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Electricity Theft Detection Using IOT

[1]Pratik Gadre, [2]Anjali Nandrekar, [3]Ajinkya Jangam, [4]Omkar Lendave, [5]Prof. S. S. Shingare

[1,2,3,4]Student, Electrical Engineering, AISSMS's Institute of Information Technology, Pune, Maharashtra, India

[5]Assistant Professor, Electrical Engineering, AISSMS's Institute of Information Technology, Pune, Maharashtra, India

***Abstract* - This research describes how to identify power theft in industries and homes using several theft techniques. Electrical energy is essential to daily living and serves as the backbone of the industry. Power theft is an issue that continues to plague the power sector nationwide. The goal of this project is to design a system that will attempt to reduce both the likelihood of theft and the illegal use of electricity. As our daily lives become more dependent on electricity, so does the need for it. This project will automatically gather sensor readings and identify any theft. This concept aims to achieve theft control while reducing the amount of manual manipulation work.**

Keywords: Electrical Energy, Power Theft, Theft Control, etc.

I. INTRODUCTION

The largest issue these days that costs electrical boards a lot of money is power theft. These kinds of events are more common in nations like India; if these thefts can be stopped, a significant amount of power can be saved. The purpose of an electrical power theft detection system is to find instances of unapproved tapping on distribution lines. The system's distribution network for the electrical power supply is its implementation component. Electricity theft from government-owned power providers is a major problem in many developing nations. An estimated US$4.5 billion, or 1.5% of GDP, is lost to electricity theft in India each year. And who is the loser? The people who suffer from excessive tariffs, inefficient systems, and inconsistent and insufficient power supplies are the impoverished, honest users, and those without connections. Earth faults or over currents can result in line faults. An over current fault results when two phase lines happen to be connected. Earth faults are caused by the phase line earthing via a cross arm or another method.

There is currently no method in India for quickly determining the precise location of a defect. Another significant issue with the Indian electrical infrastructure is power theft. This project's goal is to use a power theft circuit to detect power theft and prepaid energy meters. Worldwide attention is focused on power theft, but given the high rate in India, electricity theft has a major impact on the country's economy. Electricity is essential to the development of our nation. Despite their intense concentration on generating, transmission, and distribution, power production businesses are experiencing power outages as a result of users illegally consuming electricity from transmission lines. The electrical board is facing significant challenges as a result of power theft. According to the daily report, electricity theft costs the Electricity Board 8% of its annual earnings and must be curbed. Within the realm of electrical or electronic engineering, current and energy consumption have a significant impact on component stabilization. When it comes to industries, business owners are responsible for keeping an eye on and managing the amount of electrical energy used.

The primary goal is to avoid using more energy than the power provider has permitted by avoiding overloading the system. A current transformer that is connected in series with the load is used to audit energy use. The microcontroller's Analog to Digital Conversion (ADC) techniques are then used to measure the current. If any invariance is detected, a tripping mechanism removes the extra load and invariance. A microcontroller triggers different pieces of equipment that offer controlling features by sending control signals. After that, output can be shown on an LCD (Liquid Crystal Display). The distinction with other current systems is that, in addition to meter bypassing, transmission line theft may also be identified.

Another benefit of this system is that it eliminates the need for a manual interface because it is entirely automated. It also calculates meter readings precisely, eliminating the requirement for the manual meter reading method that was previously used. Because it requires a lot of labor and resources, the traditional manual meter reading is no longer appropriate for longer-term operating needs. It causes further issues when charging and calculating readings by hand. Consumers of electricity are growing significantly in number. Managing and preserving power in accordance with the expanding needs becomes difficult.

II. LITERATURE REVIEW

1) Design and implementation of power theft detection in automatic meter reeading using power line communication Author: Rakesh Dwivedi, Ashwani Kumar and Sandhya Dubey

Power theft is a serious concern for public, for utility company and for government. Power theft detection is hard to

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detect using conventional protection methods, so an advanced protection scheme must be developed to manage the issue. An effective protection plan against power theft needs to effectively face the issues of detection and identification simultaneously. In this scheme of power theft detection, unapproved tapping on distribution lines are detected. However, present systems are not able to detect unapproved tapping on distribution lines. But in this system, it is able to recognize which distribution line has tapping. An execution area of this power theft detection system is a distribution network. In this work, wireless data communication technique is used. With this wireless technique, it gives a wireless meter reading, which is also useful for power theft detection.

