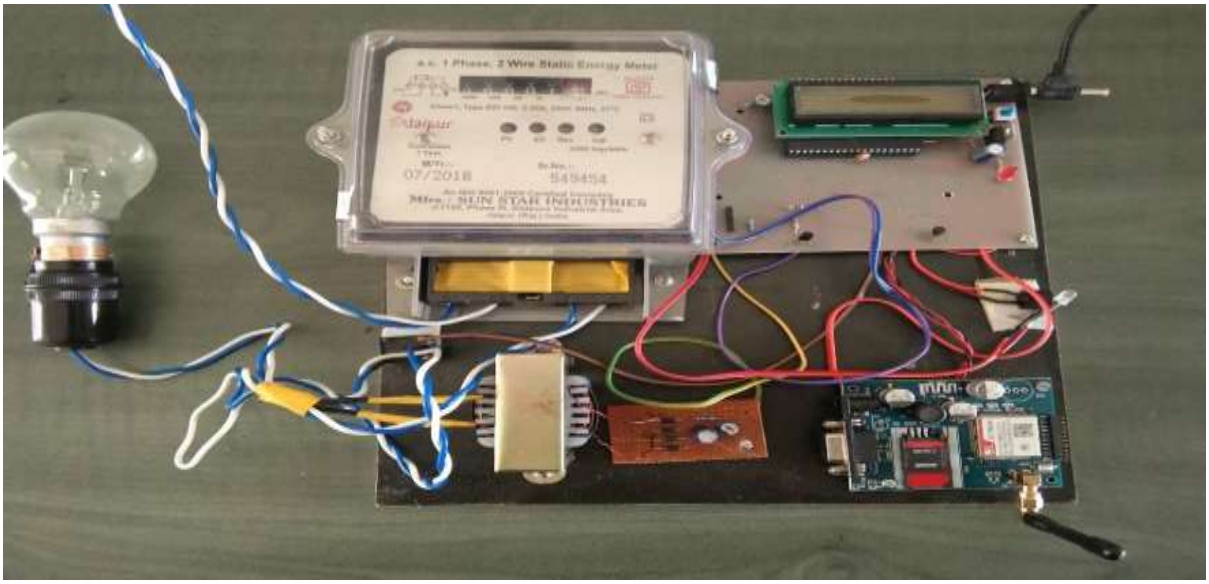
APPLICATION OF IoT- IN WIRELESS MICROCONTROLLER BASED PREPAID ENERGY METER

M. J. HEDAU[1], M. P. DHORE[1,] M. C. NAIDU[2],
1 Shri Shivaji Science college Nagpur, India
2 Hislop college , Nagpur, India

Abstract : The present paper describes how ICT plays an important role in a microcontroller based intelligent module of prepaid ENERGY METER. It is useful to modify the billing process and collection of amount to the power distribution companies. An automated module has been designed here to make the entire process online through an web app proposed to the distribution Company. The idea is to develop an automated microcontroller based Pre-Paid energy meter with EPROMS to keep the count of power unit consumed and power units available for the consumer. The Intelligent module then can send warning messages to the consumer when the available power unit drops below certain level. Power consumed is shown by the energy meter in form of 1 unit or 1 kilo watt hour of energy consumed. 1 kWh refers to the electrical energy required to provide 1000 watts of power for 1 hour. The function is exactly similar to prepaid SIM used in mobile

Keywords: Microcontroller, EPROM, Electronic meter

I. INTRODUCTION



CONSTRUCTION OF POWER METERS: In this meter an aluminum disc is placed two electromagnets, one of whose one coil is connected to the load and the other coil of another electromagnet is connected to the supply voltage. The interaction of the fluxes between the two coils provides a torque to the disc, which starts rotating, with the revolutions proportional to the load current. The counter records the number of revolutions and displays them, which indicates the energy consumed.

NEED FOR PREPAID ENERGY METER SYSTEM:

A human intervention is needed for the distribution company to carry out entire process of recording the units utilized by the consumers. Right from noting the reading and preparing the bill is very tedious job and the accuracy not guaranteed due to errors in human reading. To eliminate various problems, the most convenient method is to use prepaid meter in future.

