

The Performance Analysis of An Energy Conservation System for Hostels, Using IoT

Rutuja Bhalavane¹, Varsha Jadhav², Shubham Mohite³, Ajinkya Patil⁴

U.G. Student, Department of Electrical Engineering, NMCOE, Peth, India¹

U.G. Student, Department of Electrical Engineering, NMCOE, Peth, India²

U.G. Student, Department of Electrical Engineering, NMCOE, Peth, India³

Assistant Professor, Department of Electrical Engineering, NMCOE, Peth, India⁴

Abstract: We can see a warden madam/sir from any college hostel or private hostel is standing in front of electricity board, whose duty is to read the energy meter and handover the bills to the owner of that organization every month. This is nothing but meter reading manually. According to that reading owner have to pay the bills. The main drawback of this system is that person must go room by room and he/she has to check the electricity use by the candidates who live in of every room. Many times, errors like he or she cannot find the proper way to detect excessive use of electricity. To overcome this drawback, we have come up with an idea which will eliminate the manual checking of each room, even the errors will be overcome.

Keywords: Cloud, esp8266, MAX 232, ACS712

I. INTRODUCTION

In the present billing system, the owners of hostel are unable to keep track of the changing maximum use of consumers. Consumer will use or consume large amount of electricity and owner will not understand it. The remedy for all these problems is to keep track of the consumers load on timely basis, which will help to assure accurate billing, track maximum demand and to detect threshold value. These are all the features to be considered for designing an efficient and smart electricity observation system. The present project "IoT Based Smart Electricity Observation and Cut-off System for Hostels" addresses the problems faced by both the hostel warden and the owner of hostel. The project mainly deals with checking of electricity consumption, which utilizes the features of embedded systems i.e., combination of hardware and software in order to implement desired functionality. The project discusses comparison of Arduino and other controllers, and the application of Blynk App and Wi-Fi modems to introduce 'IoT' concept. With the use of Blynk App the warden as well as owner will get the used energy reading. Owners will even get notification in the form alert on mobile app when they are about to reach their threshold value, that they have set. Also, with the help of Wi-Fi modem the consumer can monitor his consumed reading and can set the threshold value.

This system enables the warden to read the meter readings monthly without a person visiting each room. This can be achieved using Arduino unit that continuously monitor and records the electricity consumption in its permanent (non-volatile) memory location. This system continuously records the wattage of equipment used the live wattage reading can be displayed on blynk app to the owner on request. This system also can be used to disconnect the power supply of specific room when needed.

II. WORKING METHODOLOGY

This project should contain the ESP8266 model which will be based on Arduino model. This model is generally used for the connection of Wi-Fi. Here we use Wi-Fi for the connection of internet. Whole system is based on IoT. When the various appliances of the household consume energy the energy meter reads the reading continuously and this consumed load can be seen on meter.

