IoT BASED POWER DEMAND CONTROLLER

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ABSTRACT: **The system controls the current level electrical loads to maintain the total electrical power demand during a demand interval within certain predetermined limits. The demand forecaster makes periodic projections of the metered demand to the end of the demand interval based upon the current rate of energy consumption (instantaneous demand) and the accumulated energy consumption during the demand interval. If the projected value indicates that a demand peak will occur, the system signal interrupting the load to prevent the occurrence of the peak. Conversely, if the system detects a projected low value of the demand, a "restore" condition exists whereby the load is turned on to take advantage of the available electrical capacity.**

Keywords— Energy meter, demand, power,

I. INTRODUCTION

The Internet of things (IOT) concept enables us to connect the normal day to day devices with each other over the internet. The devices connected through IOT concept can be analysed remotely. The IOT concept provides the basic infrastructure and opportunities to form a connection between the physical world and computer based systems. The concept has been gaining importance with more and more wireless devices that are increasing rapidly in the market. hardware devices are connected with each other over the internet. The ESP 8266 Wi-Fi module used in the system provides the connectivity with the internet in the system.

Now-a-days the demand for electricity is increasing at a constant rate in the population and is being utilized for various purposes viz, agriculture, industries, household purposes, hospitals etc.,. So, it is becoming more and more complicated to handle the electricity maintenance and requirements. Therefore there is an immediate requirement to save as much electricity as possible. As the demand from the newer generations of population for electricity is increasing so in along with it the technology improvement is needed. The proposed system provides a technical twist to the normal energy meters using the IOT technology. Also there are other issues that we have to address such as power theft which in turn generate economic loss to the nation. Monitoring, Optimized power usage and reduction of power wastage are the major objectives that lie ahead for a better system.

Smart energy meter using Wi-Fi system is designed based on three major objectives.

They are :-

1.   To provide automated load energy reading over an immediate basis.

2.   To use the electricity in an optimized manner.

3.   Reduce the power wastage.

1.   Consumer end

2.   Service end.

The data from the system is displayed on a webpage which can be accessed by the consumer.

The system is designed on PIC micro controller. It can be structurally differentiated into three parts viz., controller, theft detection circuit and a WiFi unit. The controller performs the basic calculations and processes the information. Theft detection circuit provides information about any extra or theft load energy reading and the most important role is played by the Wi-Fi unit to send the information from the controller over the Internet.

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METHOD

The system principally monitors electrical parameters of household appliances such as voltage and current and subsequently calculates the power consumed. The novelty of this system is the implementation of the controlling mechanism of appliances in different ways. The developed system is a low-cost and flexible in operation and thus can save electricity expense of the consumers.

EXISTING METHODOLOGY

It facilitates to read energy meters without having to visit each and every house/organizations. This system comprises a microcontroller which takes the readings at regular intervals and records it in its memory. This feature (remote monitoring) is made available as it consists of a GSM module which communicates the information regarding the meter reading via an SMS. The present meter reading system does not involve the GSM module. The scheme proposed and tested in this paper avails the GSM infrastructure, its nationwide coverage and the Short Messaging System (SMS) cell broadcasting feature to wirelessly transmit the individual house/organization power consumption readings.

The existing systems are either an electronic energy meter or an electro-mechanical meter which are currently in use is limited to record up to kWh units. The kWh units recorded by meter readers monthly, on foot which need to be processed by a meter reading company. For processing the meter reading, company needs to link each recorded usage data to the particular account holder and then determine the amount owed by means of the specific tariff in use. On basis of various platforms researchers proposed many system for Automatic Meter Reading (AMR).

There are various wire-based AMR systems like Power Line Carrier (PLC) and Telephone Line Network (optical/ cable) and wireless AMR systems such as E-metering systems based on GPRS, Bluetooth, GSM. Design of an Electric Energy Meter for long-distance data information transfers which based upon GPRS, but this system can't be implemented so easily because the regular use of GPRS is still a dream to the common man.

