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Design of GSM & IOT Based Energy Meter

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***Abstract*—** In modern times electricity has become part and parcel of our life as the modern age is continuously developing we need to develop our measuring system (Energy Meter).We integrate the energy meter with a GSM module to send message to the consumer regarding their daily usage in per unit so they keep track of their electricity consumption which indirectly helps them to save electricity.This also has a Wifi module to transmit live data to the thinkspeak channel for remote monitoring both for consumer as well as the electricity board person who can also keep track of the electricity consumption for official purposes.This kit will serve to reduce the human labour and resources thereby reducing the human error aspect to the billing and also the workflow will be efficient as well as transparent to the consumer as they can keep track of their electricity consumption.

***Keywords*—Arm7,LPC2148,Sim900a,Esp8266**

1. INTRODUCTION

Electricity is one of the essential necessities of human beings for their life. It is a non-renewable energy source therefore we must use it judiciously for its sustainable utilization. The Internet of Things (IoT) permits object to be controlled and sensed remotely through existing communication network that creates chances for more direct integration between the physical world and computer-based systems. This proposed IoT based smart energy meter reading and monitoring system in this study, measures electricity consumption of each household and generate its bill automatically using IoT and telemetric communication techniques like microcontroller. These activities are resulting in improved efficiency, accuracy and economic benefit. Also this study provides an effective mechanism for detecting and controlling electricity consumption in household sites based on their usage.Nowadays automation is present in all sectors, although over changing areas have emerged and successfully implemented but the power service provider is still using standard power acquisition methods used by each customer. This method is time consuming and costly and can lead to human error. An Automatic Energy meter system is only available in most study papers the program has not yet been implemented.Our proposed system will automatically send digital energy details to the service provider with the help of a GSM modem and that is why the system will report to the service provider once via SMS. The same system can be used to test the last readings consumed by the consumer, when required by the user with the same GSM modem.The main purpose of this project is to design a hi-tech energy meter with automatic control.

2. LITERATURE SURVEY

The traditional method of retrieving power data is incorrect and the cost of data entry systems is high. This report therefore introduces the development and

development of an automated meter reading system. This program is a way to monitor and remotely control the home power meter. This information is sent and received by the Power Supply Company with the help of the Global Mobile Networking (GSM) system. This system not only reduces labor costs but also increases the accuracy of meter readings and saves a lot of time. The system avoids error readings and error readings. It also provides increased data security. Reading and billing of GSM used energy meters benefits both service providers and consumers. This program overcomes the problems of standard metering systems and provides additional services such as power outages and interruptions. The upgraded system also provides information on daily, monthly and annual energy use. Information on daily energy use will help consumers manage their energy consumption. This improved system is reliable and secure as only authorized people can access this program.

3. METHODOLOGY

In residential areas the power grid and power lines coming to our homes have the following specifications 220v and frequency 50Hz (Indian standards). The Energy Meter IC MCP3905A/05L/06A with active power output for energy metering. The base device used for measuring the energy meter simultaneously for ARM7 LPC2148 will be an optocoupler. An optocoupler is a device commonly used to galvanically separate microcontroller electronics from any potentially dangerous current or voltage in its surroundings. Optocouplers usually have one, two or four light sources (LED diodes) on their input while on their output, opposite to diodes, there is the same number of elements sensitive to light. The point is that an optocoupler uses a short optical transmission path to transfer a signal between the elements of circuit, while keeping them electrically isolated. This isolation makes sense only if diodes and photosensitive elements are separately powered. In this way, the microcontroller and expensive additional electronics are completely protected from high voltage and noises which are the most common cause of destroying, damaging or unstable operation of electronic devices in practice. The most frequently used optocouplers are those with phototransistors on their outputs. When it comes to the optocouplers with internal base-to-pin 6 connection (there are also optocouplers without it), the base can be left unconnected to the current signal. The energy meter IC is producing impulses according to real power consumption. It calculates 1 KWh for 1600 impulses. For this the meter is rated as 1600imp/KWh. For every impulse the LED will blink. We have connected an Optocoupler high voltage side to this LED so that the Optocoupler will switch for every impulse. The direct connection from the energy meter IC may be dangerous for high voltage and make error for ac component to the ARM7 LPC2138/48. A relay is used in connection with energy meter for prototyping purposes here in this project. A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations, here one to four relays are connected across loads for prototyping purposes but the whole configuration can be used for individual households. When the load is connected across relay the energy meter starts working as well as optocoupler starts measuring impulses and starts sending data signal to ARM7 LPC2138/48 with UART established between ARM7 LPC2138/48 and ESP8266 module and GSM module SIM900A and the whole network is ready for serial communication. Total load consumed is calculated using formula

$$\text{Total load used} = \frac{K_h * N * 3600}{T} \qquad \text{-------(1)}$$

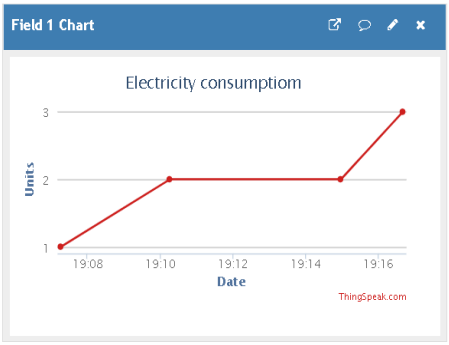
Were,

Kh = Regular meter

N = Pulse Number

T = Total Pulse Time for N Pulses.

Thus, code for total load consumed and their respective usage and unit conversion and power consumed, units consumed cost of power is programmed into ARM7 using keil compiler and proteus software (these software's are used for hex file creation). Also codes for Sim900a and ESP8266 for IOT integration and for mobile communication and app purposes. The first one being a LCD display which will display the units consumed and the rate accordingly. There is also a Sim900A (gsm/gprs model) which will send the messages to consumers and also the PSU company server for the documentation as well as for the daily message updates. The other one is , ESP8266(Wifi Modem) which will transmit the data to the website for the detailed report of the consumption , bill generation , daily consumption alert etc.We will be also using Thinkspeak service in order to represent the data in a graphical manner.



4. Results

After penultimate testing Of The Proposed Paper,we came up with the following results:

5. Scope and Applications

This system will create electricity consumption awareness among the common people , because they will have access to their live current consumption and the rate according to it(just like the daily mobile data consumption)and also there will be an active effort to save electricity as well as money The proposed system can be used in the following ways :

1) Automatic electricity bill generation
2) Daily message updates for the consumer
3) Monitoring of the meter reading regularly
4) Real time updates on the websites.
5) Hassle free operations between consumers and the power supply company.
6) Consumers can analyze their consumption pattern with greater clarity and can optimize their usage.

5. CONCLUSION

This kit overcomes the limitations of the standard meters and also provides additional services such as strengths Cut out the warning and interrupt warning. The upgraded system also provides details of daily, monthly and annual energy use. Details about daily energy use will help consumers to manage energy consumption. This came about the system is reliable and secure as it can only be authorized by an authorized person access the system This project aims to provide a comprehensive infrastructure for a power meter currently used for the concept of a smart city Major future developments will create energy meter readings, disturbing diagnostic methods, and communication and disconnection and initial details providing users everything will happen over Wi-Fi internet and the over text message for the consumers.

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