ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

Remote Monitoring of Transformer using Microcontroller

Basil George[1], Felix Babu[2], Vishnu Mohanan[3], Thomas George[4]

UG Students, Dept. of EEE, MBITS, Nellimattom, Kerala, India[1,2,3]

Assistant professor, Dept. of EEE, MBITS, Nellimattom,Kerala,India[4]

ABSTRACT: The paper proposes an effective method to acquire performance data of distribution transformers remotely by GSM modem[4] or XBEE. The system uses a temperature sensor, potential transformer and current transformer for monitoring three different data of the transformer and then send the same to a control station at a different location. The values of all the sensors are sent sequentially as per the frequency of multiplexing of the ADC to the microcontroller[1].The data then is passed to XBEE module which operates at 2.4GHz for transmitting[9]. Remote receiver is also a microcontroller based unit that receives not only the real time data but also the error signal along with it, to operate corresponding relay for further action.The power supply consists of a step down transformer 230/12V, which steps down the voltage to 12V AC. This is converted to DC using a Bridge rectifier and it is then regulated to +5V using a voltage regulator 7805 which is required for the operation of the microcontroller and other components.

I.INTRODUCTION

Transformer is the key equipment in a power system and hence ensuring its safe and stable operation is grave. Here the term "Monitoring" is here defined as an on-line collection of data related to transformer performance. In power systems, distribution transformer is an electrical equipment which distributes power to the low-voltage users directly, and its operation condition is an important component of the entire distribution network operation. Operation of distribution transformer under rated conditionguarantees their long life .However, their life is significantly reduced if they are subjected to overloading, resulting in unexpected failures and interruption of supply to a large number of customers thus effecting system reliability. Overloading and ineffective cooling of transformers are the major causes of failure in distribution transformers. The monitoring devices or systems which are presently used for monitoring distribution transformer possess so many drawbacks[5]. Moreover it is very difficult and expensive to construct the communication wires to monitor and control each distribution transformer station.

The problems faced by the existing system are mentioned below;

(1) Ordinary transformer measurement system generally detects a single transformer parameter, such as power, current, voltage, or phase. While some method could detect multi-parameter, the time of acquisition of operation parameters is too long, and testing speed is not fast enough.

(2) Detection system itself is not reliable. The main drawback is the device instability, poor anti-jamming capability.

(3) Timely detection data updates are not sent to monitoring centres in regular intervals.

Thus, we need a distribution transformer which has real-time monitoring system which can detect all operating parameters operation, and send to the monitoring centre in time. It leads to remote monitoring of key operational parameters of distribution transformers which can provide useful information about the health of transformers which will help the distributors to optimally use their transformers and keep the asset in operation for a longer period. This will help to identify problems before any serious failure which leads to a significant cost savings and greater reliability. Here ZigBee is used for communicating the monitored parameters[2]. The Zigbee module will provide a wireless mode of communication between a monitoring embedded device and the client by instant messaging about transformers features in regular intervals.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

II.TRANSFORMER MONITORING AND CONTROL

There are different types of monitoring and protecting devices fitted to a distribution transformer according to customer needs during manufacture. These device monitor voltage, current and temperature rise in the transformer[5]. In case of over and lower voltages, over current and over temperature the protective device isolates the load from the transformer. Thus the load is protected from voltage variations and transformer is protected from over current and temperature rise
For a 100 KVA transformer, typical value of over voltage limit is Vrated + 12% and allowable temperature rise is 55 degree Celsius. Depending upon the rating of transformer these limits may change. But these values may be changed with respect to customer requirement. One customer wants to fix the over voltage limit to 250 V and other wants to fix it as 240V for same 100KVA transformer.Thus, there is a change in protective circuit design for different customers. The monitoring circuit going to be discussed here is a microcontroller based remote monitoring digital circuit[1]. This can be used to get the real time data of voltage, current and temperature from transformer location to customer location. Thus the device we call it as "Remote Monitoring of Transformer" offers flexibility, reliability, security and all advantages of digital system to transformer protection.

III.HARDWARE COMPONENTS

The main hardware components used are:

- Power supply block 230V AC-5V DC
- Microcontroller AT89S52
- RF Transceiver 2.4GHZ module
- Regulators
- Diodes
- LCD 16x2
- Capacitors
- Current transformer
- Potential transformer
- LM 35 temperature sensor
- ADC 0808

IV.BLOCK DIAGRAM

The existing transformers have complexity in measuring and controlling the parameters manually. The occurrence of fault in the transformer requires time for monitoring and rectifying. Due to this, there occur delay in corrective measures and then efficiency reduces. To overcome these difficulties, the system is digitalized and the parameters are measured using sensors and corrective measures are done automatically[5].

