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TALKING ENERGY METER BASED ON MICROCONTROLLER

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Abstract – In recent years, the demand for electric ease of electricity. People are unaware of energy consumed by various appliances. An electricity meter is a device that measures the amount of electric energy consumed by various electrical appliances. The main drawback of previously used traditional meters is that they do not provide information to the consumers, which is accomplished with the help of Talking Energy Meter. As power consumption is increasing day by day there should be more focus on understanding consumption patterns. Traditional electromechanical energy meters are now replaced by electronic meters in domestic as well as commercial applications. This project is aims to design a circuit which helps the consumer in taking care of the electrical energy consumption. This system helps the users by alerting them about the billing status and unit consumption. The "Talking Energy Meter" using ATMEGA328 Microcontroller is an exclusive system which is used to help the deaf and dumb people to announce their requirements using voice module aPR33A3. This aims to provide a user friendly interaction.

1. INTRODUCTION

In the early phase of household technology, delivery of electricity is completely depended on traditional energy meters. These meters play a key role in measuring the consumption of electrical energy in individual households. The usage of these meters has been slowly declining with the improvement in technology as fast changes has been made to encounter the problems occurred by the traditional meters. The major problem arises when habitants are unaware of their daily behavior. Monthly feedback given to the consumers is not sufficient as the consumers will not have knowledge on how much energy does the individual appliances consume. To overcome the problems of traditional electricity meters, electronic meter or static energy meter comes in picture.

Now a day's, technology is developing rapidly. High automated and secured systems are preferred in all fields including electricity distribution. Electrical energy is universally accepted as an essential commodity for human beings. Energy is the prime mover of economic growth and is vital to the sustenance of modern economy. Future economic growth crucially depends on the long term availability of energy from its sources. The Microcontroller based "Talking Energy Meter" mainly aims at the middle class and the lower class family to bring their electricity bill down with the help of the power consumption alert system. It benefits the government as it is helps in reducing the power consumption and succeedingly can reduce the unusual power usage.

Energy meters being deployed at homes are used for reading the power that is being consumed. Each consumer may fix a customized threshold value (unit). If the value reaches above the threshold, it will alert to the consumer by voice module. This system may install at any place where the energy consumption should be regularly monitored and controlled. The consumers can fix their own threshold budget values and can be easily customized based on their requirements. This is used to continuously monitor the meter reading and give monthly information about the number of units consumed along with its cost to the consumer.

2. LITERATURE SURVEY & PROBLEM STATEMENT

LITERATURE SURVEY

1. Analysis of Smart Meter Data for Electricity Consumers
Author: GrzegorzDudek, Anna Gawlak, MirosáawKornatka, Jerzy Szkutnik

Published in: 2018 IEEE

Smart meter systems are being deployed to improve grid reliability and promote energy, water and gas efficiency while providing improved services to their customers. Smart metering which is installed in millions of households worldwide provides utility companies with real-time meaningful and timely data about electricity consumption and allow customers to make informed choices about energy, water and gas usage. Smart meter data analytics has become an active area in research and industry. It aims to help utilities and consumers understand electricity consumption patterns. This paper provides analysis methods for load data including: analysis of daily load profiles and similarity between them, analysis of load density, and analysis of seasonal and irregular components in the load time series.

2. Smart Meter for the IoT
Author: F. Abate, M. Carratù, C. Liguori, M. Ferro, V. Paciello

Published in:2018 IEEE

In recent years, smart devices are increasingly. These devices allow making cities smart, enabling communication not only among people but also among things, creating a new

system nowadays known by the term IoT (Internet of Things). A smart city is based on a smart grid that allows to intelligently manage the power grid. In order to do this, the network must have intelligent meters that can communicate bidirectionally with the network. This market has led to a proliferation of smart meters that give the opportunity to measure the consumption of each single device in homes. The most part of smart meters are based on a chip that calculates the parameters needed to estimate energy, water and gas consumption. In this paper, the authors consider a smart meter based on a common chip that calculate the power consumption and the meter characterization is reported.