OBJECTIVE OF PROPOSED METHOD

• Object of the project is to provide a power distribution control system which can provide the solution power cut.

• The system controls the current level electrical loads to maintain the total electrical power demand during a demand interval within certain predetermined limits.

• Daily usage will be send as an SMS.

DATA ACQUISITION ANALYSIS:

According to the layout of the house, the daily utilization chart is given in Fig.1. In this graph, we can analyze the consumption of the energy in 24 hours by the lighting and the major equipment's like fridge, fans, etc. The daily

utilization graph makes easy to understand the utilization of energy in a particular day.
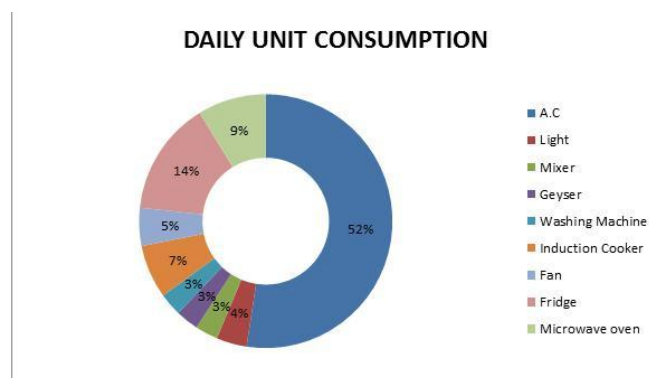

Fig.1. Daily Power Utilization

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HARDWARE IMPLEMENTATION

POWER SUPPLY

A power supply (sometimes known as a power supply unit or PSU) is a device or system that supplies electrical or other types of energy to an output load or group of loads. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

POWER SUPPLY UNIT BLOCK

All digital circuits work only with low DC voltage. A power supply unit is required to provide the appropriate voltage supply. This unit consists of transformer, rectifier, filter and a regulator. AC voltage typically of 230Vrms is connected to a transformer which steps that AC voltage down to the desired AC voltage level. A diode rectifier then provides a full wave rectified voltage that is initially filtered by a simple capacitor filter to produce a DC voltage.

This resulting DC voltage usually has some ripple or AC voltage variations. Regulator circuit can use this DC input to provide DC voltage that not only has much less ripple voltage but also remains in the same DC value, even when the DC voltage varies, or the load connected to the output DC voltage changes. The required DC supply is obtained from the available AC supply after rectification, filtration and regulation.

The main components used in the power supply unit are Transformer, Rectifier, Filter and Regulator. The 230V AC supply is converted into 9V AC supply through the transformer. The output of the transformer has the same frequency as in the input AC power. This AC power is converted into DC power through diodes. Here the bridge diode is used to convert AC supply to the DC power supply. This converted DC power supply has the ripple content and for normal operation of the circuit, the ripple content of the DC power supply should be as low as possible. Because the ripple content of the power supply will reduce the life of the circuit. So to reduce the ripple content of the DC power supply, the large value of capacitance filter is used.

This filtered output will not be the regulated voltage. For this purpose IC7805 regulator IC is used in the circuit.

TRANSFORMER

Transformer is a device used either for stepping-up or stepping-down the AC supply voltage with a corresponding decreases or increases in the current. Here, a transformer is used for stepping-down the voltage so as to get a voltage that can be regulated to get a constant 5V.

RECTIFIER

A rectifier is a device like semiconductor, capable of converting sinusoidal input waveform units into a unidirectional waveform, with a nonzero average component.

FILTERS

Capacitors are used as filters in the power supply unit. The action of the system depends upon the fact, that the capacitors stores energy during the conduction period and delivers this energy to the load during the inverse or non-conducting period. In this way, time during which the current passes through the load is prolonged and ripple is considerably reduced.

VOLTAGE REGULATOR

The LM78XX is three terminal regulator available with several fixed output voltages making them useful in a wide range of applications. IC7805 is a fixed voltage regulators used in this circuit.