2) Electrical power theft detection and wireless meter reading

Authors: Sagar Patil, Gopal Pawaskar, Kirtikumar Patil.

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 not able 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 provide an additional facility of wireless meter reading with the same technique and in same cost. This will protect distribution network from power theft done by tapping, meter tampering etc.

3) Wireless power meter monitoring with power theft detection and intimation system using GSM and Zigbee networks

Authors: G. L. Prashanthi1, K. V. Prasad

With the electric industry undergoing change, increased attention is being focused on power supply reliability and power quality. Power providers and users alike are concerned about reliable power, whether the focus is on interruptions and disturbances or extended outages. Monitoring can provide information about power flow and demand and help to identify the cause of power system disturbances. The proposal in this paper is to monitor the power consumed by a model organization such a household consumer from a centrally located point. Monitoring the power means calculating the power consumed exactly by the user at a given time. The power consumed by the user is measured and communicated to the controlling substation whenever needed by the person at the substation. The feedback from the user helps in identifying usages between authorized and unauthorized users which helps in controlling the power theft, one of the major challenges in current scenarios. Communication between user/household and substation can be of wired and wireless.

4) GSM Based Electricity Theft Detection

Authors: Nilesh Mohite, Rinkuraj Ranaware, Prakash Kakade

This paper presents a detection of power theft in every houses and in industry for different methods of theft. Electrical energy is very important for everyday life and spine for the industry. Electricity is indiscipline to our daily life with increasing need of electricity the power theft is also increasing, power theft is a problem that continues to plague power sector across whole country the objective of this project is to design such a system which will try to reduce the illegal use of electricity and also reduce the chances of theft. This project will automatically collect the reading and also detect the theft This model reduces manual manipulation work and try to achieves theft control.

III. PROBLEM STATEMENT

1. There is no indication regarding power theft detection provided by the current technologies.
2. When theft is discovered, systems cannot react automatically.
3. A prototype device known as the "Power theft detection system" is put into place to get around all of these problems.
4. The goal of this project is to build a system that will attempt to reduce both the likelihood of theft and the illegal use of electricity, as power theft is a problem that continues to affect the power sector throughout the entire nation.

IV. METHODOLOGY

This project's objectives are to detect power theft and minimize billing, labor, and electricity board time. Although it is a major concern worldwide, India's economy is greatly impacted by electricity theft due to the country's very high rate. Current detection and prevention techniques for power theft are ineffective and inefficient, resulting in lost revenue as well as damage to private and public property. Power theft is the main source of the significant power shortfall. The difficulty of detecting power theft is one of the obstacles to curbing it. It is particularly challenging to pinpoint the precise site of power theft. To optimize power network management, measurement of factors such as power line voltage and current has not been sufficiently available. However, because modern technology has advanced, we now have better ways to identify power theft.

V. SYSTEM DESIGN

- A current sensor, an IOT, a buzzer circuit, an LCD (16x2), and a load through a relay are all interfaced with the Arduino Uno micro controller in our system.

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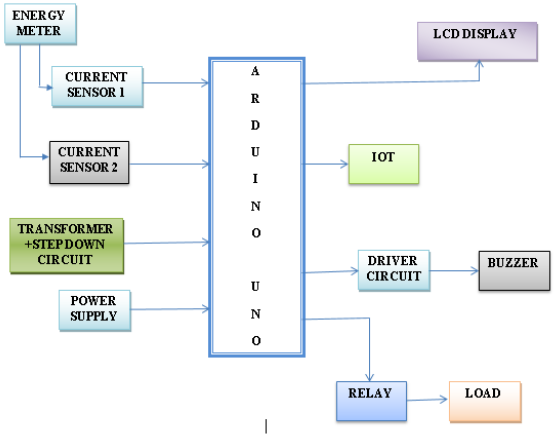

