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An Embedded Electric Meter Based on IoT

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Abstract: *In present world almost all industrial system are based on wireless communication, as it has many advantages. The embedded electric meter will continuously monitor and send the data on to a server system through wireless communication where the data will be stored as well. Later in LCD the value of EB meter will display. Even when the recharged unit is low the alarm will indicate. In software the user can see all the dates which is seen in LCD. The number of units used and amount details will be visible in software the user is able to monitor the EB meter. The proposed energy meter provides an effective solution for monitoring and managing energy consumption. It promotes sustainable energy practices by empowering users to take control of their energy consumption and reduce wastage*

Keywords: Arduino, LCD display, current coil, relay, and loads, IOT

I. INTRODUCTION

One of basic need is electricity for human and also commonly used domestic, industrial and agricultural purpose in today's life. Mostly the energy meter in electricity grid. Energy meter help the utility of account to usage of electricity by consumer on kw per hour basis. The biggest problem in our house the electricity distribution is collecting meter reading day by day processes. To overcome these drawbacks, we are going to develop an IoT based embedded smart energy meter. This paper present a embedded smart energy meter for automatic metering and billing process. We all know about electricity energy meters which are installed in everyone's house or office to measure the electricity consumption. The energy meter is designed to measure and monitor real-time energy consumption by each load using a current coil.
The processed data is presented on LCD for convenient monitoring and analysis after being sent to an Arduino board for processing. The energy metre has a relay that can be used to control up to different loads in addition to real-time monitoring. It offers the option of remotely charging the energy meter. With RFID, the user can refuel the EB meter. The LPC2142 microcontroller, which has an ARM processor, is primarily used for the wireless control of meter reading systems. Arduino UNO is an 8-bit ATMega328-based microcontroller board.

II. LITERATURE SURVEY

Chandra Suresh, et al. [1] They proposed technological development in Wireless Sensor Networks made it possible to use in monitoring. Utility providers are able to evaluate customer behaviour and forecast the load demand at specific times of the day using the information of how energy usage varies with the time of day. It should be noted that some fundamental quality standards must be met by the electrical energy delivered to the consumer premises from the standpoints of both the customers and the utility providers. Over the course of the week, the energy user varies. In this work, we propose the installation of two embedded energy metres, one at the residence of the user and the other at the street transformer. Consumer end energy metres track and measure consumer electrical energy consumption. **Kulkarni et al. [2]** They proposed to create a measuring device that improves electrical parameter measurement and transmits these parameters to service providers via GSM technology. To send the read data, the energy meter system can integrate an embedded microprocessor with a GSM interface. This information can subsequently be incorporated into the already the existing energy meter systems at power processes and other organisations. Energy is measured and computed using a GSM-based energy meter. The evaluation's findings show that this meter represents a practical method of measuring energy. It is highly accurate and can be used to determine water, gas, and other flow rates. In the case of GSM technology, the number of units utilised by the user would be reported to the main
Akindele Olufemi, et al. [3] ingested by the consumer

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will be forwarded to the primary] They suggested creating a smart metre that was reliable, effective, multi-functional, and affordable. The utilities were able to recover the metre energy measurement data remotely thanks to new features included to the planned metering system. Data sharing that was previously done monthly was changed to daily or hourly sharing during the process. The procedure has made it possible for the clients to generate and consume simultaneously. The data absorbed by the consumer is sent **to** the primary using a microcontroller board. They proposed developing a smart metre that was dependable, efficient, versatile, and reasonably priced. Thanks to newly added capabilities to the intended metering system, the utilities were able to remotely recover the metre energy measurement data**.**

Aswin, Chidambaram, et al. ***[4]*** They claimed that the development of technology has made electrical and electronic equipment essential for people to have in order to live secure and pleasant lives. Humans depend on electricity to power various electrical and electronic devices used for household, commercial, and industrial purposes. Major power theft has become a menace to our grid systems, costing electrical boards money. In nations like India, these scenarios are more frequently seen. Solving this problem can result in significant energy savings, a customer-uninterruptible power supply, and a strengthening of the commercial side of the electrical markets. Smart energy metre implementation can overcome this problem. An electronic gadget called a "Smart Energy Meter" (SEM) is used to monitor.

III. METHODOLOGY

3.1 Existing System

With the aid of IOT and GSM technologies, this existing smart metre measures energy consumption and automatically calculates the bill. The Arduino microcontroller is used in the creation of this system. The microcontroller is integrated with all of the devices. Here, the user's location is used to measure the energy consumption units and compute the bill. The produced bill is sent through SMS to the user's smartphone. Once we are unable to keep a daily record of current usage, a bill is generated every two months. Our suggested approach will be used to resolve these issues.

