

DISTRIBUTION TRANSFORMER MONITORING SYSTEM

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ABSTRACT

A transformer is very important in substation and power system. The data assets and provision of transformer is an very important aspect in electric network as huge number distribution transformers are distributed a huge area. Through this paper we are presenting an idea for designing and new accoutrement of GSM based system and software is used to programme running purpose, and recording main operation constant of a substation transformer relating a voltage measurement, transformer oil measurement, heat of transformer (temperature) measurement of three phases. The proposed plan of online observe system of transformer proportion in a Global Service Mobile modem (GSM) Modem, with the use of microcontroller chip and sensors. Parameters of working condition of distribution transformer is received in the form of short message service and it will be saved in the phone or internal storage.

INTRODUCTION

A many technologies are mainly used online and offline monitoring of transformer most of the industries and companies use the online monitoring system. Distribution transformer is the very important equipment in distribution network. In this paper has collective information about transformer monitoring system that has many advantages such as ease in information collection, better management, condition assessment and decision making for engineers. Main purpose of distribution transformer is to transform the wide AC voltage to low voltage. The Life of transformer is depended on its conditions. System reliability is drastically reduced due to loading of transformer and also it affects the winding. Overloading and ineffective cooling of transformer are the many problems of failure of distribution transformer

The substation transformer life is depend on its performance, resulting in many failures and loss of more supply to a large number of customers and big substations these affects on system of substation. The All factors can reduce the life of transformer. The main causes of failure in distribution transformers are due to overload and rise the oil & temperature of winding transformer. The global service mobile modem (GSM)

based monitoring of distribution transformer is very useful as compared to the manual operating system and work properly compared to manual. Whenever the abnormality occurs after receiving the message of any abnormality condition and message saved in phone memory, on abnormality condition take action easily and immediately to prevent any problems of failure of distribution transformers. In a substation many distribution transformers and check each transformer with such system can easily find out faulty transformer and sent message to your mobile phone, thereby no need of checking all transformers every day and time to time parameter and thus we can recover the system in less time and displayed on LCD display.

PROBLEM STATEMENT

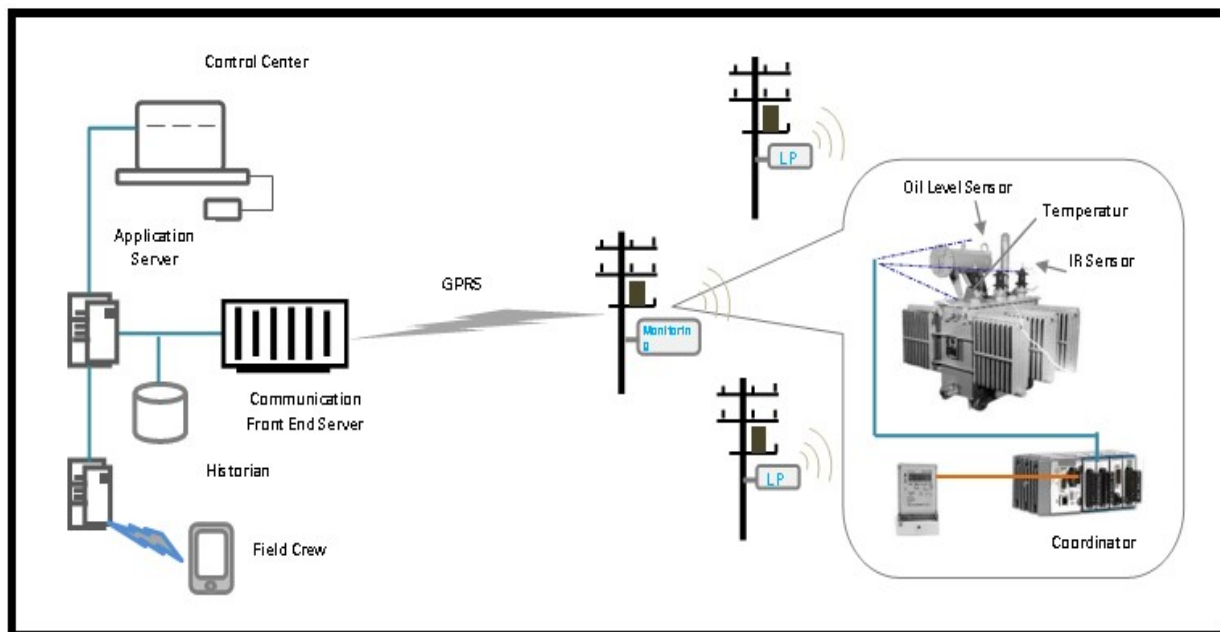
A Distribution transformer damage rate in India per annum is very high in the range of 30% and related to that in the advanced country which is about 5% to 10%. The distribution transformer damage within the period of 3 years will lead to eventually loss of cost of the manufacturer company. Nearly forty five lakhs distribution transformer are placed in India with rating of transformer ranging between 10-250 KVA with total handling capacity of transformer is 315 GVA and, per annum 14 % distribution transformer are being added to the system network.

