

IoT Based Energy Meter Reading, Theft Detection and Energy Control Using GSM

^[1] B.Ravali, ^[2] R.P.ManikantaKumar, ^[3] V.Aditya, ^[4] CH.Amrutha, ^[5] N.Veeraiah
^{[1][2][3][4]} B.Tech students, Dept. of ECE, MIC College Of Technology, Andhra Pradesh, India
^[5] Asst.Professor, Dept.of ECE, MIC College Of Technology

Abstract - This paper has the information about the design based on ATmega328p micro controller and also has the energy meter implementation using the concept of IoT. This system design intimate about the Theft detection, power or energy consumption and energy control. When theft is detected at particular transformer it will noticed to the service provider end and consumers. How much power consumed in their house stored in the web page, so consumers can monitor their energy or power consumption. If the capacity of the meter is exceeded i.e., over load, that information is intimated to the consumer, so consumer can monitor their meter safely. The hardware interface circuit involves ATmega328P micro controller, wifi module, GSM modem.

Index Terms— ATmega328P micro controller, ESP8266 Wi-Fi module, GSM modem.

I. INTRODUCTION

Today, our world is frequently facing a challenging environment everywhere. The main problem is energy crisis. For this problem, having a relevant system to control and monitor the power usage is the only solution. Reducing the usage of power in households is the only approach through which today's energy crisis can be addressed.

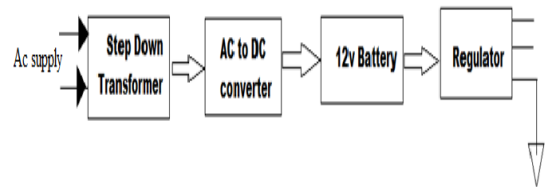
We should provide an ideal solution for this, so that consumers can be facilitated. The solution is concept of IoT (Internet of things) meters. Here, current transformers and voltage transformers are connected consider as a energy meter.

In this information like electricity theft can be known to service provider end and consumer through GSM. How much theft energy is detected it is stored in the web page, so consumers also to know about the energy.

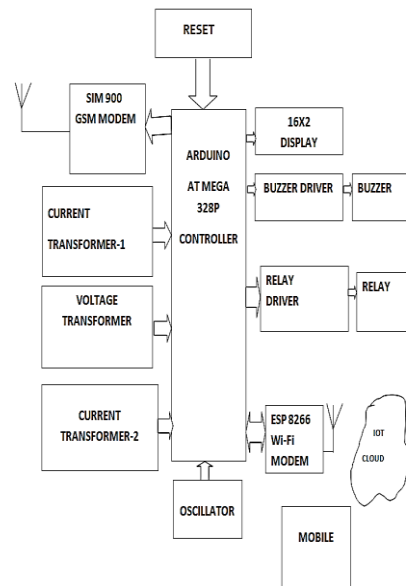
Number of units the consumer consumed is stored in web page by wi-fi module, so consumer knows about their energy consumption by using their IP address in web page. Consumers can monitor their power or energy. If the meter is over loaded it will noticed to the consumer through GSM.

Following the above factors, this concept is of four units. They are Microcontroller unit, current transformers, GSM modem and Wi-Fi module. The consumers can keep track on their power consumption from a web page providing a device IP address.

BLOCK DIAGRAM



Fig(1a) : Block diagram of power supply



Fig(1b): Block Diagram Of Smart Energy Meter

II. RELATED WORK

We have observed that many researches have done relentless work on internet of things(IoT) and PCB boards (circuits).The paper from the web server gave us basic idea of IoT bases energy meter which are authorized by merolop,landic,ianniel G. This IoT based meter can gives us to analyze the unnecessary power loss in different areas and improve efficiency of power system one of the papers of web server written by darshan iyer gave the information on power theft detection ,the same related work can be collected from paper by pounam barle ,ankitha saswadhar ,pupal,s kali.