The failures of transformers in service are broadly due to: temperature rise, low oil levels, over load, poor quality of LT cables, and improper installation and maintenance. Out of these factors, temperature rise, low oil levels and over load, needs continuous monitoring to save transformer life.

In our proposed system, the transformer parameters such as temperature, current and voltage is monitored. The sensing unit is used to sense these parameters of transformer. The measuring unit senses and sends the analog value to the microcontroller unit. The microcontroller unit performs the necessary control actions like switching on the exhaust fan. The RF transmitter does the transmitting action to the place where it can be viewed. The RF receiver is connected to the LCD display for monitoring the parameters. Thereby, the transformer is monitored continuously for a regular operation[3]. The block diagram of the system is shown in figure 1 and figure 2.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

A. Transmitting Section

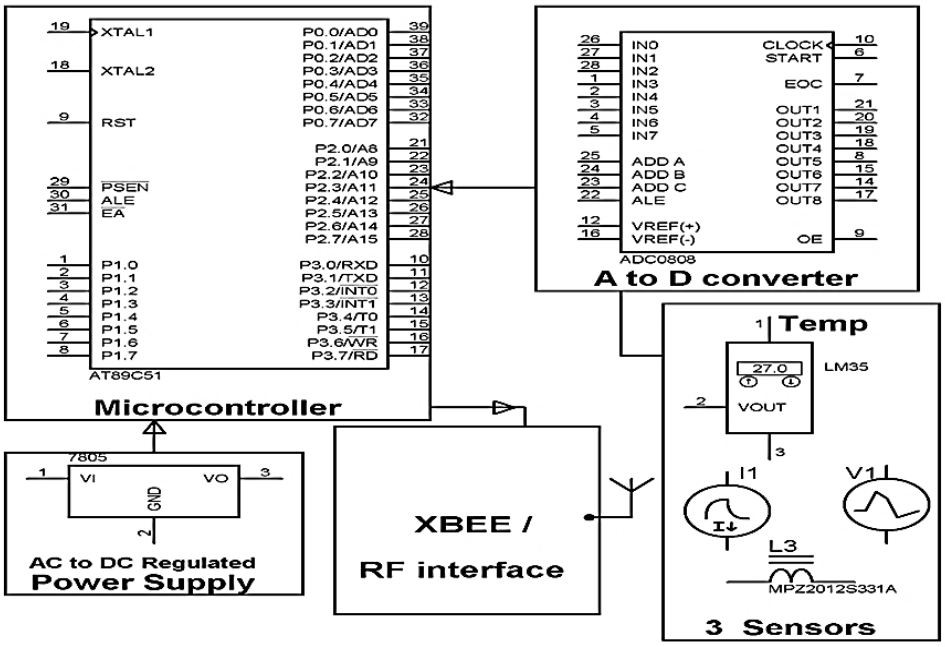

Figure 1: Block diagram of Transmitting Section

B. Receiver Section

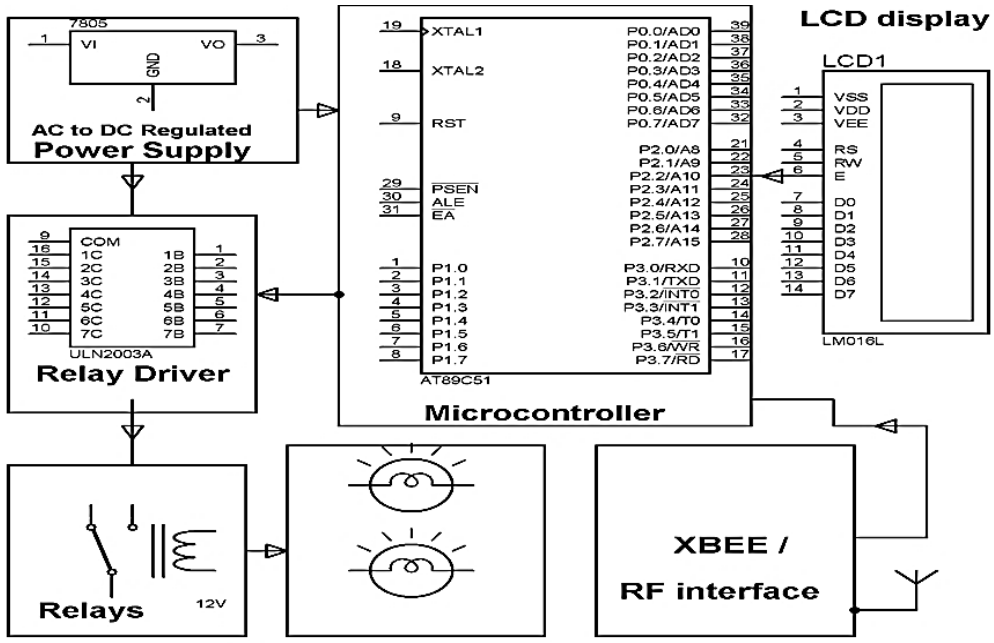

Figure 2: Block diagram of Receiver Section

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

V. SOFTWARE REQUIREMENTS

The software program used on the microcontroller in the transmitter and receiver sections in this project is Keil microvision 2. Keil is a German based Software development company founded in 1982 by Gunter and Reinhard keil.