At the condition all type of transformers are monitored manual, and recording parameter values in substation and industries. There are several faults in manual testing because of observation error and which are caused by oil level and windings temperature.

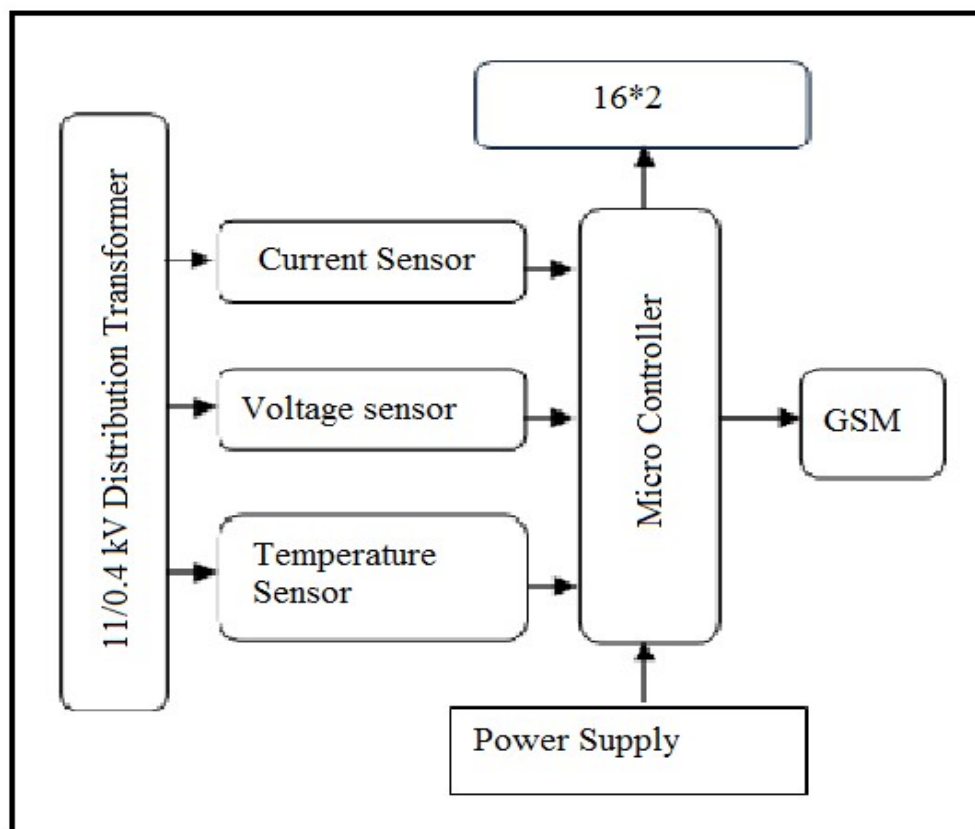
A manual monitoring system does not facilitate regular monitoring the oil level of transformer, rise in transformer oil temperature, rise in ambient temperature of transformer, the load current does not manual check regularly. The transformer abnormal condition is results in variation in different parameters like temperature of transformer, oil temperature, ambient temperature, load current, oil level of transformer. The monitoring devices that are presently used for monitor a transformer to face many problems and failures deficiencies as; a monitoring network is detects a one parameter such as a capability of transformer, current of transformer, phase of transformer. In many time detect multi parameters. This proposed GSM based system is designed by to overcome all disadvantages of manual testing and improves life and efficiency of distribution transformer. In most of companies and industries this task is achieved by using SCADA system for monitoring transformer but SCADA system is very expensive and hence we start to use the GSM based system for mentoring also because the cost is saved, the error and correction offset and gain adjustment of circuit can be added in the system to minimize the error and enhance the accuracy and increase the efficiency and reduce the manual losses.

