

**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH
TECHNOLOGY****STUDY ON SMART METER READING FOR DATA MONITORING****Lalit Mohan^{*1} & Varsha Mehar²**^{*1}M.tech Scholar Department of Electrical Engineering Bhabha College of Engineering Bhopal, India²Asst.Prof. Department of Electrical Engineering Bhabha College of Engineering Bhopal, India

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ABSTRACT

In an electrical power system, The electric meter board officially to manually take a meter readings and calculate bill as it is time consuming and requires man power. Billing consumers for energy consumption is not uniform. It is a tedious job for the electricity board official to Manually go and take meter readings of big industrialists and reset their power demand after recording it. Even the latest smart meter is not tamper proof. Hence Considering all these factors it is possible to design an smart meter reading that is tamper proof, supports automatic meter reading and billing system , which device using an industries and home of transmission lines. The meter can be used to take the readings of which device operating show the meter of running the device industrialist which sends these readings to a secured data automatically reset it after recording it.Considering all these features that can be done by a single Energy meter it is called a SMART METER.

A Smart meter system has been design For operating device show the display which are running in power electronics system and also we are using Microcontroller ATMEGA328 which show device machine cycle the monitor to load. Parameters like as voltage, current circuit and power energy use are done using protocol Communication USART Master Microcontroller is done. Units is found, wireless technology GSM Technology are used to send SMS to a monitor control unit section.

Keywords: Smart meter to load monitor, GSM technology, Microcontroller Atmega, PCB board, line power transmission.

I. INTRODUCTION

Energy meter reading to billing is an important part of power energy distribution. One of a time a person from the authority side comes and count the meter reading and show the bill to the consumer. The big problem with in this system is that it required of a man power, time consuming and causes error. So there comes the scope of a "SMART METER" which will provide bill to consumer both as an SMS along with other inbuilt features such as tamper proof, fault detection etc..Theproposed energy meter utilizes a GSM module to transferenergy consumed to the authority side. Similarly authorityside also uses these GSM service to send back the bill.

Electricity stealing is also common issue now. The maindisadvantage of mechanical meter was it was less reliable,less accurate and non-tamper proof. Even the present dayelectronic energy meters used by electricity board is notcompletely tamper proof. The proposed energy meter alsohave the feature of detecting faults in the distribution system,made by checking the status of supply at distributiontransformer and that at consumer.

Voltage power network is connected to the power line to showterminal voltage of load. Then it multiple line them to get power in that instant. Then it processes its count machine cycle code o the device and values of power to calculate the total power consumed by load. Automated billing of energy meter is made possible by connecting a GSM modem to the energy meter. As the authorities request for the units of energy consumption the same is send to them through GSM service from the energy meter. Once the value reaches the board they prepare a bill and send this to the registered mobile number of the consumer also a hard copy of the bill is mailed to the address if the registered consumer. The bill is prepared using a thermal printer which requires no ink at all, thus saving of money.

Meter monitor:-In Electronics power unit system, a monitor to running condition is any work to flow condition of electric current. As like a short condition circuit break is a power break line in which current flow by passes through the normally load. if a circuit is interrupted by some failure. The proper short circuit fault at to current

of a fault can be calculated for electronics power systems. In transformer power electronics unit systems, protection devices monitor to detected a fault conditions and operate circuit trip a phase and other devices to limit the of service to a unit power system off.

There are various power monitor to display-

1. Load which device will be connect show a display
2. Total load of power which is operate condition
3. GSM send message show a display
4. Show bill on display how much pay.
5. Calculation all load show a display

II. METHODOLOGY

Load calculation

AMR also give the information of total load used in a house on request at any time. Total load used in any house can be calculated by observed or record N number of pulse in T time that is described by equation number .

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

Where

K_h = Meter constant

N = Number of pulse

T = Total pulse time of N pulses.

Energy meter also sends a SMS alert to the energy provider company and customers if any persons used more than specify limit of load. The energy provider company can disconnect the power of respective customer. So customers manage their house power consumption.

The power factor use this system and calculate

$$\text{Power factor} = \frac{\text{True power}}{\text{Apparent power}}$$

$$\text{Power factor} = \frac{119.365 \text{ W}}{169.250 \text{ VA}}$$

$$\text{Power factor} = 0.705$$

$$\cos 45.32^\circ = 0.705$$

For the purely resistive circuit, the power factor is 1 (perfect), because the reactive power equals zero. Here, the power triangle would look like a horizontal line, because the opposite (reactive power) side would have zero length. For the purely inductive circuit, the power factor is zero, because true power equals zero. Here, the power triangle would look like a vertical line, because the adjacent (true power) side would have zero length.