3.2 Proposed System

It is a laborious process to monitor and continually track our electricity consumption for verification. The goal is to provide a monitoring system for energy metres so that the user may view the readings on a software web page. The LCD is used to display the precise value of units presented after the hardware is completed using an Arduino and other components. In this way, the metre is monitored using IOT technology. Based on this, the software will add the information to the wifi module. The software (web pages) will show and track the daily processes that utilise the unit. Comparing daily usages reduces consumption, minimises human involvement during the monthly reading collection, and saves money.

3.3 Working Principle

The aluminium disc in the energy metre controls the load's power usage by rotating it. Between the air gap of the series and shunt electromagnet is the disc. The pressure coil is located in the shunt magnet, and the current coil is located in the series magnet. Due to the supply voltage in the pressure coil and the current in the current coil, the magnetic field is generated. Eddy current is created in the disc as a result of the voltage coil's field lagging behind the current coil's magnetic field. Eddy current and magnetic field interaction results in. The number of turns on the pressure coil makes it more inductive. Because of the long air gap, their magnetic circuit has extremely little resistance. The supply voltage causes the current lP to flow via the pressure coil. The entire power delivered or consumed over a certain period of time is referred to as the energy (E=P x T). One watt spread over a period of one second is equivalent to one joule, often known as a watt second. Systems for driving, braking, registering, and moving make up the components. Two silicon steel laminated electromagnets make up the system's components. Shunt magnet refers to the higher electromagnet, which contains a voltage coil with numerous turns of thin wire. The two current coils, each of which is made up of a few twists of thick wire, are carried by the bottom electromagnet, also known as a series magnet. Load current flows through the circuit as current coils are linked in series with it. While a voltage coil has a high inductance to resistance ratio and is connected to the power supply mains. To make sure the angles between the voltage and the shunt magnet flux is exactly 90, copper bands in the lower portion of the shunt magnet provide frictional compensation.

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3.4 General Block Diagram

The product has two parts for implementing the process. The first one is the hardware part and the next is software part. The hardware components used in the product are explained in detail.

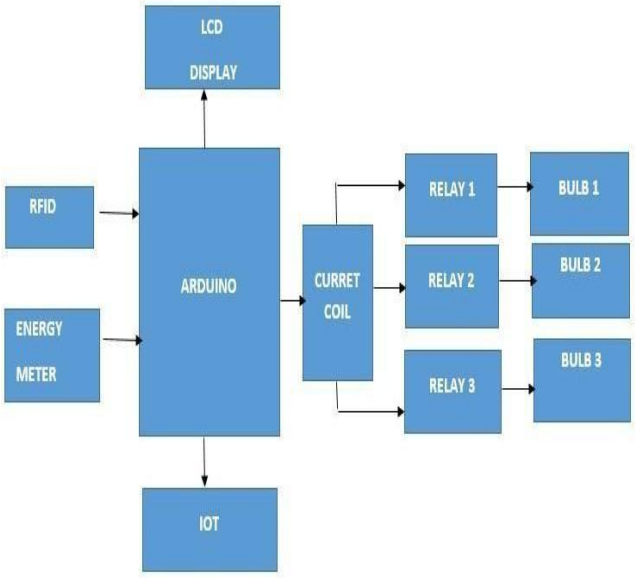

Fig 3.1 shows the block diagram of hardware components.

IV. CONCEPT OPERATION

A computer, another Arduino board, or other microcontrollers can all be reached via Arduino. UART TTL (5V) serial communication is offered by the ATmega328P microcontroller and can be carried out utilising digital pins 0 (Rx) and 1. Two key principles form the basis of how single phase induction energy metres operate. a metal disc rotating. a system for measuring and showing how much energy is used. The user can refuel the energy metre by using the RFID. Additionally, it reduce man power, low manufactured and supplements into customer transactions. The plan is to use our prior programming experience to first code the entire working. The code will then be simulated on computer software before being connected to hardware. We choose this as our major project because energy metres have become a significant part of our homes, businesses, and other building to charge the electricity used by load like light, etc. Also, there are many technologies that will be crucial in creating these concepts.

4.1 Development Preocedure

- This Arduino software come with an different serial monitor, so that user can send and receive. It's also a crystal oscillator, serial communication, voltage, and so on in addition to the ATmega328P.
- Multiple processes of connections is used to read the units.
- From the information given in the LCD is store by wifi- module.
- The web pages is created and user can login to the page, can see the units.