Flowchart for transmitter andflowchart for receiver is given on fig. 3 and fig.4.

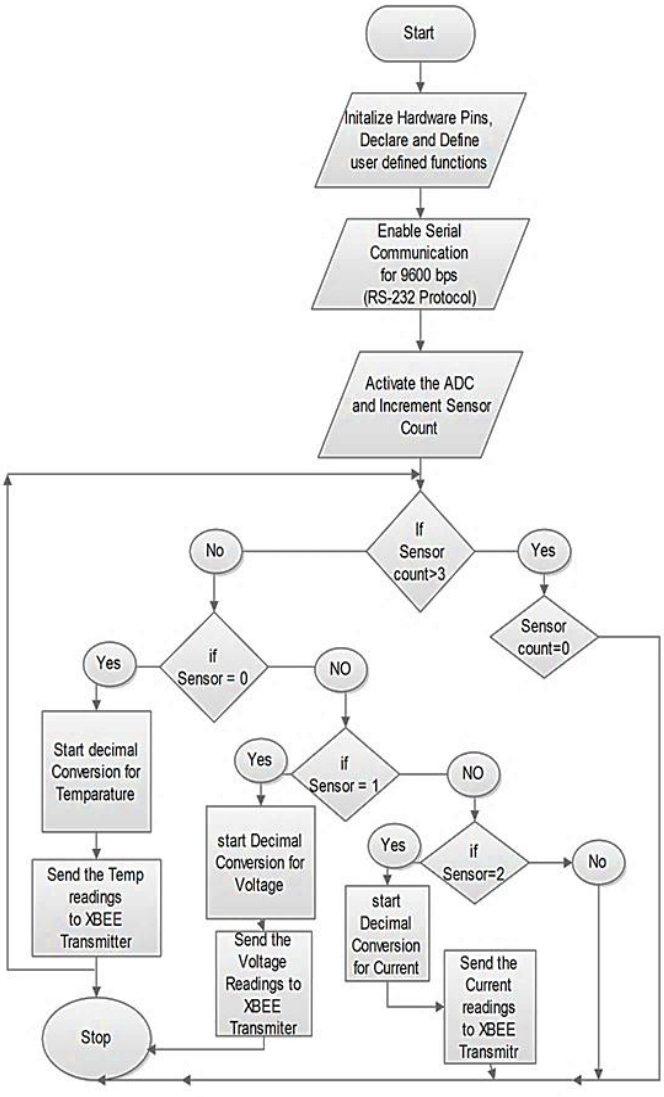

Fig. 3: Flow chart of transmitter

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

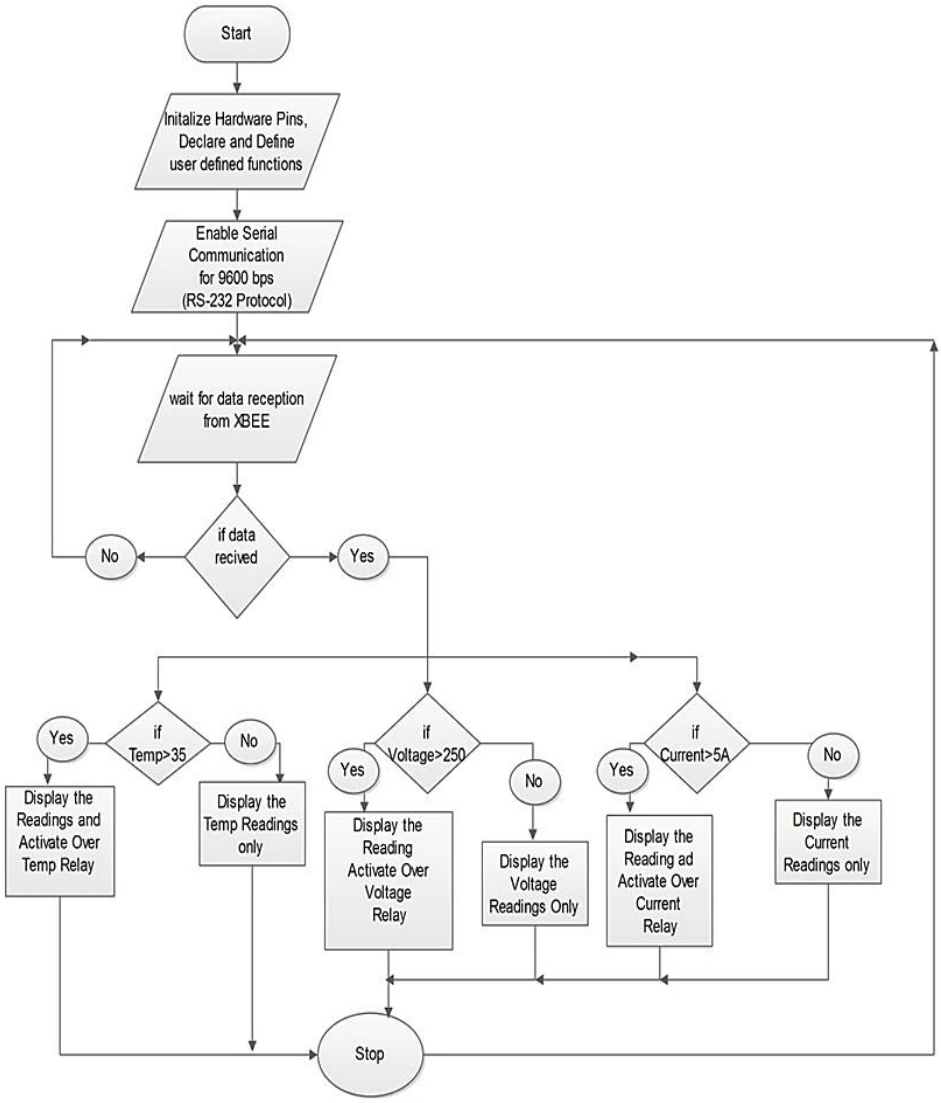

Fig. 4: Flow chart of receiver

VI.FUTURE SCOPES

This system will reduce human effort by providing automation on transformer monitoring and controlling in a simple and cost effective method[3]. The system can be used for automatic monitoring and controlling. In this method RF transceiver/XBEE module is used for data transmission and it has low range of communication, but by using GSM or internet,transformer can be monitored from any distant area.

VII. CONCLUSION

In most of the industries, mainly transformer life decreases due to improper maintenance and manual operation. If every industry installs the proposed system, transformer controlling and maintaining can be made easier.With modern technology it is possible to monitor a largenumber of parameters of distributed transformer at a relativelyhigh cost. The challenge is to balance the functions of the monitoring system and its cost and reliability.8051 microcontroller is used

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

because of its low cost and high efficiency. It provides an effective measure to save man power by providing automation of transformer monitoring and controlling.

REFERENCES

[1] "The 8051 Microcontroller and Embedded systems" by Muhammad Ali Mazidi and Janice Gillispie Mazidi , Pearson Education