The same could be said for a purely capacitive circuit. If there are no dissipative (resistive) components in the circuit, then the true power must be equal to zero, making any power in the circuit purely reactive. The power triangle for a purely capacitive circuit would again be a vertical line (pointing down instead of up as it was for the purely inductive circuit). Power factor can be an important aspect to consider in an AC circuit because of any power factor less than 1 means that the circuit's wiring has to carry more current than what would be

necessary with zero reactance in the circuit to deliver the same amount of (true) power to the resistive load. If our last example circuit had been purely resistive, we would have been able to deliver a full 169.256 watts to the load with the same 1.410 amps of current, rather than the mere 119.365 watts that it is presently dissipating with that same current quantity. The poor power factor makes for an inefficient power delivery system.

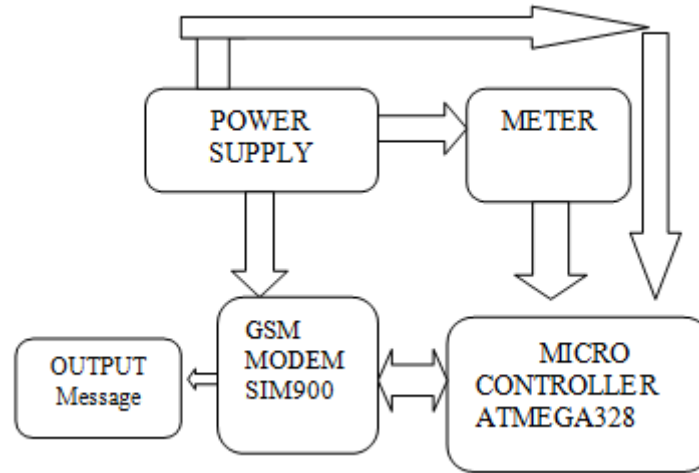
Poor power factor can be corrected, paradoxically, by adding another load to the circuit drawing an equal and opposite amount of reactive power, to cancel out the effects of the load's inductive reactance. Inductive reactance can only be canceled by capacitive reactance, so we have to add a *capacitor* in parallel to our example circuit as the additional load. The effect of these two opposing reactances in parallel is to bring the circuit's total impedance equal to its total resistance (to make the impedance phase angle equal, or at least closer, to zero).

III. WORKING AND PRINCIPAL

This implemented system design mainly for the Smart meter reading a Power system. The system design electricity will be Transformer coils1 and coils2 available for more number of turns in highly copper area. Firstly we give 230v AC power supply to the transformer. Here we are using 12V,1Amp step down transformer that convert 230v AC into 12v AC. On rectifier circuit (Signal conditioning circuit). Each line having 2 wires ,one is phase and another is neutral. Diodes are connected in H pattern. Here we are using 1N4007 diode. It work as a rectifier that convert 12v AC into 12v DC. Capacitors are used in power supplies for smooth the output of a rectifier circuit. Here we are using three 7805 voltage regulator IC'S that fixed the voltage at 5volt. Register having 1k value and LED'S are also connected together in series for fault indication.

Now 3 phase wires from this board goes to LCD board . Where these 3 wires are connected from three pin connector. This LCD board need an external power supply to operate this board ,so we connect 9v battery from it. Here we used 16x2 LCD DISPLAY and ATMEGA 328 microcontroller which is 28 pin . LCD and Microcontroller are interfaced together. Microcontroller's first pin is reset. It's second pin connect to GPS i.e. global positioning system and third pin is connected to GSM i.e. global system for mobile communication. Here we are using SIM28ML GPS Modem and SIM300 GSM Modem. Microcontroller's 4th pin connect to LCD's 4th pin i.e. register select. It's 5th pin connect to LCD's 6th pin i.e. enable. It's 7th pin connect to 5v supply. 8th pin of microcontroller connect to ground. 9th and 10th pin of microcontroller connect to crystal oscillator and ceramic capacitor. where crystal oscillator provides clock frequency and ceramic capacitor used for noise elimination. 11th ,12th and 13th pin of microcontroller connect to line meter load wire 14th,15th,16th& 17th pin of microcontroller connect to LCD's 14th,13,12th& 11th pin simultaneously these are data lines. 18th and 19th pin of microcontroller are open. 20th& 21st pin connect to VCC i.e.5v. 22nd pin goes to ground & 23rd-28th pin are open. When system works properly LCD get initialized and display welcome message on it. If fault occurs in any one of the line , it indicates on LCD DISPLAY in the form of load device power calculation to a load unit send GSM send the message to a responsible person. With the help of this monitoring and massaging system we can easily pay the meter bill as soon as possible. It's save our time and prevent the possibility. It is also connect to LCD board with 2 pin connector and send the message on LCD in the form of meter reading data. All this implemented system connects near about the distribution power unit not in substation. Substation used only massaging purpose where the responsible person receives the message of meter reading unit and device information . With the help of AT COMMANDS GSM send the message to one or more than one person it depends upon you how much number you add in it. All this system is connected to MPSEB also.