SYSTEM DESIGN

The whole system is depend on microcontroller ATMEGA328 the system monitors voltage of transformer, load, temperature of transformer and oil level of a distribution transformer. The monitoring device is fixed on the secondary of the distribution transformer and the output will be display on an liquid crystal display (LCD) panel and note down the readings. The transformer values note down and compared with the rated values of the transformer and the microcontroller is programmed use of monitored values, and the set a value in programmer then the microcontroller (ATMEGA328) sends an SMS to your mobile with the use of GSM modem. Many time faults are occurs at the time it shows warning message on liquid crystal display (LCD) in the monitoring station. The microcontroller and the sensors are continuously scans the system and updates all the parameters display on LCD in his stations. At the time of abnormality gives alert and buzzer starts to ringing.



BLOCK DIAGRAM



Methodology of distribution transformer followed by global service monitoring technology.

- The sensors are used to sensing purpose of many parameters of distribution transformers and then converted into analog signal to digital signal be processed in signals circuits and display on liquid crystal display (LCD).

- SCC consist a operational amplifier and resistors converts the digital signal in a compatible parameters readable by the interfacing of transformer.
- After that the signal message sent to your microcontroller. The parameters are read by built in ADC. The microcontroller used in the system EEPROM versions, the microcontroller used to host the embedded software algorithm that takes care of the parameters acquisition, processing, displaying, transmitting and receiving. The built-in EEPROM memory is used to save the online measured parameters along with their hourly and daily averages.
- The microcontroller is interfaced with GSM modem with help of RS 232 adapter by which it upload and downloads. The SMS is sent which contain information related to the transformer parameter and its status.

• **PARAMETER ANALYSIS**

1. Voltage Analysis:

In voltage analysis the function is to vary voltage in power system. The phase angle between are not similar. Only on polyphase system affects power quality problem. This means that power quality problem affects only polyphase systems. Unbalance of voltage happen its gives indication your polyphase can get failure and other load problem can happen The significant effect of the voltage unbalance on transformers lifetime and system reliability.

PARAMETERS	PRESET VALUE	ACTUAL VALUE
Oil level	2%	4%
Winding temp	80 deg. C	63 deg. C
Output voltage	195V	230V
Load current	8A	5A

2. Overload Analysis:

When there is excessive loading of transformer it causes heating of oil then cooling it down again when it is decreased. The transformer may burst if the load is extremely high. But chances of such incidents are quite less. The transformer will fail mostly because of high loading over a long period of time. In short, the life of distribution transformer reduces due to overloading. This overloading remains unnoticed many a times . According to some the transformer deficiency rate in India is more around 20 percent . According to Indian standard deficiency rate must be less than 4 percent.

When the load in a transformer increases

1. When excessive current flow the winding get heated.
2. Arching start at high voltage and it can jump into secondary winding of transformer.
3. Because of that coating of wire is melt and conductor get exposed it can create short circuit problem.

