Automation of Substation Using GSM

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Abstract- *This project is about design and implementation of a mobile embedded system to monitor and record key parameters of a distribution transformer like load currents , oi level and ambient temperature. The idea of on-line monitoring system integrates a global service mobile(GSM) Modem, with a standalone single chip microcontroller and different sensors. It is installed at the distribution transformer site and the above parameters are recorded using the analog to digital converter (ADC) of the embedded system.. The obtained parameters are processed and recorded in the system memory. If any abnormality or an emergency situation occurs the system sends SMS (short message service) messages to the mobile phones containing information about the abnormality according to some predefined instructions programmed in the micro controller. This mobile system will help the transformers to operates moothly and identify problems before any catastrophic failure.*

Keywords- Substation, Protection, Control, Monitoring, Web.

I. INTRODUCTION

In power systems, distribution transformer is 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 condition (as per specification in their name plate) guarantees their long life .However, their life is significantly reduced if they are subjected to overloading, resulting in unexpected failures and loss of supply to a large number of customers thus effecting system reliability. Overloading and in effective 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 exist some problems and deficiencies. Few of them are mentioned below:

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

(2) Detection system it self is not reliable. The main performance is the device itself instability, poor anti-jamming capability, low measurement accuracy of the data, or even state monitoring system should is no effect.

(3)Timely detection data will not be sent to monitoring centers in time, which cannot judge distribution transformers three-phase equilibrium.

(4)A monitoring system can only monitor the operation state or guard against steal the power, and is not able to monitor all useful data of distribution transformers to reduce costs.

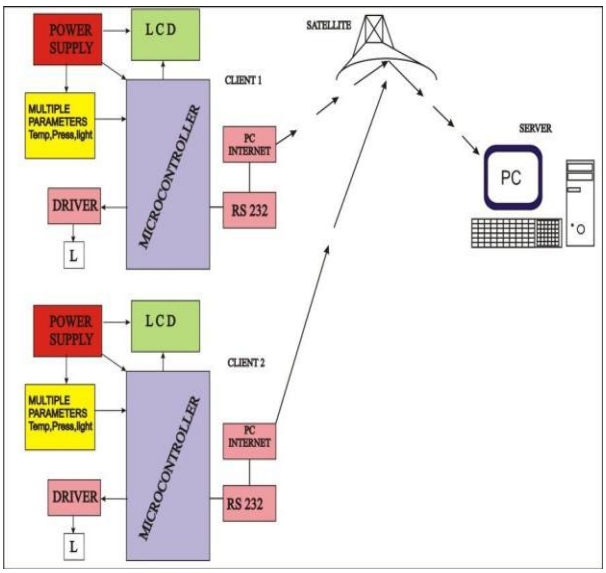


Fig. DESIGN OF THE SYSTEM

II. PROPOSED SYSTEM

Abnormality in distribution transformer is accompanied with variation in different parameters like Winding temperature, Top and bottom oil temperatures, Ambient temperature, Load current, Oil flow (pump motor), Moisture in oil, Dissolved gas in oil, Bushing condition, LTC monitoring, Oil level. However, we are dealing with oil temperature and load current.

Online monitoring system consists of embedded system, GSM modem, mobile-users and GSM networks and sensors installed at transformer site Sensors are installed on

transformer Side which reads and measures the physical quantity from the distribution transformer and then it converts it in to the analog signal. The embedded module is located at the transformer site. It is utilized to acquire, process, display, transmit and receive the parameters to / from the GSM modem. These condis the GSM module. It is the link between the embedded system and the public GSM network. The third is utility module that has a PC-based-server located at the utility control center. The server is attached to GSM modem and received transmits SMS from/to the transformer site via the GSM module.

