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Transformer Health Monitoring System using IoT and GSM

Ammuthaelakkiya. K[1], Kavipriya. N[2], Kayalvizhi. J[3], Renukadevi. R[4], L.V. Revathi[5]
UG Student[1, 2, 3, 4], Assistant Professor[5]
Department of Electronics and Instrumentation Engineering
Kamaraj College of Engineering and Technology, Madurai, India

Abstract:
Transformer is one of the important electrical equipment that is used everywhere. Monitoring transformer's health had become a fiery task. Since in case of any damaged in the internal properties of the transformer will result in huge drawback. So it is mandatory to regularly keep an eye of the transformer. The main objective of this proposal is to acquire live data of transformer health remotely over the internet using Internet of Things technology. We are going to monitor the transformer parameter such as temperature, current, level. These data will be sent over internet using TCP / IP protocol. In case of any power failure the user will be notified with an alert message using GSM module. It also has a unique feature of detecting the phase failure. If any phase gets defect then it will indicated in the development board by an LED. These parameters will be displayed in an android application. By this process we can get to know the health of the transformer regularly and necessary step can be taken to maintain it in a proper way.

Key words: Arduino, ESP8266, GSM, Current sensor, temperature sensor and Ultrasonic Sensor.

I. INTRODUCTION

Electricity plays an important role in our life. Every moment of our life depends upon electricity. Electricity has several components and equipment helping human to transfer and regulate the distribution according to usage.

The most crucial equipment of transmission and distribution of electric power is transformer. In power system, an electrical component transformer directly distributes power to the low-voltage users and its operation condition is an criteria of the entire network operation. The majority of the devices have been in service for many years in different (electrical, mechanical, environmental) conditions.

They are the main components and constitute the large portion of capital investment. Operation of distribution transformer under rated condition (as per specification in their name plate) guarantees their long service life. However their life is significantly reduced if they are subjected overloading, heating low or high voltage, current resulting in unexpected failure and loss of supply to a large number of customers thus is affecting system reliability.

Overloading, oil temperature, load current and ineffective cooling of transformer are the major cause of failure in distribution transformer. As a large number of transformers are distributed over a wide are in present electric systems, it's difficult to measure the condition manually of every single transformer. So, we need transformer system to monitor all essential parameters operation, and send to the monitoring system in time.

It provides the necessary information about the health of the transformer. This will help and guide the utilities to optimally use the transformer and keep this equipment in operation for a longer period a distribution.

II. BASIC OPERATION

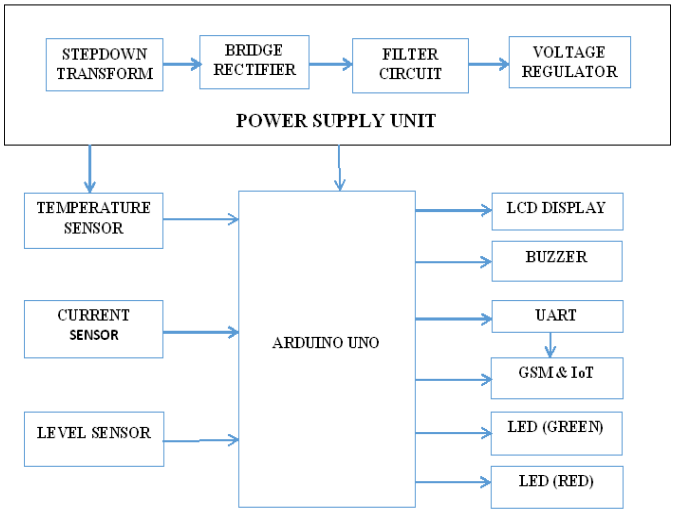

Figure.1. Block diagram

This system is designed for online monitoring of distribution transformers parameter can provide useful information about health which will help the utilities to optimally use their transformers and keep the asset in operation for a long time. In this system we used four sensors for monitoring that is voltage sensor, a current sensor, level sensor and temperature sensor. We used a power supply to operate arduino UNO and Wi-Fi modem. Above figure shows the connection between all modules. Sensor sense the data and display it on LCD display at the same time Wi-Fi module sends the data to the user on given IP address as per program. If we get an unsecured data about the system can avoid failure. This is proposed a model of real-time transformer monitoring system using GSM & IoT. This is classified in four parts-power supply, controlling, data processing and data uploading.

