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Design and Implementation of Energy Audit with IOT and ARDUINO

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***Abstract*—This project develop for in industry to save not needed circumstances consumption of energy and to known what is exact requirement of industry and it is also developed for analysis the system, hence the proposed system is taking this development at next level by enhancing the term IoT(Internet Of Things) for industrial remote energy parameter monitoring system.**

The objective of energy audit is to identify the end use of energy in industry, and this feasibility study leads to implementation of energy management program. Remote monitoring of different industries sensor, machineries, energy or the power panels are the most demanding products and many organizations are working on it. Up till now we have seen only computers, mobiles and very few device are connected to internet directly.

Still many embedded system or the devices needs to redesign so that they can communicate with other world through the internet. In simple word we called it as a IoT(Internet of Things). By using IoT device we are developing project named as "Design and Implementation of Energy audit with IOT and ARDUINO".

***Index terms*:-** Internet of Things (IoT); Arduino board; GSM Modem; Microcontroller ATMega328P; Modbus-RS232 converter

I. INTRODUCTION

As the energy audit is need of industries in order to save unnecessary energy consumption and to know the exact requirement of industries hence the purpose system is talking this development at next level by enhancing the term IoT(Internet of Things) for industrial remote energy parameter monitoring system. The objective of energy audit is to identify the end use of energy in industry and this feasibility study lead to implementation of an energy management program.

Remote monitoring of different industries sensor, machineries, energy of the power panel are the most demanding products and many organizations are working on it. Up till now we have seen only computers, mobiles and very few devices are connected to internet directly. Still many embedded system or the devices needs to redesign so that they can communicate with other world through internet. In simple world we called it as a IoT.

II. LITERATURE SURVEY

Gilberto P. Azevedo all explains in the software development area as in most field of the computer industry new technologies are trumpet as revolutionary solution almost daily just to disappear silently sometime later. This was not the case with open architecture energy management system (EMS). About 10 years after their conception, they have proven to be a successful technological approach. But this does not mean that all problem have been solved; in fact, this is a dynamic research area, in continuous revolution and still rising challenges for the near future. D. Sivasanskari, k. Ramamoorthy purpose a system for residential power this system uses WSN- wireless sensor network, these sensors easily detect and calculate the energy usage. The main advantage is that this team does not touch the existing connection i.e, this is a plug and play system. But on the other hand this system did not have a proper user interface therefore making it difficult to understand.

N.K.Suryaveda and S.C. Mukhopadhyay reported the design and development of smart monitoring and controlling system for electrical appliances in real time, in which it emphasizes the realization of monitoring and controlling of electrical appliances in many ways. They determined the area of daily peak hours of electricity usage level and come with a solution by which we can lower the consumption and enhance better utilization of already limited resources during peak hours. This system lacked the ability to calculate the cost of usage but nonetheless this was a great system to monitor usage.

Suh and ko proposed and intelligent home control system based on a wireless sensor/actuator network with a link quality indicator based routing protocol to enhance network reliability. It can integrate diversified physical sensing information and control various consumer home devices with the support of active sensor networks having both sensor and actuator components. Since the system used a number of sensor this system was automatically very expensive and was not received very well by the public.

I.Kunold, M.Kuller, J.Bauer, and N.Karaoglan describe a system concept of energy information system in flats using wireless technologies and smart metering devices. Smart meters offer a lot of new features, for example handling a different dynamic tariffs and in addition to their carrier interface a data access capability for in house application. Using these capabilities an embedded in house energy information system with a smart energy controller will be proposed, which allows displaying real time data information and analysis of power consumption. This paper was a huge success but the system was never implemented in real time.

K.Gill, S.H.Yan, F.Yao presented a ZigBee-based industrial automation system in which less importance is given to the industrial automation. Because however the adoption of industrial automation system has been slow so that this paper identifies the reason behind slow adoption and also evaluate the potential of Zig-Bee for addressing these problems with the help of design and implementation of flexible industrial automation architecture. This system was very expensive and complicated.