A. Existing Method

The present system of energy meter provides the feedback to the house holder (consumer) in the form of bill at the particular date every month . The bill is based on the power consumption by the consumer in that particular month.the major disadvantage in the present system is tampering of power system meter which causes energy crisis.

B. Proposed method

The existing system has no way to track the energy usage on a more immediate basis,to overcome this problem this method has an opportunity to know.

III. SYSTEM IMPLEMENTATION

The project describes about the theft detection, power optimization and relevant energy consumption information to user.User can also know the number of units consumed from a web page by providing device IP address .If there is any theft detection occurs in energy or smart meter will be displayed on the window.

Power supply is a primary requirement for the project work for this we have to use center tapped secondary of 12v-0-12v(step down) transformer and current transformer is used to measure the alternating current.Here semi-conductor diodes are used as a rectifier to convert alternating current(AC) to direct current(DC) .The rectified output is filtered for smoothing the DC, for this purpose capacitor is used.IC LM 78XXX series is used for voltage regulator and safe guard it from overheating.The pulse data from energy meter takes the ATmega328 micro controller and performs the logic or control operations like number of units the consumer consumed and send it to the wi-fi module.Meter reading

,wi-Fi configuration data will be displayed on the LCD module .

1.Electro-Mechanical Switch For Load:

It is a mechanical switch which is operated electrically to turn ON or OFF current in an electrical switch. when the applied current or voltage exceed the threshold value,if the coil activates the armature it which operates either to close the open contacts or to open the closed magnetic force that activates the switch mechanism.

2(i). Theft Detection:

Here we have used two current transformers one is at the source end (current transformer-1) and other is at load end(current transformer-2).If the power difference between these transformers is exceed the threshold level then there is a theft is detected.The buzzer driver indicates the theft by raise the buzzer and relay activates the switch mechanism.

Theft detection result is intimated by the company side and consumer side from the web page or to the particular mobile number registered for that meter device.

2(ii).Power consumption:

Consumers knows about their energy consumption from the web page by using their IP address by the wi-fi module.so consumer can monitor their power or energy.

2(iii).Energy control:

If the meter threshold level is exceeded due to the overload it will notify to the consumer through GSM to send the msg to the consumer.

3.Wi-fi Unit:

Wi-Fi is a technology for wireless local area networking with device based on the IEEE 802.11.standards.Wi-fi modem is used for store the information in cloud like theft detection , number of units the consumer consumed.

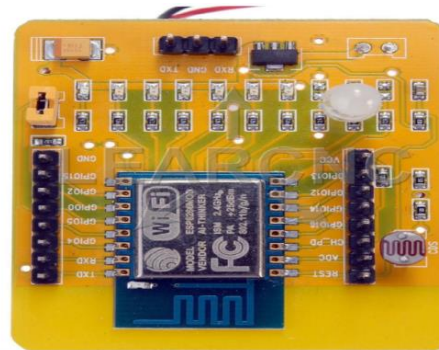


FIG: WI-FI MODEM

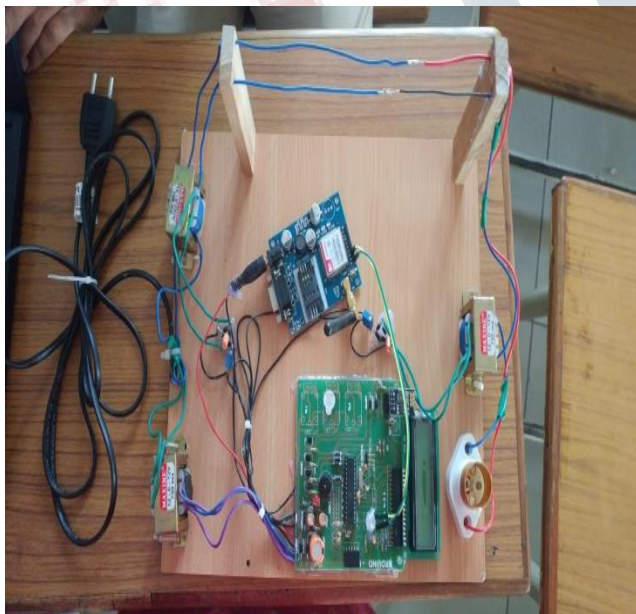
4. GSM Modem:

GSM modem operates over a subscription to a mobile operator. Here theft detection information and meter over load information is intimated to the service and consumer provider end through GSM modem to the particular mobile number register for that meter device.

