

Portable Power Monitor and Fault Indicator

¹Vishalakshi S, ²M.Sneha, ³J.Y.Sasi ⁴D.Prakash

^{1,2,3}B.E (Electrical and Electronics Engineering),

⁴Assistant Professor (EEE),

Sri Ramakrishna Engineering College,
Coimbatore, Tamil Nadu, India.

ABSTRACT

This paper is proposed for a portable power monitor and fault indicator. A prototype device is developed for wireless power monitoring which is developed using ARM microcontroller with Wi-Fi enabled communication technology. This work consists of monitoring the individual machine through Wi-Fi based communication. The proposed method measures the input parameters from the provided sensors. ARM microcontroller continuously monitors the input data and provides the Power consumption of the machine automatically to the webpage connected through Wi-Fi module. If any fault conditions like Overload and Low voltage are identified, the indication will be given to the concerned authority of the organization through SMS which is implemented using GSM technology.

Keywords-ARM,GSM,Sensor,Wi-Fi(Wireless Fidelity)

I. INTRODUCTION

Internet of Things (IoT) has helped many organizational systems to improve efficiency, increase the speed of processes, minimize error and prevent theft by coding and tracking the objects. Computing and communication has its future in the

technological transformation brought by the IoT. The main aim of this project is to monitor the power consumption of individual machines connected under a SSB [Sub Switch Board].The other purpose is to provide the detailed analysis of all the operating parameters of the machines to the concerned authority through a webpage. In case of any fault occurrence like Overload and Under voltage, a message will be sent using GSM technology.

II. EXISTING SYSTEM

Generally, the existing system consists of stationary energy meter in SSB [Sub Switch Board]. There is more than one machine connected to a particular SSB. The energy meter which is fixed in the SSB measures the power consumption of all the machines. While measuring the power consumption by using energy meter, the individual power consumption cannot be identified and then the parameters like voltage, current, power, running hours should be measured manually in the existing system. The measured values should be updated only by manual work. This will lead to improper measurement and updating. This system will not indicate in case of any fault occurrence.

III. PROPOSED SYSTEM

The power consumption of individual machine should be noted in order to identify high power consumption machine. This will help to take immediate actions against high power consumption machine and this will reduce the overall power consumption. The fault condition should be intimated. The proposed system is easily portable to each individual machine. This system will provide the voltage, current, power readings of individual machines and it will be updated automatically in a webpage. This will avoid manual errors and will reduce the process time. The in charges can able to see the updated values in the webpage at any place and time by the use of username and password. The updated values in webpage indicate the power consumption at a particular time. This will help to note a high power consuming machine and to take remedies against that. In case of any fault conditions the message will be delivered to the authorized person through GSM module. This will help to take immediate actions against the fault.

IV. METHODOLOGY

Initially three phase AC supply is given to the prototype. Three potential transformers namely PT1, PT2, PT3 are connected across RY, YB and BR respectively. Three current transformers namely CT1, CT2, CT3 are connected along R, Y and B of the supply respectively. The 440V input is stepped down to 6V by means of the potential transformers. Current from the input is reduced to 2A. The outputs from

CT's and PT's are fed to their respective rectifier circuits so that it can be rectified to the optimal value which ARM controller LPC2148 can withstand. The rectifier circuit is designed with a group of four diodes which converts alternating current into direct current of 3V and also with a smoothing capacitor which smooths or even out any fluctuations which appear in the signal. It also has a potentiometer to make any adjustments further to the values. The voltage and current from the filters are fed to the ARM controller where it is processed. The ARM controller is programmed in such way to display voltage, current and to calculate power. The running hours is calculated by the timer which is inbuilt in the ARM. The LCD display is interfaced with ARM controller and it displays voltage, current, power and running hours. It is updated for every 60 seconds. The fault conditions are identified as overload and under voltage for the machines. In case of any faults mentioned above occur a relay is tripped ON. As a matter of safety message is sent to the specified authority of the organisation regarding the fault conditions. A GSM module 800C is fitted to the prototype and it has accessibility to a permanent mobile number and an alterable mobile number. The displayed parameters are also updated in a website named thingspeak.com by IOT. The contents are regularly refreshed, updated and they are also represented in a graphical form. A username and password are provided to access the webpage.