3. Temperature Analysis

The component temperature is affected on the life of transformer. The transformer life increases it is main to maintain the temperature (heat) of transformer at the optimum level condition.

Components Used

1) Microcontroller

At mega 328:

microcontroller is a 8-bit AVR RISC-based the microcontroller is a combination of 32 KB internet service provider(ISP) the flash memory with receiving and transmitting capable, 1 KB EEPROM version memory, 2KB static memory, general 32 pins are used, in a system 3 timer and counters with comparing with the modes of internal and the external interrupts of microcontroller, serial programmable of a non synchronous acceptor transmitter(USART), two-wire sequence interface, for network connection serial port, channel-6 10-bit analog to digital converter (8-channels in TQFP and QFN/MLF packages),

programming timer with internal serial oscillator, and the five software is selectable power save modes are in the internal software. This microcontroller it starts on 1.9-5.7 volts. The Frequency achieving 2MHz

2) Sensors:

Sensor is main component in electronic equipment. the purpose of sensor is to detect abnormal condition or adjustment in the its surrounding condition and sending parameters and other information to another electronic component to which is used in this system.

- i. LM 35 sensor- a sensor used To measure the heat of transformer and measure oil temperature the pins of sensor is attach to the arduino kit.
- ii. Voltage sensor – it uses to measuring the transformer voltage and record the parameters display on liquid crystal display(LCD). The A2 pin is joint to arduino board.
- iii. Float sensor – it used to measure oil level. A3 pin is attached to arduino kit

3. GSM:

The GSM is mainly used in automation purpose because the GSM gives instant notification to our arduino kit in the system mainly used mobile sim cards standard. The data communications is including with the using of GSM, first by switching transport, then the by packet the mobile information transmitting via GPRS service to the Enhancing a information values for the GSM Evolution (EDGE).

Serially, the 3GPP developing of 3G as a UMTS the units, following by 4G advance technology standards, which this is not part of GSM

GSM Association of GSM. In the system most common codec is used. The GSM is purchased the trademark.

4. LCD display

LCD is a display used for many projects, notebooks, and in other smaller electronic equipments.

LCD is also known as liquid crystal display

Supply voltage of LCD is 5V

The pins are attached to Liquid crystal display screen to Arduino kit, connect the following pins:

- 8 pins using of LCD data pins
- pin 1 to ground
- pin 2 to VCC
- pin 3 to VEE
- pin 4 receiving pin
- pin 5 write pin
- pin 6 enable

8 pins of LCD is data pins

In the LCD the pot is using adjust the contrast

Addition , in a system wire and 10k pot is using to +6V and ground A 220ohm resistor and pot is using to capability of the backlight display, usually pin 16 and 17 liquid crystal display of connectors are used.

ADVANTAGES

- Low cost.
- Real-time monitoring.
- High efficiency.
- High Accurate

APPLICATIONS

- Distribution Transformer.
- Industrial Applications.
- Used in substations.

DISADVANTAGES

- Extra investment required.
- Loss of network leads to complete failure.

CONCLUSION

This system implemented on the transformer we can record the failure in transformer. We cannot measure the temperature of oil, ambient temperature rise, and load current manually, it is more reliable and beneficial substitute as global service modem situated monitoring over manual monitoring system. After receiving a message from abnormality, which usually takes 5-10 sec immediate action its help to distribution transformer failure. In distribution transformer number of incorporated transformer and therefore by implementing this system in each transformer, we can easily figure out which transformer is failure by message to your cell phone. 5 to 10 sec required to sent the message.

Because of this Global service modem based distribution transformer help prevent from failure of transformer and its takes less time to recover the system. The receiving message may vary to the public GSM network but still then it is effective than manual monitoring.

FUTURE SCOPE

In future the integral can larger by using a server module can be included in this network for receiving and storing the data periodically used to database application. In the future the IoT system is implemented and with the using of wifi system & it is very useful in future. and the all parameters are display on internet using wifi system.

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