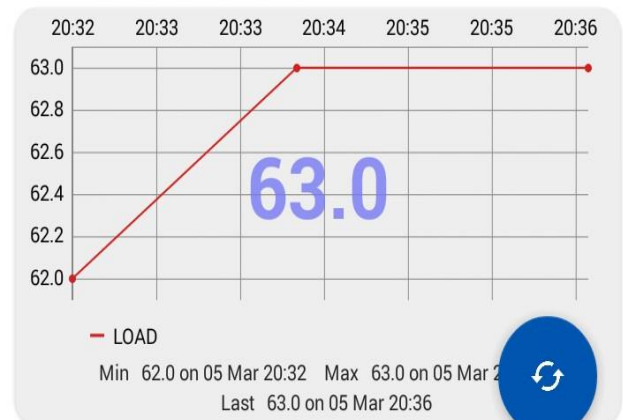
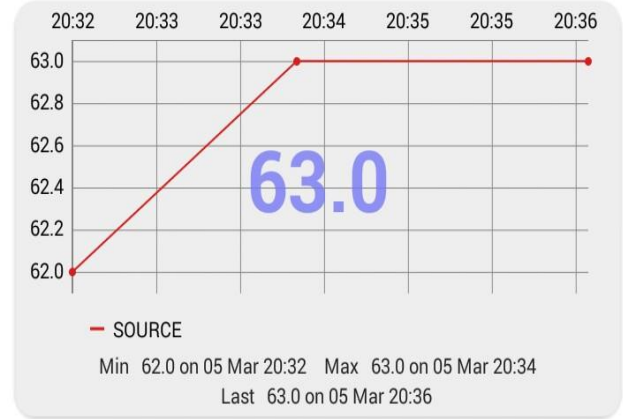


FIG:GSM MODEM

IV.RESULT



Fig(4):IoT energy meter reading and theft detection circuit.



Fig(4b):Terminal window showing theft detected and energy consumption.

V.CONCLUSION

According the present generation of smart city advancement THEFT & POWER ENERGY METER which is mainly concentrated on connectivity and network factor of the IOT , energy consumption calculation based on connecting of calibration pulses which is designed and implemented using PIC18F46K22 MCU in embedded system domain.

In this IOT based meter reading system is designed to continuously monitor in the meter reading and service provider. Which is also used to disconnect the connection when customer doesn't pay monthly bill. Which mainly avoided human involvement and deliver effective meter reading, prevent billing mistake.

***THE PROJECT HAS ACHIEVED FOLLOWING
OBJECTIVES:***

- Ease of accessing information for consumer from energy meter through IoT.
- Theft detection at consumer end in real time.
- LCD displays energy consumption units and temperature.
- Disconnection of service from remote service.

REFERENCES:

[1] Andrea Zanella, Senior Member, IEEE, Nicola Bui, Angelo Castellani, Lorenzo Vangelista, Senior Member, IEEE, and Michele Zorzi, Fellow, IEEE, "Internet of Things for Smart Cities", IEEE Internet of Things Journal, vol. 1, no. 1, pp. 22-32, February 2014.

[2] Poonam Borle, Ankitha Saswadhar, Deepali Hiwarkar, Rupali S Kali, "Automatic Meter Reading for Electricity", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 2, no. 3, pp. 982-987, March 2013.

[3] Landi, C.; Dipt. di Ing. dell'Inf., Seconda Univ. di Napoli, Aversa, Italy ; Merola, P. ; Ianniello, G, "ARM-based energy management system using smart meter and Web server", IEEE Instrumentation and Measurement Technology Conference Binjiang, pp. 1 – 5, May 2011