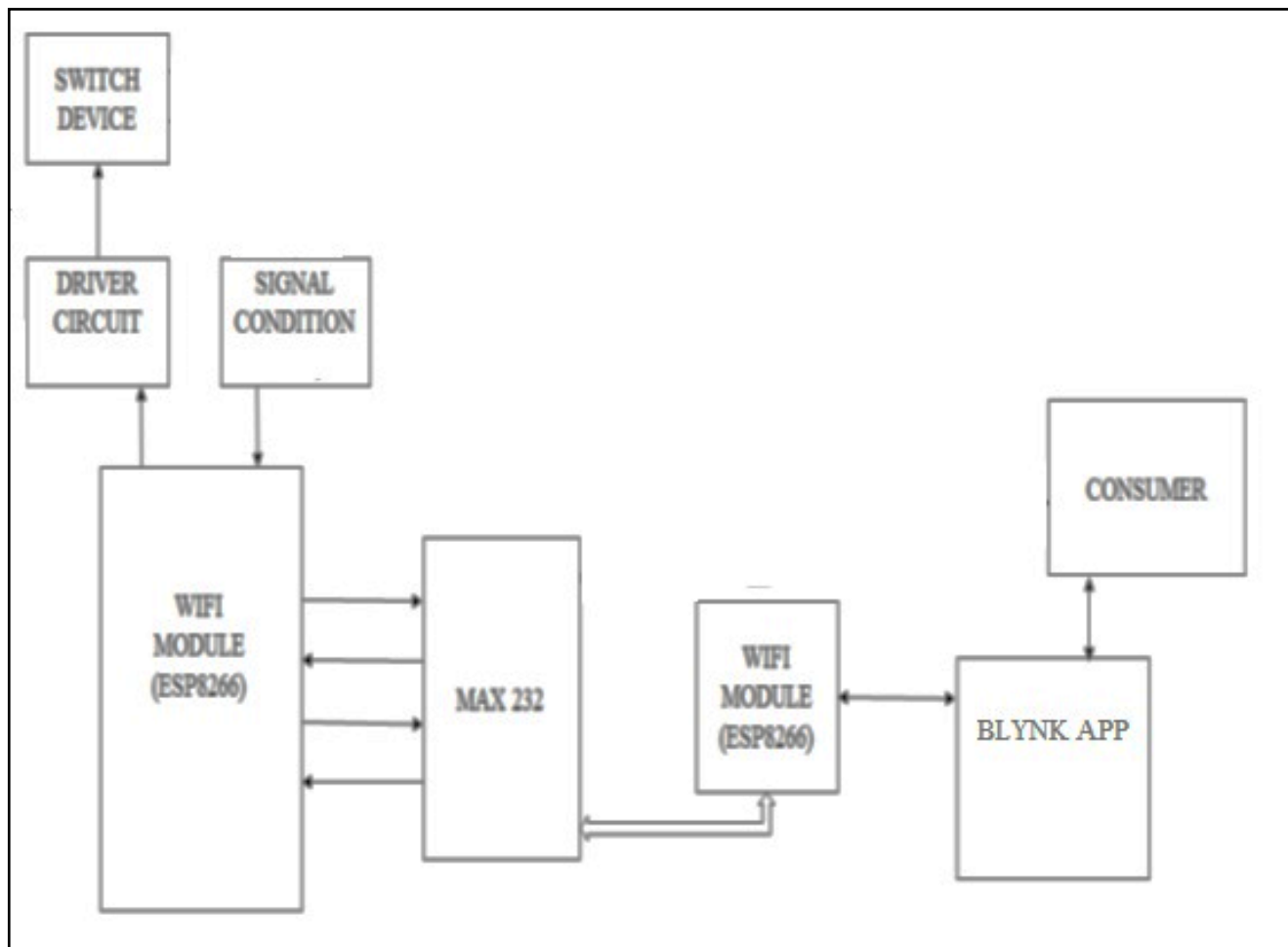


Fig.1 Block Diagram of system

We can see that the LED on meter continuously blinks which counts the meter reading. Based on the blinking, the units are counted. Normally, 3200 blinks is one unit. In our project we are trying to develop, a system in which Arduino esp8266 act as main controller, which continuously monitor energy consumption. As per the blinking of LED on energy meter the Arduino will measure the unit consumption. The measured wattage with the calculation of the cost will be continuously displayed on mobile app that we have designed.

Threshold value can be set on as per the owner's requirement. When the consumer's electricity consumption wattage will be near about to the set threshold value it will send a notification value to the owner. This threshold value notification will increase the awareness amongst the owner about the energy consumption.

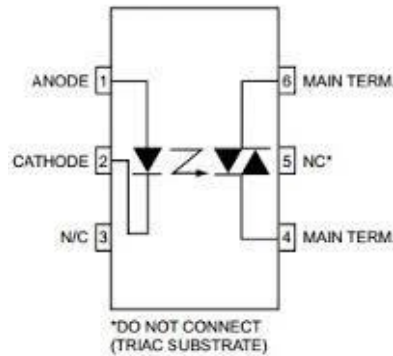
When the owner gets the notification he can visit that room and stop the consumption. If the owner is not aware with the threshold notification, then the electricity will automatically get off. Then room living peoples or students need to visit warden to again restart the electric supply.