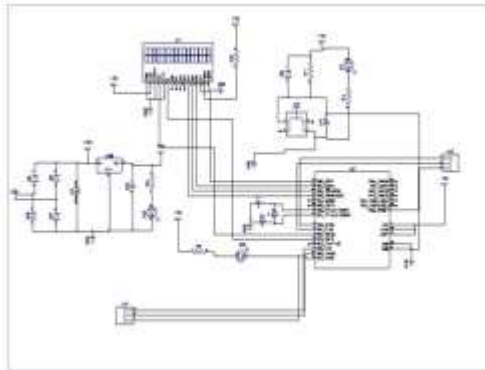
Hardware Design



IV. CIRCUIT DESIGN

4.1 Circuit monitor for device

This circuit for monitor to fault and send the fault information



V. EXPERIMENTAL RESULTS

Figure 4.1 shows the prototype modal of GSM based energy meter. In this project the pulse and unit (meter reading) count continuously according to load connected. Accordance to their demand of meter reading energy provider company send a SMS to the respective meter. Microcontroller receives this SMS through GSM modem so an interrupt signal occurred due to SMS. Microcontroller read pulse and unit from send the same to authorized number. total load used alert feature of this system in a house. Energy meter sends a SMS alert to energy provider company whether people using more than specify limit of load in such format "Excess load use by METER ID 2134455 Date: 23/04/18 Time 10:13:28". Energy provider also gets the information of power load at any time. Last but not the least important feature of this system is that it gives the information of tempering, if any person attempts to temper energy meter, then a signal will be active and AMR will sent a SMS to energy provider company that "Tempering occurs on Meter.

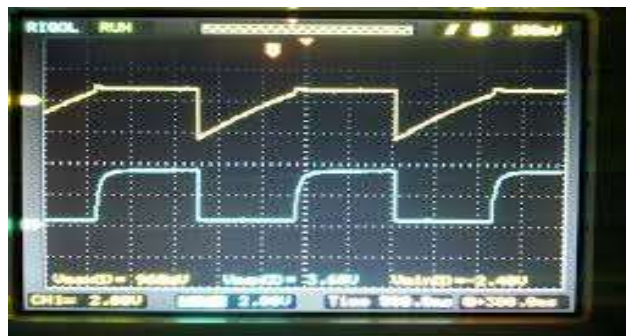


Practical implement prototype Smart meter

The all system design first PCB design by software, and transformer design AutoCAD connected to a wire and coil turns 1000 and component soldering by PCB check the hardware of the system testing LCD display show the location and Fault and fault circuit Also design by PCB and connect to to this system and GSM modem connect to RX and TX pin Microcontroller USART communication.



Message of smart meter reading



Output voltage and current waveform

Advantages of the system

1. This system design is very useful for electric power unit maintenance.
2. This System protection for every device
3. In system can b control over load problem.
4. Power distribution unit easily calculation .
5. The system design very low cost .

VI. CONCLUSION

GSM based energy meter is easy to installation and beneficial for both energy provider and consumer. AMR is not only solve the problem of manual meter reading but also provide additional feature such as power disconnect due to outstanding dues, power reconnect after pay dues, power cut alert, tempering alert. AMR also gives the information of total load used in a house on request at any time. It sends a SMS alert to energy provider company whether a person using more than specify limit of load. The statistical load used and profile



can help customer manage their energy consumption. This system is secure and reliable because it can be accessed only by an authorized person. If any un-authorized person tries to access the system this system send an alert to energy provider and also give warning of that unauthorized person. This device has the capability to revolutionize the energy meter market and will become help to country revenue by stopping the current theft and punishing the dishonest customers.

VII. SCOPE FOR FEATURE WORK

A smart meter monitor at a module can be connect to this system for receiving and storing device parameters information periodically about all the distribution power of transformers utility in a database application. This database will be a useful source of information on the utility power unit. The utility in monitoring the operational device a work of their power distribution and identify device before at characteristics failures thus resulting in significant very cost saving fast working system reliability.

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