III. HARDWARE IMPLEMENTATION

The hardware implementation of smart bin is separated in to different atomic units such as ACS712 module, Temperature sensor module, Ultrasonic Sensor Module, GSM module, voltage module.

A. Temperature (LM35) module:

Temperature sensor is a device which senses variations in temperature across it. LM35 is a basic temperature sensor that can be used for experimental purpose. It give the readings in centigrade (degree Celsius) since its output voltage is linearly proportional to temperature.

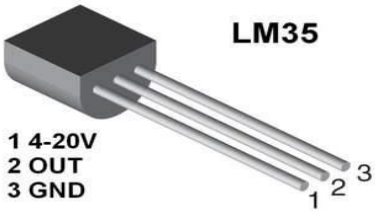

Figure.2. Pin diagram for temperature sensor

B. Current sensor module:

ACS712 Module uses the famous ACS712 IC to measure current using the Hall Effect principle. The module gets its name from the IC (ACS712) used in the module, so for you final products use the IC directly instead of the module. These ACS712 modules can measure

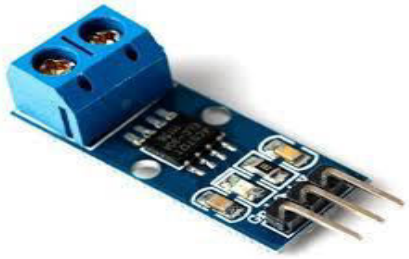

Figure.3. Current sensor module

Current AC or DC current ranging from +5A to -5A, +20A to -20A and +30A to -30A.

C. Ultrasonic module:

The ultrasonic module consists of transmitter, receiver and control circuit. This module is used for detecting the level of the waste materials in the smart bin. The ultrasonic module is shown in Fig.3.

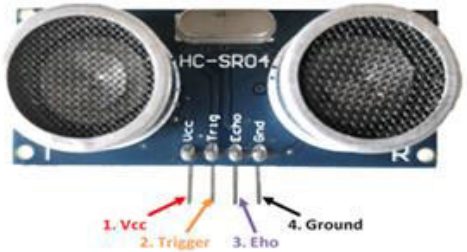

Figure.4. Ultrasonic module

The ultrasonic module transmits a short burst of sound to the bottom of the smart bin and reflects back to the sensor after finding any obstruction of waste particles. By measuring the time of flight, the distance can be measured.

D. GSM module:

The GSM module is used to send the message or call forwarding to the authorized person. The GSM module is shown in Fig.5.

Figure.5. GSM module

The GSM module is interfaced to the Arduino using level shifter IC MAX 232. When the program is executed, the module is synchronised with Arduino and sends the message to the phone number mentioned in the program.

E. Wi-Fi module:

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

Figure.6. Pin configuration of ESP8266.

The pin interfacing configuration of hardware components with the Arduino is shown in Table 1.

Table.1. Pin Interfacing Configuration

S.NO	Module	Pin no
Temperature Sensor		
1	LM 35	A0
Current Sensor		
2	ACS712	A1
Level Sensor		
3	Ultrasonic Echo Trigger	 6 7
Wi-Fi Module		
4	ESP8266 Tx Rx	 3 2
GSM Module		
5	GSM 800c Tx Rx	 10 11

IV. SOFTWARE IMPLEMENTATION

Arduino IDE is used for writing embedded C programming. Arduino UNO is a microcontroller board based on the ATmega328. It has 14 digital pins and 6 analog pins which can be configured as either input or output. The number of digital inputs can be increased by using I^2C bus. The load cell header files, wires and software serial header files are included to program the different sensor modules. The flowchart for software implementation is shown in Fig.5.