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REGULATOR 7805

Voltage sources in a circuit may have fluctuations resulting in not providing fixed voltage outputs. A voltage regulator IC maintains the output voltage at a constant value. 7805 IC, a member of 78xx series of fixed linear voltage regulators used to maintain such fluctuations, is a popular voltage regulator integrated circuit (IC). The xx in 78xx indicates the output voltage it provides. 7805 IC provides +5 volts regulated power supply with provisions to add a heat sink.All voltage sources cannot able to give fixed output due to fluctuations in the circuit. For getting constant and steady output, the voltage regulators are implemented. The integrated circuits which are used for the regulation of voltage are termed as voltage regulator ICs. Here, we can discuss about IC 7805.The **voltage regulator IC 7805** is actually a member of 78xx series of voltage regulator ICs. It is a fixed linear voltage regulator. The xx present in 78xx represents the value of the fixed output voltage that the particular IC provides. For 7805 IC, it is +5V DC regulated power supply. This regulator IC also adds a provision for a heat sink. The input voltage to this voltage regulator can be up to 35V, and this IC can give a constant 5V for any value of input less than or equal to 35V which is the threshold limit.
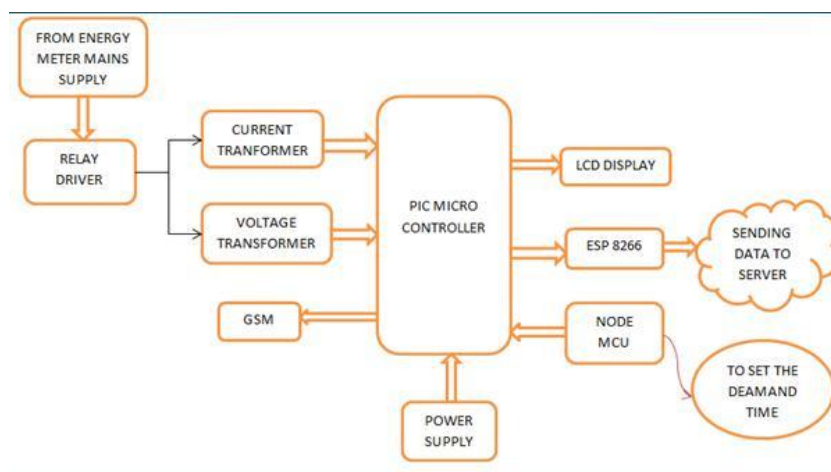
7805 IC Rating

- Input voltage range 7V- 35V
- Current rating $I_{c} = 1A$
- Output voltage range $V_{Max=5.2V}$, $V_{Min=4.8V}$

Regulated Power Supply Circuit

The voltage regulator 7805 and the other components are arranged in the circuit.

BLOCK DIAGRAM

CONCLUSION

The idea of prepayment electricity bill prior its usage is being gradually accepted around the world, and that's why the market for prepaid energy metering is growing. After having many advantages, this project still needs more safety check and modification especially the GSM module for the network coverage of SIM which is being used, should be strong so that the GSM can work properly.

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REFERENCES

[1]   Albert Thumann, Handbook of Energy Audits, Published by The Fairmont Press, Inc. 2005

[2]   http://www.tangedco.gov.in/

[3]   G. 1.BEE Energy Management Report , Uttarakhand Renewable Energy Development Agency

[4]   S. U. Kulkarni and KalpanaPatil, Energy Audit of an Industrial Unit- A Case Study, International Journal of Emerging Science and Engineering, Volume-2, Issue-1, November 2013

[5]   Malkiat Singh, Gurpreet Singh and Harmandeep Singh, Energy Audit: A Case Study To Reduce Lighting Cost , Asian Journal of Computer Science and Information Technology, 2012, PP 119-122

[6]   Mukesh K Saini, S. ChatterjiandLini Mathew, Energy Audit of an Industry , International Journal of Scientific & Technology Research, Volume 3, Issue 12, 2014