V. RESULT AND DISCUSSION

This gives a detailed information of the project and how the hardware and software can be used, it about An Embedded Electric Meter Based on IOT.

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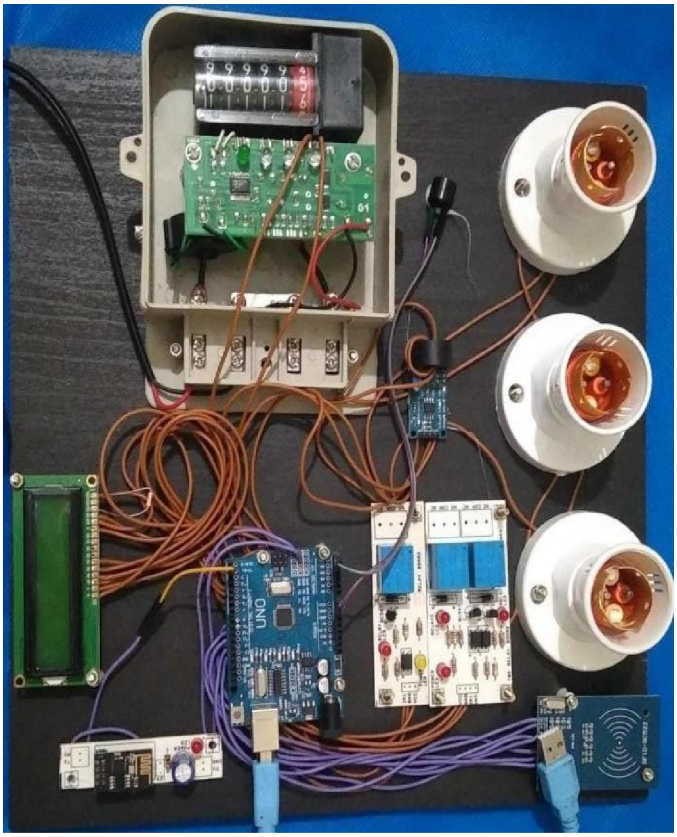

Fig 4.1 Result of Embedded electric meter based on IOT

The fig 4.1 shows that all these tasks are controlled by any computer connected to the net and performed by the interfacing sensors with microcontroller and Arduino.

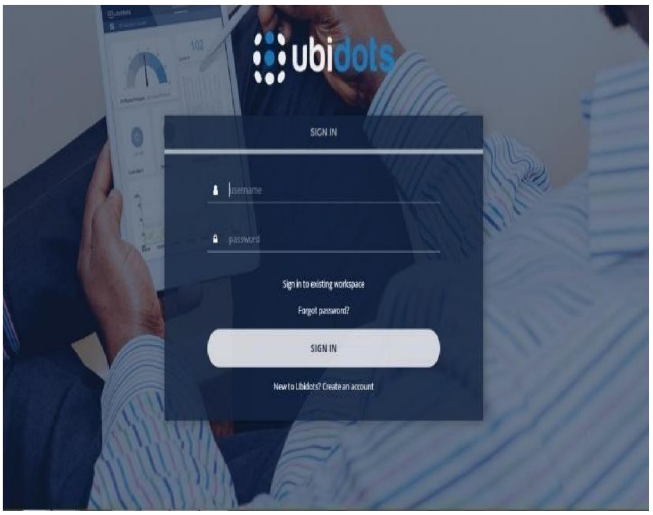

Fig 4.2 Login page of Embedded electric meter based on IOT

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Fig 4.3 Values of EB meter

The Fig 4.3 shows that, it gives an brief idea of the project and how it can be used, there is a user login button can get sign into system.

VI. CONCLUSION

In conclusion, an energy meter using IoT and Arduino technology is an effective solution for monitoring and managing energy consumption. The proposed energy meter measures real-time energy consumption using a current coil and transmits the data to an Arduino board for processing. The processed data is then displayed on an LCD display for easy monitoring and analysis. The energy meter is also equipped with 3 relays that can be used to control up to 3 separate loads, promoting sustainable energy practices and reducing energy wastage. the proposed energy meter provides an efficient way to manage and monitor energy consumption helping to reduce energy wastage and promote sustainable energy practices. It is an day to day updated processes. The user can login to the web page and can see all units, also an amount of energy meter. The audible alarm will start ringing when the unit is low, se when its has been low the user can use RFID and can recharge. The Wi-Fi module can be used instead of the module

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