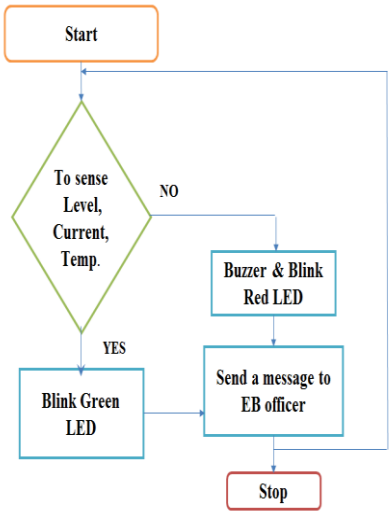

Figure.5. Flow chart for Software implementation

The methodology for the implementation is:
Step 1: Start the process.
Step 2: Sense the parameters such as temperature, current, level.
Step3: Check whether the parameters is in the limit or not.
Step4: If YES, blink green LED and send the message continuously.
Step 5: Send SMS alert to the authorised person
Step6: If NO, blink red LED and send the message continuously.
Step 7: Send SMS alert to the authorised person.

V. RESULT AND DISCUSSION

The complete model of implemented hardware module is shown in Fig 7.

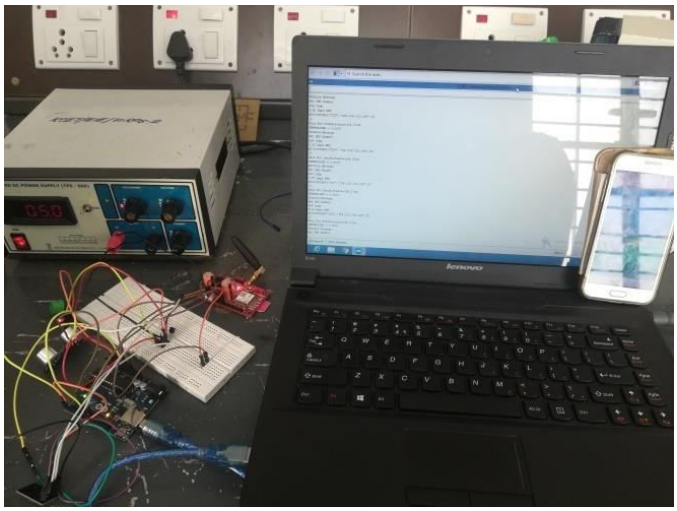

Figure.7. Entire Hardware module

The output of the sensors in the stimulation of Wi-Fi module is shown in the Fig. 8

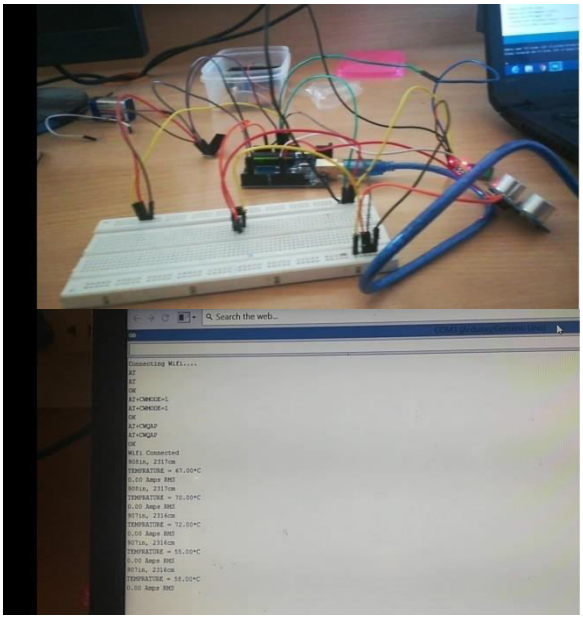

Figure.8.Wi-Fi module stimulation

The output of the GSM modules is shown in the Fig.