Dae-Man Han and Jae-Hyun Lim members contributes their work towards the development of ubiquitous industrial networks, energy savings and user happiness are two major design considerations for modern lighting systems. This paper introduces smart industrial interfaces and devices definitions to allow interoperability among Zig-Bee devices produced by various manufacturers of electrical equipment, meters, and smart energy enabling products. They introduced the proposed industrial energy control system design that provides intelligent services for users and also demonstrate its implementation using real test bed. This system was never implemented in real time.

Suh and Ko proposed an intelligent industrial control system based on a wireless sensor/actuator network with a link quality indicator based routing protocol to enhance network reliability. It can integrate diversified physical sensing information and control various consumer industrial devices, with the support of active sensor and actuator components. This system attempts to manage all the appliances hence making the system harder to implement and expensive.

Nguyen et al. have proposed building a smart industrial system with WSN and service robot. In which they have presented the design of optical linear encoder(OLE) based system for function of capturing human arm motion and arm function evaluation for home based monitoring and this system would also find wide range application in field of rehabilitation. This System is highly sophisticated because it uses motion control to manage appliances, example the user can use arm motion to control their appliances. But the disadvantage is that it is harder to implement in houses that are already constructed. This system needs to be implemented in the construction stages of the building.

III. OBJECTIVE OF IOT

To design a microprocessor based or IoT based internet enabled remote data acquisition system for energy parameter monitoring. To develop a web service for interaction between web application and microcontroller/IoT device.

To implement centralized data gathering and management application. To develop internet and enabled graphical data analysis tool.

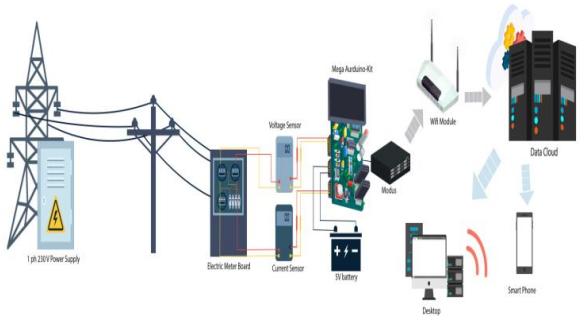

Fig 1: Energy Monitoring System

Above stated diagram show the typical implementation of the MSEB meter and these meters are only capable of showing incremental energy consumption by means of some digital only, but we can't see exact load like voltage, current, power factor, etc. and not even the previous consumption details like daily usage, day time usage, night hours usage, etc to solve this problem we have smart meter. These smart meters are capable enough to show multiple parameters along with storing log of almost a month, but again this will raise a problem these meters can transmit this information to any other device and not this is feasible to note all reading manually periodically. So next we need to develop an IoT based device to read all the parameters from meter over MODBUS protocols and upload this information to IoT server so that using the web or mobile application user can see the energy parameter consumption graphically. Hence this is the exact scope of the work to develop the IoT based device, deployed IoT server and develop web application for data analysis.

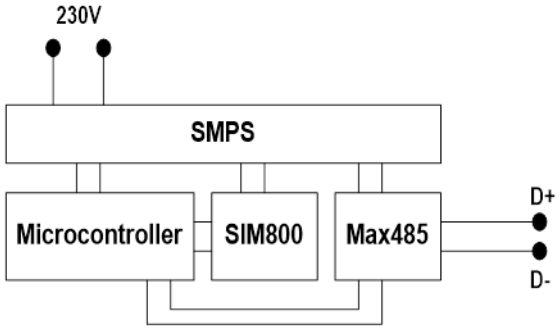

Fig 2: IoT Device

The working strategy of proposed system and its functionality let's see the internal clock of IoT device about what we are discussing. The proposed IoT device is consisting following block where first block is to communicate with smart meter, as smart meter works on industrial MODBUS or RS485 protocol it converts RS485 to RS232 so that microcontroller can understand it. In order to communicate with web system will be having GPRS modem which deals with internet communication and finally as this device is intentionally designed for industry stable power source matters a lot we need SMPS power supply module clubbing all these together will result in to IoT based EMS.

