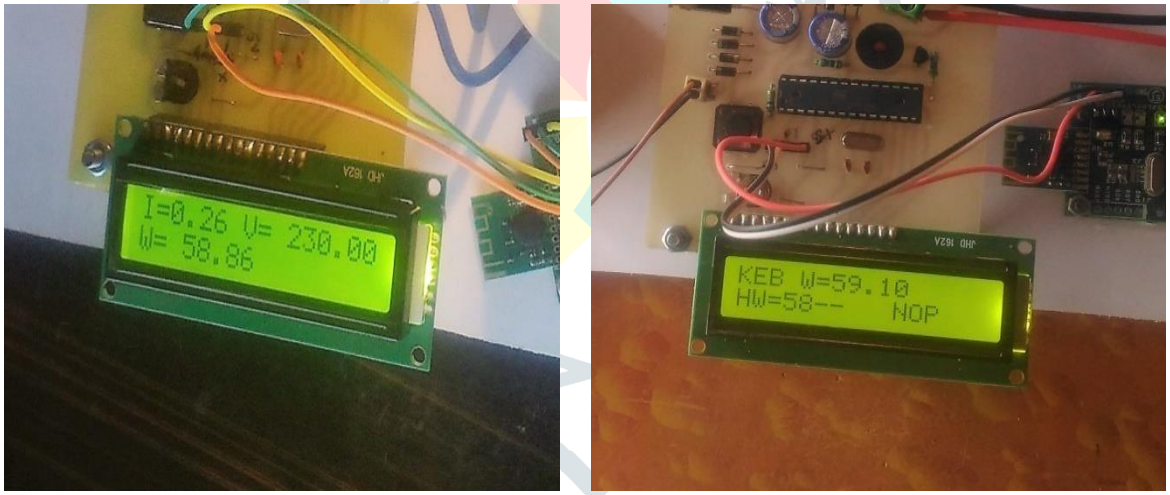


Fig 5.1 Message display on supply side and load side during normal working conditions

In the above fig 5.1 Current, voltage, power read and displayed on LCD data from load side is transmitted to the supply side through wireless device. Here we can see that the supply side power is equal to the load power consumed by the consumer. It means there is no theft operation, hence it displays as NOP (No operation) at the supply station (KEB).

Fig 5.2 Readings on supply side and load side during theft operation

In fig 5.2 It is seen that readings displayed on the supply side is more than the consumer side (load side) it means that theft has been occurred on the distribution line. Hence it displays as TFT (Theft) and gives alert signal at KEB station. Further the authorized agency can take the corrective actions. So by implementing the proposed system we can detect the electricity theft in a distribution system.

6. CONCLUSION

By the proposed system we can detect the electricity theft in various industrial and consumer areas by measuring and comparing power at load side and KEB station side. Implementation of the proposed system will give information of the electricity theft in the form of alert buzzer and display message at the suppliers station and they can take the corrective actions. It saves large amount of electricity, and there by electricity will be available for more number of consumer than earlier, in highly populated countries like INDIA and hence economy of the country can be improved.

7. REFERENCES

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