MAX 232:

We are using MAX 232 for serial communication with the components that are GSM module and Wi-Fi module MAX232 is used to provide TTL to the components as per the requirement. GSM needs TTL so it is connected to Arduino through MAX232. Some Wi-Fi module doesn't require TTL because it's already build in it and some may require based on its working.

Wi-Fi MODULE (ESP8266):

Wi-Fi stands for Wireless Fidelity. We are using Wi-Fi which acts as heart for IoT. Through Wi-Fi the consumer can set changes in threshold value, he can ON and OFF the electric use. Time to time the readings of units and cost are displayed on blynk app. Consumer can accesses the Arduino board and smart switch with help of Wi-Fi.

DRIVER CIRCUIT (moc3071):

- It is a 6 pin device known as opto coupler or opto isolator.
- In our project we are using this opto coupler to cut off the AC load.
- It is connected to the SSR to cut off the AC load.

SWITCHING DEVICE:

In our system we are using SSR as switching device even though we can use RELAY because SSR is highly advantageous. We are using switching device to switch the energy meter. For ON and OFF purpose of meter we are using switching block. SSR stands for SOLID STATE RELAY.

Why SSR instead of RELAY?

- Both are used as AC switching device, but if switching speed is high than SSR is suitable, if switching speed is slow than RELAY is used.
- Relay life decreases as number of usage time increases, but in SSR there is no change.
- For driving RELAY, current or power required is more comparatively to SSR.
- For switching SSR requires 15amp, whereas RELAY needs (30amp,50amp,90amp) as per requirement.

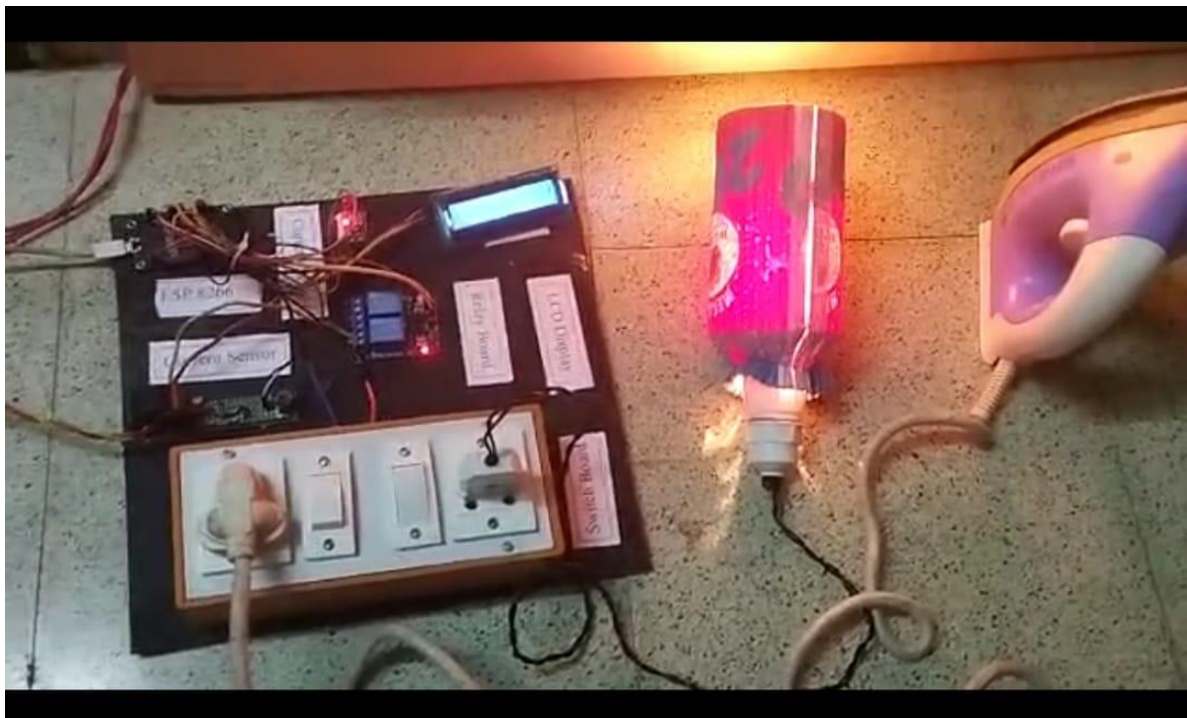
III.HARDWARE MODEL AND RESULTS

Fig.2 Working Model

RESULTS:



Fig.3 Hardware model with android app

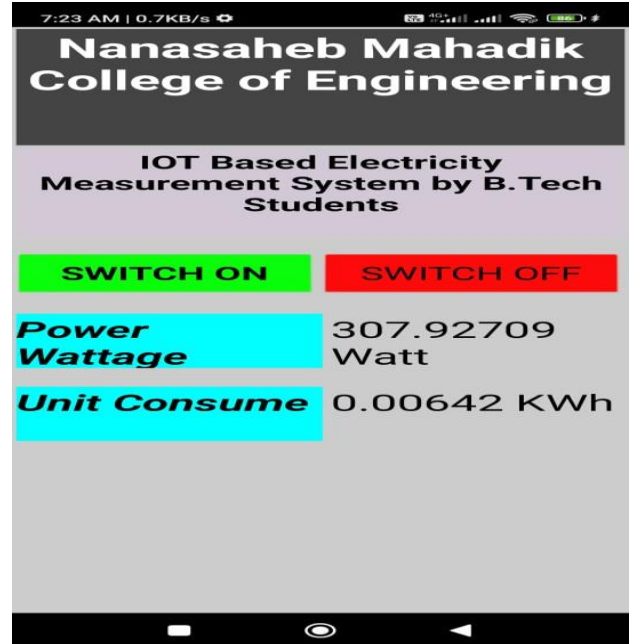


Fig.4 Android app

READINGS:

Equipment	Standard Range (Watt)	Wattage displayed on LCD and android app
1. Bulb	200W	215.63W
2. Iron	760W	789.20W

IV. CONCLUSION

The proposed system will work on the internet and real time operation is done. The proposed system will save electricity by using IoT operation. The system can low cost if developed in bulk.

REFERENCES

[1] Himshekhar Das, L.C.Saikia, “GSM Enabled Smart Energy Meter and Automation of Home Appliances”, PP-978-1-4678-6503-1, 2015 IEEE.
 [2] Ofoegbu Osita Edward, “An Energy Meter Reader with Load Control Capacity and Secure Switching Using a Password Based Relay Circuit”, PP-978-1-4799-8311-7, ‘ Annual Global Online Conference on Information and Computer Technology’, IEEE 2014.
 [3] Yingying Cheng, Huaxiao Yang, Ji Xiao, Xingzhe Hou, “Running State Evaluation Of Electric Energy Meter”, PP-978-1-4799-4565-8, ‘Workshop on Electronics, Computer and Applications’, IEEE 2014.
 [4] Sahana M N, Anjana S, Ankith S,K Natarajan, K R Shobha, “Home energy management leveraging open IoT protocol stack “, PP- 978-1-4673-6670-0, ‘Recent Advances in Intelligent Computational Systems (RAICS)’, IEEE 2015.
 [5] Luigi Martirano, Matteo Manganelli, Danilo Sbordone, “Design and classification of smart metering systems for the energy diagnosis of buildings” IEEE 2015.
 [6] J. Widmer, Landis, “Billing metering using sampled values according IEE 61850-9-2 for substations”, IEEE 2014.

- [7] Cheng Pang, Valierry Vyatkin, Yinbai Deng, Majidi Sorouri, "Virtual smart metering in automation and simulation of energy efficient lightning system" IEEE 2013.
- [8] Amit Bhimte, Rohit K. Mathew, Kumaravel S, "Development of smart energy meter in labview for power distribution systems", "IEEE INDICON 2015 1570186881", 2015.
- [9] H. Arasteh, V. Hosseinnzhad, V. Loia, A. Tommasetti, O. Troisi, M. Shafie Khan, P. Siano, "IoT Based Smart Cities: A survey" IEEE 978-1-5090-2320-2/1631.00, 2016.