EMBEDDED SYSTEM:
An Embedded System is a combination of microcontroller based hardware and typical software to undertake specific task. Embedded systems uses microcontroller to perform its own task.
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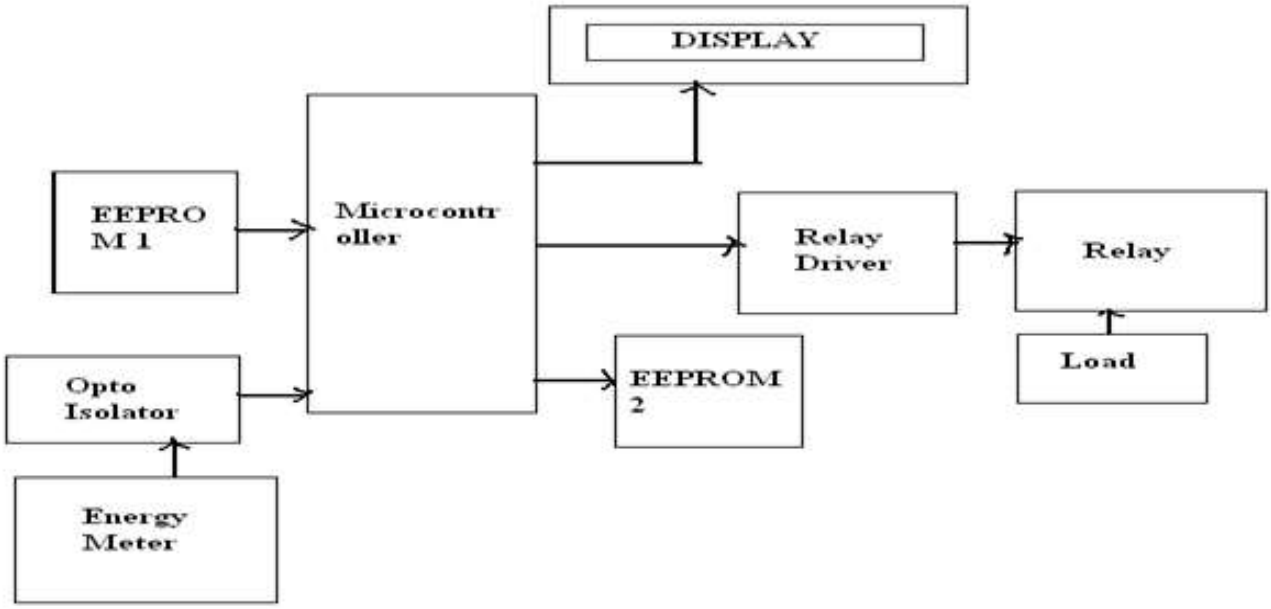
GSM MODULE : A GSM modem is a device which can be either a mobile phone or a modem device which can be used to make a computer or any other processor communicate over a network. The GSM modem has wide range of applications in transaction terminals, supply chain management, security applications, weather stations and GPRS mode remote data logging.

Working :



Prepaid Energy Meter System basically like in a mobile phone recharging, the consumer buys a recharge from the distribution companies web app and gets some energy units in return for an amount specified by the distribution company as per the consumers usage. The Power Units will keep reducing for every unit of energy consumed and once zero, the power supply would be automatically cut off. The amount deducted for every unit of energy consumed can be controlled by the distribution unit according to the peak hours.

A simplest type of Prepaid Energy Meter consists of two EEPROMs interfaced to a microcontroller. One EEPROM contains the recharged balance Units. The microcontroller reads this balance and stores it in the other EEPROM along with the tariff .The energy meter supplies pulses to the microcontroller for every unit of energy consumed. The microcontroller increases the spent energy unit by one and decreases the balance amount in the EEPROM by the fixed tariff. As soon as the balance unit in the EEPROM comes down to zero, the microcontroller sends a signal to the relay driver which in turn switches off the relay, such that the main supply to the load is switched off. An LCD is also interfaced to the microcontroller which displays the amount of energy consumed. The recharge card is actually an EEPROM in which the allocated energy units is stored. The Microcontroller reads the balance amount and stores it along with the tariff and the energy units allocated in its RAM and are programmed to delete off the information present in the EEPROM (making the card invalid for further use). The energy meter gives electric signal to the opto isolator which consists of an LED and an opto-transistor combination such that the LED glows and emits light for every electric signal received by the energy meter (which sends a electric signal for every unit consumed). The opto-transistor starts conducting and sends high and low pulses to the microcontroller. The microcontroller is programmed such that a counter is kept incrementing for every pulse rate, which gives the value of the energy consumed.