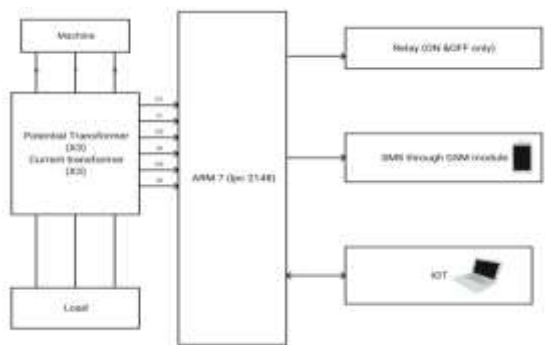


Fig 1 Block diagram

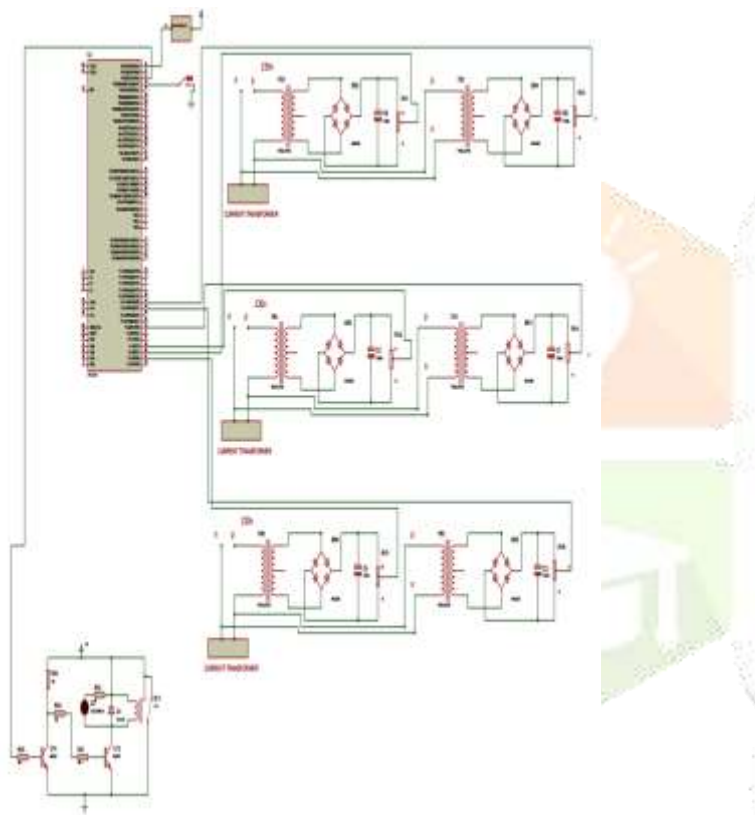
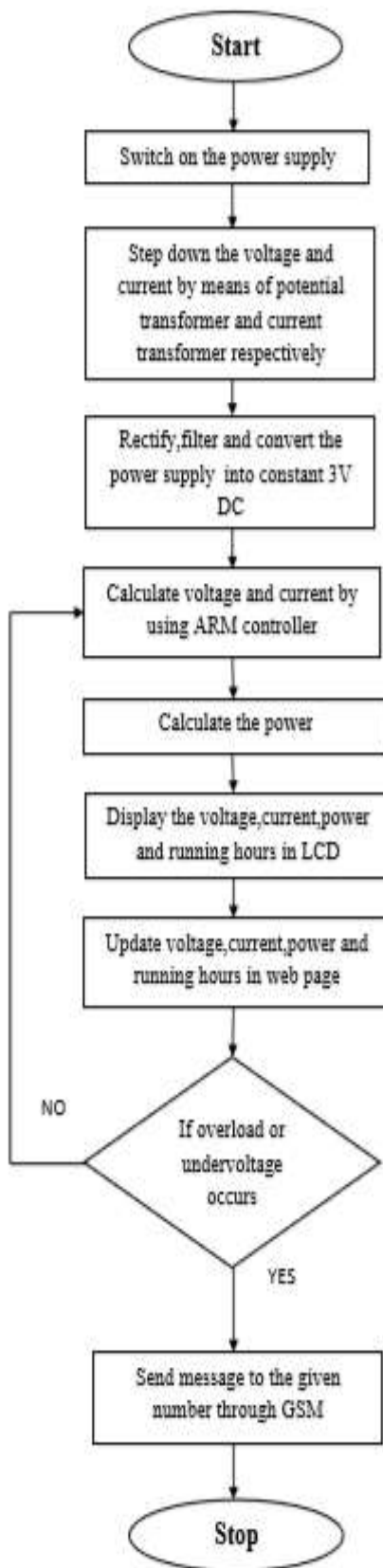


Fig 2 Circuit diagram

V. FLOWCHART



VI. ALGORITHM

Step 1: Start the program.