III. HARDWARE IMPLEMENTATION

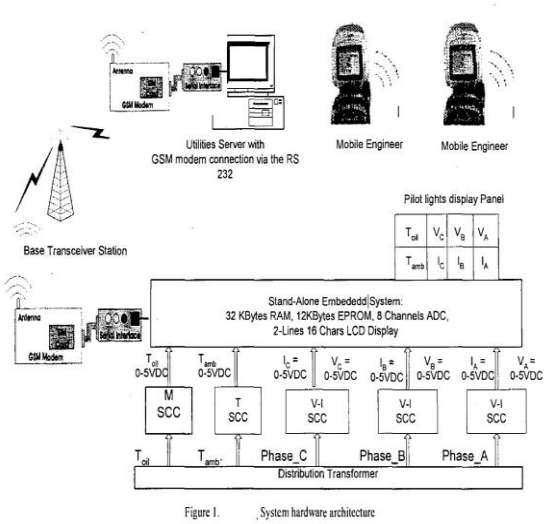


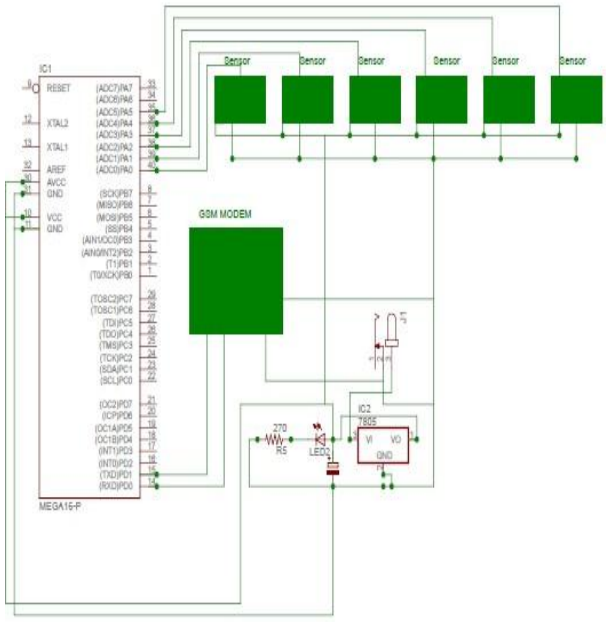
Figure 1. System hardware architecture

This chapter explains regarding the Hardware Implementation of the project. It tells about the design and working of the design with the help of circuit diagram and explanation of circuit diagram in detail. It explains the features, programming and serial communication of AT mega 16L microcontroller. It also explains the different modules used in this project.

Theaboveschemedepictsthesequenceofmethodologiesfollowed inthemonitoring of distribution transformer via GSM technology

First sensors which are installed at the transformer site sense the various parameters of transformers and convert in to analog signal to be processed in signal conditioning circuits

- Next the SCC consisting of opamps and resistors manipulates the analog signal to a compatible value so that can be read by the embedded system.
- Next the signal is passed through micro controller. The ADC is used to read the parameters, built-in EEPRO Misused to host the embedded software algorithm that takes care of the parameters acquisition, processing, displaying, transmitting and receiving.The built-in EEPROM is used to save the online measured parameters along with their hourly and daily averages.
- The GSM modem is interfaced with the microcontroller through RS232 adapter by which it upload and download SMS messages that contain information related to the transformer parameter sand status.
- This GSM modem then sends this SMS to mobile users containing information about parameters value of the distribution transformers.



IV. APPLICATIONS

- All Places needed automation such as used in paper mills , cruise electric vehicle, textiles mills, flour mills and robotics
- Many of those operation including electric motors and therefore there is need for feasible effective control strategies with digital control of those motors
- In traditional processes motors are synchronized through mechanical transmission system consisting of line shaft gear pullers. So for variable load condition speed control is important to achieve a robust system.

V. CONCLUSION

The gsm based monitoring of distribution transformer is quite useful as compared to manual monitoring and also it is reliable as it is not possible to monitor always the oil level, oil temperature rise, ambient temperature rise, load current

manually. After receiving of message of any abnormality we can take action immediately to prevent any catastrophic failures of distribution transformers. In a distribution network there are many distribution transformers and associating each transformer with such system, we can easily figure out that which transformer is under going fault from the message sent to mobile. We need not have to check all transformers and corresponding phase currents and voltages and thus we can recover the system in less time. The time for receiving messages may vary due to the public GSM network traffic but still then it is effective than manual monitoring.

REFERENCES

[1] Leibfried, T, "Online monitors keep transformers in service", Computer Applications in power ,*IEEE, Volume:11Issue: 3 , July 1998Page(s):36-42.*

[2] Chan, W. L, So, A.T.P. and Lai,L.,L.;"Interment Based Transmission Substation Monitoring", *IEEE Transaction on Power Systems, Vol. 14, No. 1, February 1999, pp.293-298.*

[3] Par S. Tenbohlen, T. Stirl, M. Rösner,"Benefit of sensors for on-line monitoring systems for power transformers"

[4] T. D. Poyser, "An On-Line Microprocessor Based Transformer Analysis System to Improve the Availability and Uti'lization of Power Transformers". *IEEE Trans. On Power Apparatus and Systems, Volume PAS-102, April1983, pp.957-962.*

[5] Muhammad Ali Mazidi , Janice Gillispie Mazidi, Rolin D.Mckinlay,The8051Microcontroller And Embedded Systems Using Assembly And C, Second Edition, Pearson Education, 2008,India.

[6] Microcontroller AT mega 16; www.atmel.com/Images/doc2466.pdf .

[7] Constant in Daniel Oancea," GSM Infrastructure Used for Data Transmission", 7th International Symposium on Advanced Topics in Electrical Engineering (ATEE), 2011May12-14, Page(s): 1– 4.

[8] Abdul-Rahman AI-Ali, Abdul Khaliq Sk &Muhammad Arshad," GSM-Based Distribution Transformer Monitoring System" *IEEE MELECON 2004,May12-15,2004,Vol 3 from page no. 999 to page no. 1002 Croatia*