[2] C.E.Lin, M.Ling, and C.L.Huang (1993). "An expert system fortransformer fault diagnosis using dissolved gas analysis". IEEE Transactions on Power DeliveryYo1 8, No 1 January 1993
[3] C. Bengtsson, "Status and Trends in Transformer Monitoring" IEEE Transactions on Power Delivery, Vol. 11, No. 3, July 1996.
[4] Abdul-Rahman AI-Ali, et al., "GSM-Based Distribution Transformer Monitoring System" IEEE MELECON 2004, May 12-15, 2004,
[5] Dubrovnik, Croatia P.M. Sneha Angeline, "Performance Monitoring of Transformer Parameters" in "International journal of innovative research in electrical,electronics,instrumentation and control engineering Vol. 3, Issue 8, August 2015
[6] Nagargoje Surekha ,Abhishek Kumar ,Mr. Daniel A.Figueiredo,"Monitoring and controlling of distribution transformer using gsm modem" in "International Journal of Advanced Research in Computer Science and Software Engineering", Volume 4, Issue 7,July 2014.
[7] Mei- sung kang, "ZigBee wireless network for transformer load monitoring and temperature sensitivity analysis" Industry applications in transactions, and 2011.
[8] Li Cai and Nina Dai 'The Home Security System Based on ZigBeeTechnology' IEEE Transactions 2010.
[9] The ZigBee Protocol [OB/EL], http://www.digi.com/technology/rfarticles/wireless-zigbee.jsp 2009.
[10] Digi International Inc,XBee ZNet2.5/XBee-PRO ZNet2.5 OEM RF Modules, Product Manual v1.x.4x – ZigBee Protocol For OEM RF Module Part Numbers: XB24-BxIT-00x,Digi International , Inc.11001 Bren Road East Minnetonka, MN 55343877, 912-3444 or 952 912-3444 http://www.digi.com