Another EEPROM is interfaced to the microcontroller where the balanced amount and the energy units consumed are stored. For every increment in count, the balanced amount in this EEPROM is deducted. Finally when the balance amount is zero, the microcontroller sends a low signal to the Relay driver to give a high signal at its output, which switches off the relay. Normally the microcontroller gives a high signal to the input pin of the relay driver, which develops a logic low signal at its corresponding output pin and the relay coil is energized, thus connecting the load to the main supply. Also warning messages are send to the consumer mobile phone at some predetermine level to indicate the reducing available power unit. This enables the consumer to recharge before the power is cut off.

BENEFITS OF PREPAID METER

- In the conventional System (Post Paid) the consumers pay the bill after almost a month after they have consumed the Power, whereas in the prepaid system the Distribution company gets the money as soon as the consumer recharge for the same.
- In the conventional system large man power is needed to take reading of the units consumed by the consumer, preparing bill for the same, distribution of the bills for every household and at the end collection of the bills, which is completely eliminate in the Prepaid system
- The consumer in the prepaid system get constant warning regarding the units consumed by them which lead to proper management and use of the power by the consumer.
- The prepaid system completely eliminate defaulters which is a big problem faced by the distribution company and provides them with full control over distribution system.

ICT REPLACE WITH IOT

Machine-to-Machine communication is the association of information and communication technologies (ICT) but Internet of Things or IoT is a global infrastructure for the information society, which allows advanced services by interconnecting objects (physical or virtual) using technologies existing or evolving interoperable information and communication". A long distance communication refers to a combination of hardware and software making it possible for information exist in an ICT (Information Technology) network.

CONCLUTION : It is highly accurate as the whole idea of reading the units and then billing manually or any other means is eliminated. Consumer cannot escape from paying the electricity bill and the State Electricity Board gets free from debts. On the consumer front, the tedious task of paying the bill and waiting anxiously for the bill is eliminated. Wastage of energy is diminished as now only the required energy will be consumed as allotted. The power grid can monitor the overall energy consumption and any tampering attempts are actually of no use and can be detected if still prevalent.

FUTURE SCOPE

In future this concept will helps for designing the better product to the consumers. It should be possible by wireless communication. The designing of hardware of this product is affordable to consumer and also efficient to achieve the work.
In incoming days the product will be world wide of all energy meter. We are thinking about to add new future in our product to provide world wild connection of all energy meter with advance feature. ICT manage all the function of energy meter.

REFERENCES

1. American International Journal of Research in Science, Technology, Engineering & Mathematics ISSN (Print): 2328-3491 "Meter with GSM Technology Prepaid Energy"

2. International Journal of Computer Science and Electronics Engineering (IJCSEE) Volume 4, Issue 2 (2016) ISSN 2320–4028 (Online) "A Prepaid Energy Meter Using GPRS/GSM Technology For Improved Metering And Billing"

3. International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 06 Issue: 03 | Mar 2019 www.irjet.net p-ISSN: 2395-0072 2019, IRJET | Impact Factor value: 7.211 | ISO 9001:2008 Certified Journal | Page 1161

4. M. J. Hedau, M. P. Dhore, P. B. Dahikar, "Application of Wireless Signal Simulation Via Cell-Phone "International Conference on circuit system and simulation, , pp. 92–95, Vol.7, IACSIT Press, Singapore, 2011

5. M. J. Hedau, M. P. Dhore, P. B. Dahikar, "Application of Microcontroller in Technical communication" International Journal of ETA and ETS, ACSIT ISSN No 0974-3588Vol.5Issue 1,2012.

6. P. B. Dahikar M. J. Hedau, S. C. Moholkar "Application of Microcontroller in Receiving Unit of the Technical Communication"International Journal of ETA and ETS, IACSIT ISSN No 0974-3588 Vol.5 Issue 2, 2012.