3. Smart Energy, water and gas Metering and Power Theft Control using Arduino & GSM
Author: Visalatchi S, Kamal Sandeep K

Published in: 2017 IEEE

Energy, water and gas theft is a very common problem in countries like India where consumers of energy, water and gas are increasing consistently as the population increases. Utilities in electricity system are destroying the amounts of revenue each year due to energy, water and gas theft. The newly designed AMR used for energy, water and gas measurements reveal the concept and working of new automated power metering system but this increased the Electricity theft forms administrative losses because of not regular interval checkout at the consumer's residence. It is quite impossible to check and solve out theft by going every customer's door to door. In this paper, a new procedure is followed based on MICROCONTROLLER Atmega328P to detect and control the energy, water and gas meter from power theft and solve it by remotely disconnect and reconnecting the service (line) of a particular consumer

PROBLEM STATEMENT

The most common type of meter measures kilowatt-hours. When used in electricity retailing, the utilities record the values measured by these meters to generate an invoice for the electricity. They may also record other variables including the time when the electricity was used. The idea behind this project is to construct the Energy Meter that is useful for illiterates and the busy people who cannot concentrate on the energy meter readings because of their busy schedule. This system helps the users by alerting them about the peak loads (max energy consumption), power status (ON/OFF), billing status etc. The voice alerts could be in any local language. Hence this system can be used across the world. The typical voice alerts are "Over load", "Pay electricity bill", "Turn off the lights" etc.

Existing System:

Energy consumption is measured using various technologies. Bill for usage is generated and provided to the customer using certain methods. Payment is collected in electricity board from the customer. Recently, research into the field of Automatic Meter Reading System has continued to receive much attention in academia. Traditional Electro-mechanical meters where used to measure the energy consumption. It is an analog meter where readings are noted in the card by a person and the reading where taken to Electricity board station where the bill is generated for the consumption. The consumed data will arrive to the customers in the manner of written format. Consumer has to pay the bill for the usage in Electricity board station. Human error and inaccuracy is main disadvantage of this method.

Proposed System

A Talking Energy Meter works by communicating directly with wireless data protocol with the energy supplier, so the company will always have an accurate meter reading and there's no need to take a meter reading ourself. Talking Energy Meters can work in a variety of different ways, including using wireless mobile phone type technology to send data. There are many benefits of smart energy meter. Talking energy meter monitor shows how much energy you're using in money. So users can see what they are spending by the minute. Knowing more about how much energy things use, will help to choose the way the user uses them.

3. DESIGN OF ENERGY METER

The complete circuit diagram is shown in Fig. In energy measure, the power information varying with time is calculated by a direct multiplication of the voltage signal and the current signal.

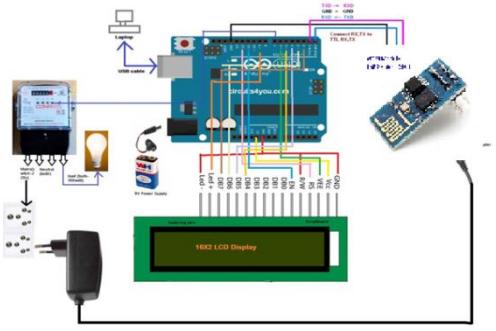

Fig 1: Circuit Design Of Energy Meter

The energy meter IC is producing impulses according to real power consumption. It calculates l KWh for 1600 impulses. For this the meter is rated as 1600imp/KWh. For every impulse the LED will blink. We have connected a Potentiometer to the LED which is used to adjust the contrast of the LCD.

4. WORKING AND RESULTS

WORKING

The purpose behind this system is to design a circuit which aware the consumer about their energy usage by giving the voice alert when consumed energy get exceeds the threshold limit which is set by the user according to their requirement. It also helps to monitor the electrical energy usage and protect the meter if someone tries to theft the electricity by cutting the line of meter with prior SMS to the electricity board.