Figure 1: Block Diagram

- **Current Sensor**
  - While using a current sensor, measures the input current drawn from the meter
  - The output current drawn from the meter is measured and shown on the LCD.
- Energy pulses and current signals are read by the microcontroller under typical conditions. If the buzzer stays off and current is being drawn while energy pulses are normal, then there is no evidence of power theft.
- When someone tries to connect to the meter at that moment, the input current changes, which causes a disparity in the input and output currents.
- The microcontroller detects the difference and initiates automated action if it exceeds the pre-established value.
- The buzzer activates, the load automatically turns off, the IOT transmits data to the Thing Speak Server, and the LCD displays "theft is detected" when theft is detected.
- The microcontroller receives the corresponding signal and displays "Power theft is detected" on the LCD. In order to prevent power theft, a buzzer will sound and the microcontroller will cut off power to the loads. Data is sent to Thing Speak Server by IOT.
- This project employs a 750mA, 5V regulated power source. Voltage regulation is accomplished with the 7805 three terminal voltage regulator. For rectifying the ac output of the secondary of a 230/18V step down transformer, a bridge type full wave rectifier is utilized.

VI. RESULT AND DISCUSSIONS

- The ATMEGA 328 Microcontroller is used in the embedded system arena to design and build the Internet of Things-based electricity theft detection system being shown in this project.
- A great deal of care has gone into the experimental work.
- The outcome confirms that employing an embedded technology does lead to increased efficiency.
- A year of research and implementation culminated in the project. While the circuits operate as intended when constructed separately, the output varies and exhibits a distinct reaction each time the circuits are integrated. One possibility is that the internal wiring of the bread board being utilized, or loose connections between the wires. This study assesses if concepts and methods to solutions suggested in research are satisfied by the practical implementation by compiling a list of the outcomes obtained from the practical activity.
- Additionally, the message is shown on LCD by the system.
- The diagram below illustrates the proposed system's hardware configuration:

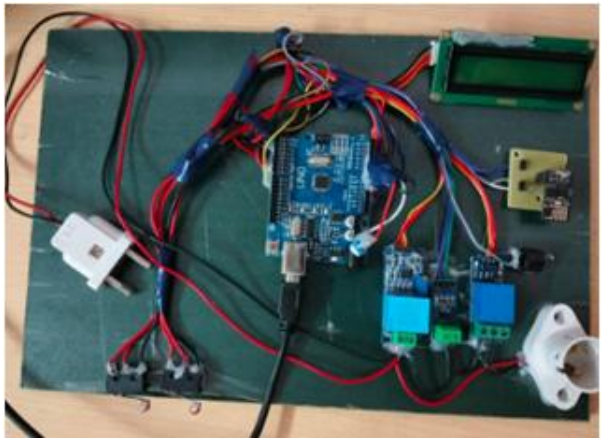

Figure 2: Result of Hardware

VII. CONCLUSION

This project uses an embedded controller and Internet of Things to demonstrate the idea and execution of an autonomous trip control system for energy management. It was primarily industrial in nature. For household areas, a similar concept might be used to prevent the unauthorized use of power. The purpose of this study is to lessen the significant power and financial losses brought on by customer power theft. This design leads one to the conclusion that power theft can be successfully stopped by identifying the location of the theft and reporting it to the appropriate authorities. Additionally, the device may incorporate an automatic circuit breaker, which would allow it to remotely turn off the house's power supply or that of any user attempting to commit power theft. The proposed system's capacity to transmit digital data via a wireless radio link to a distant station expands the possibilities for how the electricity board might control the power supply. Particularly, the single phase electric distribution system is the primary focus of the system design. Some of the primary issues plaguing the current Indian grid system, including energy waste, power theft, and transmission line failure, are resolved by the proposed system. It makes it

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easier and faster for the vigilance squad to combat theft. Its application might put an end to the crime of power theft, opening the door for fresh growth.

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AUTHORS BIOGRAPHY

Pratik Gadre,
Student, Electrical Engineering, AISSMS's Institute of Information Technology, Pune, Maharashtra, India.

Anjali Nandrekar,
Student, Electrical Engineering, AISSMS's Institute of Information Technology, Pune, Maharashtra, India.

Ajinkya Jangam,
Student, Electrical Engineering, AISSMS's Institute of Information Technology, Pune, Maharashtra, India.

Omkar Lendave,
Student, Electrical Engineering, AISSMS's Institute of Information Technology, Pune, Maharashtra, India.

Prof. S. S. Shingare,
Assistant Professor, Electrical Engineering, AISSMS's Institute of Information Technology, Pune, Maharashtra, India.

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