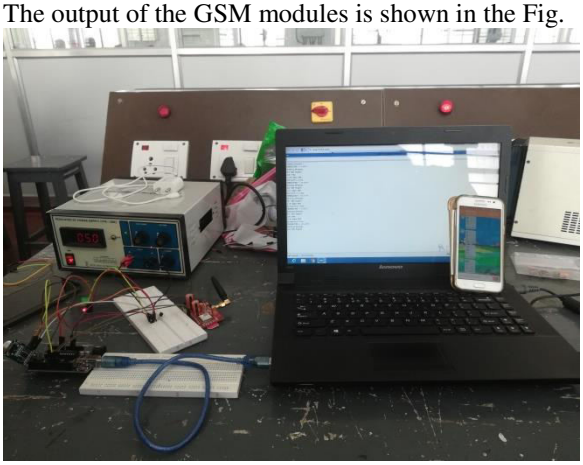

Figure. 9. Stimulation of the GSM modules with sensors

V. SUMMARY

Currently there is no monitoring methodology for distribution transformers. Protective devices are available only to prevent occurrence of fault and will be useful at the time of fault. To design and implement an embedded mobile &IoT system to measure current, oil level & oil temperature of the transformer. By continuous monitoring transformer faults can be predicted and prevented.

VI. REFERENCE

[1]. M.Hussain , M. Salman , Rohit , A.Subhan , H.khalid and S.H.Zaidi, ”Condition Based Health Monitoring of Transformers 2018 International conference on Computing Mathematical and Engineering Technology(iCoMET) , Sukkur , 2018,pp.1

[2]. V.Sanjeeya, prof.A.Vidya, “Real Time Transformer Health Monitoring System using IoT Technology”, International

Journal of Science Technology & Engineering, volume 4|Issue 09|March 2018

[3]. VadirajacharyaK, Kharche, Harish Kulakarni, Vivek Landage" "Transformer Health Condition Monitoring Through GSM Technology" International Journal of Scientific and Engineering Research | Volume 3, Issue12,Dec 2012

[4].R.R.Pawar and S.B.Deosarkar, Health Condition Monitoring System for Distribution Transformer using Internet of Things (IoT)", 2017 International Conference on Computing Methodologies and Communication (ICCMC), Erode, 2017, pp. 117-122.

[5].V.Vaibhav and S.Kishore Kumar, " Real Time Health Monitoring System of Transformer using IoT", 2018 International Journal of Pure and Mathematics volume 119 No.15 2018,921-925.

[6]. Anurudh kumar1, ashish raj2, abhishek kumar3, sikandar prasad4 &balwant kumar5 "method for monitoring of distribution transformer", 1,2,3,4&5 Dr. M.G.R, Educational and Research Institute, University, Chennai-600095.

[7]. U.V.Patil1, Kathe Mohan2, Harkal Saurabh3, Warhade Nilesh4 "Transformer Health Condition Monitoring Using GSM Technology", Vol-2 Issue-2 2016 IJARIIE.

[8]. A. Z. Loko1, A. I. Bugaje2, A. A. Bature3 "AUTOMATIC METHOD OF PROTECTING TRANSFORMER USING PIC MICROCONTROLLER AS AN ALTERNATIVE TO THE FUSE PROTECTION TECHNIQUE", International Journal of Technical Research and Applications e-ISSN: 2320-8163, Volume 3, Issue 2 (Mar-Apr 2015), PP. 23-27.

[9]. Karpe S R1, Sandeep Shelar2, Shraddha Garkad3, Shruti Lakade4 "Fault Detection and Protection of Transformer by Using Microcontroller", International Journal of Modern Trends in Engineering andResearch.