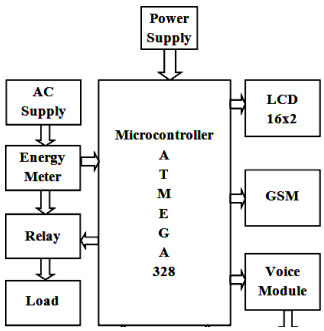

Fig 2: Block Diagram

The block diagram of Talking Energy Meter based on Microcontroller. An AC source is given to the electric energy meter and from this; the load is connected to the meter via a relay switch. The billing of the corresponding energy usage is determined and per unit rate of consumption is set at the time of programming. The threshold unit value is set for which the consumption level increase is notified to the user. And the user can change that threshold limit according to the requirement by using dome switch. A relay switch is connected with the microcontroller and the load which is used to cut the supply if someone tries to steal the electricity, it is used as protection purpose. Voice Module is used to give the alert when consumption of units exceeds the set limit by user. As soon as the limit exceeds, the voice alert occur and SMS get send on registered mobile number.

Smart Energy Meters

It is an advanced metering technology involving placing intelligent meters to read, process and feedback the data to customers. It measures energy consumption, remotely switches the supply to customers and remotely controls the maximum electricity consumption. Prepaid Energy Metering system uses the advanced metering infrastructure system technology for better performance.

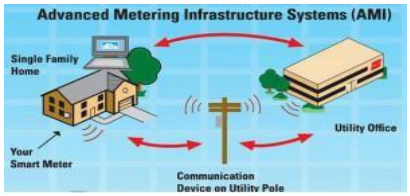

Fig 3: Smart Energy Meter

These are capable of communicating in both directions. They can transmit the data to the utilities like energy consumption, parameter values, alarms, etc. and also can receive information from utilities such as automatic meter reading system, reconnect/disconnect instructions, upgrading of meter software's and other important messages. These meters reduce the need to visit while taking or reading monthly bill.

RESULTS

The proposed system introduces a new method of meter reading electronically and transmitting to headquarters for further processing. This helps in reducing the manual errors that occur in the present meter reading systems. Meter reading system can be used to take readings for different utilities. Let us consider an example of Electricity; here we are connecting the Energy Meter between main supply and load, by which Microcontroller will be able to measure the energy units consumed by the consumer. When the various appliances of the household consume energy, the energy meter reads the reading continuously and this consumed load can be seen on meter. We can see that the LED on meter continuously blinks which counts the meter reading. Based on the blinking, the units are counted. Normally, 3200 blinks is one unit.

Fig 4: LCD Module output

RS pin of the LCD module is connected to digital pin 12 of the Arduino. R/W pin of the LCD is grounded. Enable pin of the LCD module is connected to digital pin 11 of the Arduino. This method is very simple, requires less connections and we can almost utilize the full potential of the LCD module. Digital lines DB4, DB5, DB6 and DB7 are interfaced to digital pins 5, 4, 3 and 2 of the Arduino. The 10K potentiometer is used for adjusting the contrast of the display. The Arduino can be powered through the external power jack provided on the board. +5V required in some other parts of the circuit can be tapped from the 5V source on the Arduino board. The Arduino can be also powered from the PC through the USB port.

CONCLUSION

The proposed Talking Energy Metering System is capable of monitoring various parameters of electrical energy and the consumer can take suitable precautions to safe guard the electrical appliances. This makes the consumer an active part of Energy Management. The consumer can also control the load during peak hours. If the amount of load shifted to normal hours there by the peak demand will go down and hence power generation during peak hour can be reduced,

this brings the production cost down. Since, the consumers get benefited for limiting the consumption during peak hours, they become vigilant in managing electricity consumption. Hence, the designed Talking Energy Metering system is useful to both utility Provider and consumers. The complete working model of a smart energy meter was built. The model satisfactorily worked with a lamp load.

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