IV. RESULT ANALYSIS

Fig 3: Project Prototype

This is the complete model of our project. The post design and implementation of industrial energy and static analysis system is consist of Microcontroller, GPS and GSM system, Smart Meter, IoT (Internet Of Things)

device, CT(Circuit Transformer) . The Smart Meter is used to display the current status of energy consumption.

A. View of standby mode

This is the output for the Stand By Mode. In this figure the energy monitoring is in Stand By Mode.

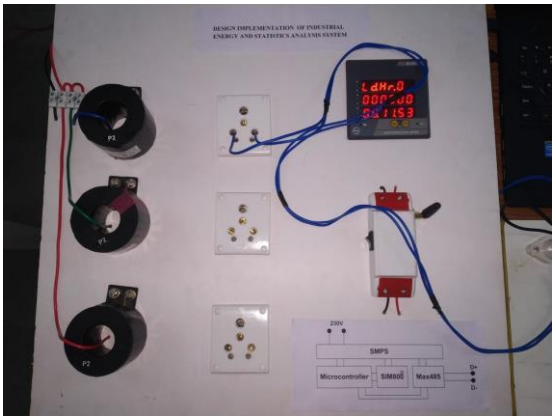

Fig 4: Stand By Mode

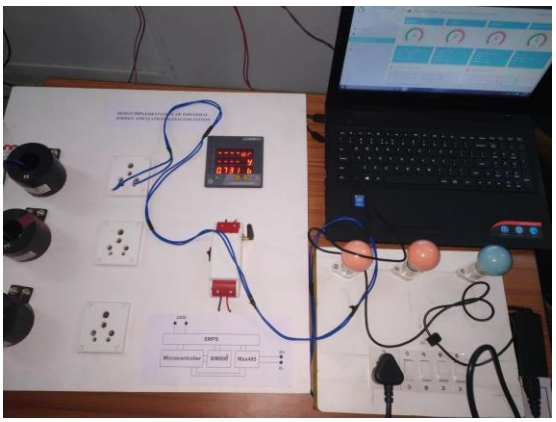

Fig 5: Live Energy Monitoring System

This fig shows the live status of energy monitoring system.

B. Screenshot Of The System

The Dot net code was uploaded for alpha and beta testing on ems.iotmatic.in.

The Dot net code successfully ran on browsers of various platforms such as Desktop and Smartphone.

Following figure illustrates the working model of the proposed system. The screenshot also describe that the system is equally responsive on any platform.

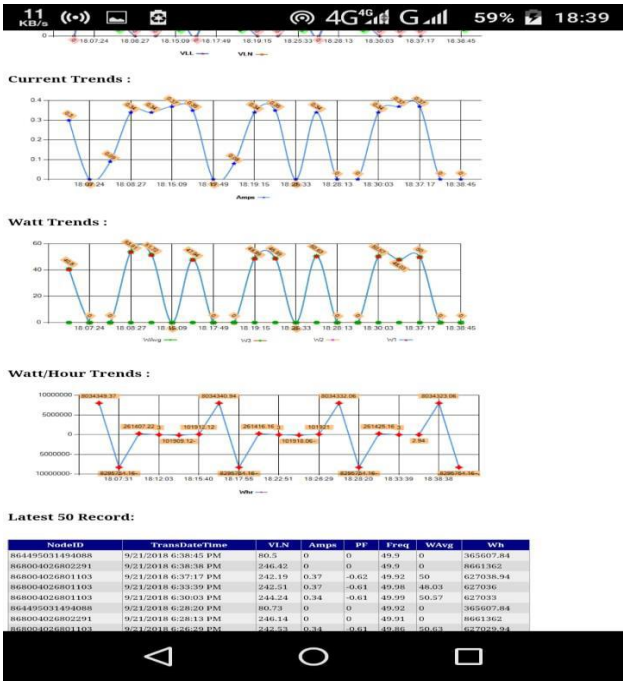

Fig 6: Screenshot of Energy Monitoring System

V. CONCLUSION

The system provides a platform to access the notification and announcement it will also wide and efficient to analysis the status ticks off energy for both domestic and industrial purpose the purpose system should also eliminate any kind of unnecessary manual work required for the energy auditing.

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