Step 2: Switch ON the power supply.

Step 3: Step down the voltage to 6V using potential transformer and current to 2A using current transformer.

Step 4: Convert the inputs to rectified filtered constant 3V DC.

Step 5: Calculate the voltage and current using the programmed ARM controller.

Step 6: Calculate power using the formula $P=V*I$.

Step 7: Display the calculated Voltage, Current, Power and Running hours in LCD.

Step 8: Update the value of Voltage, Current, Power and Running hours in the webpage for every 60 seconds.

Step 9: If Overload and Undervoltage occurs, send the alert message though GSM to the concerned authority.

Step 10: Else continue from Step 5

Step 11: Stop the program

VII. RESULTS

The image of the hardware prototype result is as follows

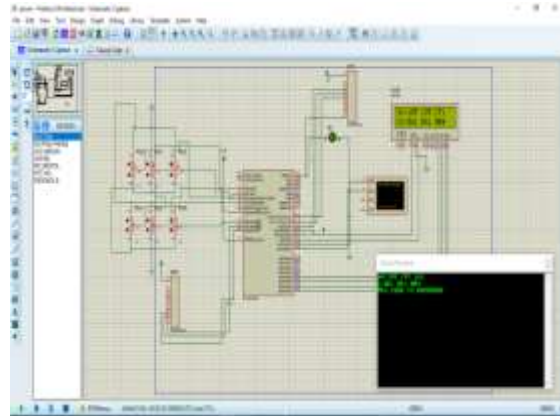


Fig 3 Simulation result

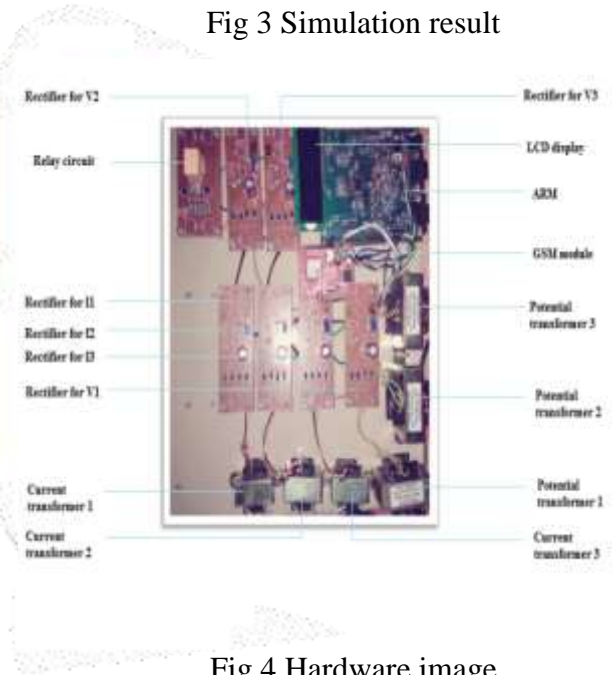


Fig 4 Hardware image

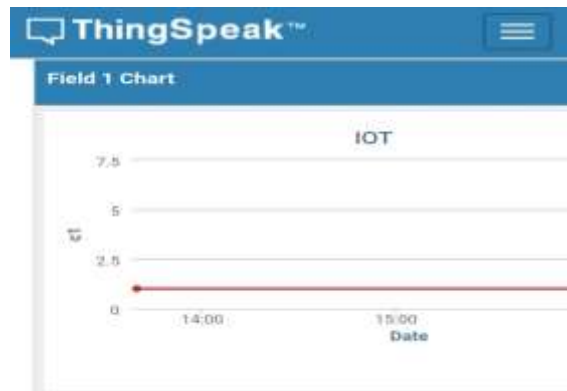


Fig 5.1



Fig 5.2

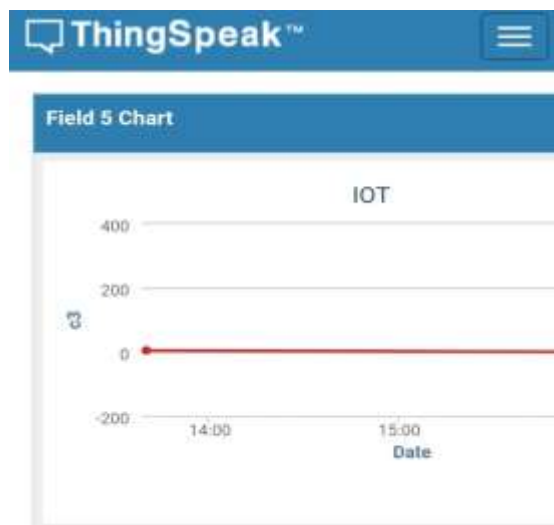


Fig 5.5



Fig 5.3

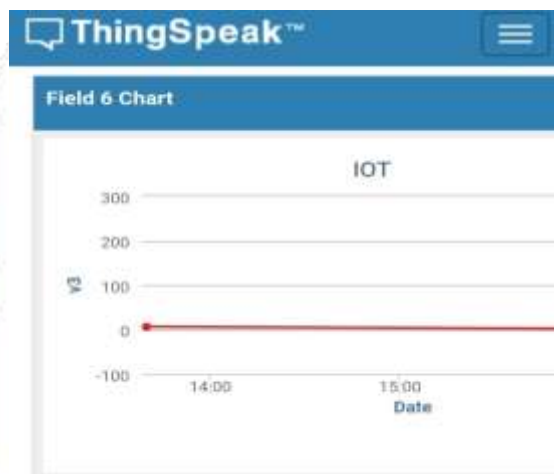


Fig 5.6

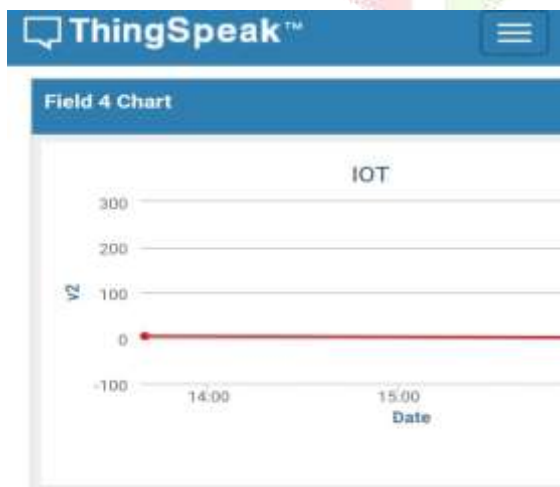


Fig 5.4

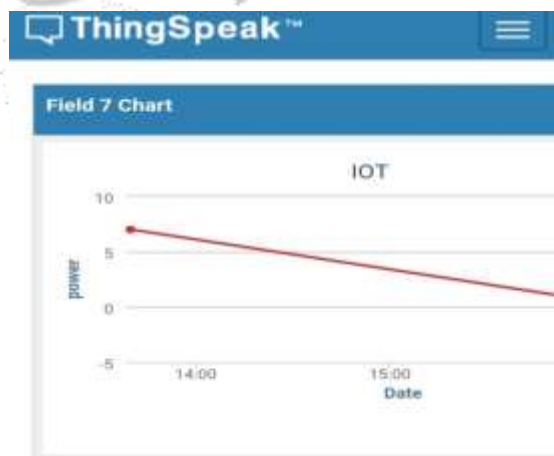


Fig 5.7

Fig 5 Webpage results

VIII. CONCLUSION

The 21st century has brought great discoveries and advancements in the field of technology. Embedded controller based on wireless power monitoring and controlling has been developed using ARM Processor and W-Fi module.

The complete working model of a portable power monitor and fault indicator is built which uses Wi-Fi module system. The model satisfactorily worked with a motor. Automatic meter reading can be explained well using this system. Financial losses due to electricity and power theft can be minimized. Labour charges and effort can be reduced. Finally, this type of system supports remote metering which is the future of Energy meters.

- Unique ID for Admin and User.
- Only admin can modify any data and add new users.
- Power used by the Users can be monitored hourly / daily manner.

IX. FUTURE SCOPE

Although it is a portable power monitor, it can be fixed to a particular machine for a long time. When this is implemented to all the machines under the SSB, the user can monitor the power consumption of all the machines within one place. So, the overall power consumption of a particular SSB can be monitored and remedies can be taken in case of any fault or high power consumption.

X. REFERENCES

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