TRANSFORMER PARAMETER MONITORING AND FAULT AUTOMATICALLY INTIMATED TO ELECTRICITY BOARD USING PIC MICROCONTROLLER

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Abstract--*Now a day, the transformer is an important component of an electricity board all over the world. Here the distribution transformer plays a major role. It distributes electrical energy to low voltage users directly. In this paper monitoring system of distribution transformer using embedded system, like temperature, oil level, voltage, current to monitor and regulate different parameters and also used various types of sensors for monitoring the parameters. Our proposed system is a low cost, easy to use and capable of monitoring and displaying data using microcontroller.*

Keywords --*Distribution transformer, embedded system, Sensors, Microcontroller.*

I. INTRODUCTION

In Electrical power transmission frameworks, transformers speak to one of the key parts in utility frameworks. Since it is a basic piece of the substation, key container necks happen on the off chance that we neglect to screen the transformer regular observing of the urgent jobs of a transformer before causing destroying the framework due to emerging issues this can take into consideration a change from intermittent to condition-based support. A few parameters of the transformer activity are (1) Temperature of oil, (2) Moisture level, (3) Operation of cooling fans, (4) Electrical burden levels and (5) Gas sensors. This investigation shows the Real-time Monitoring and control of frameworks utilizing sensors for perusing the estimation of various parameters of transformers.

The explanation behind utilizing ARM7 processor gadgets is cost adequacy, little size, hearty and decreased power utilization which helps in the utilization of the least power. So the essential highlights of ARM can be utilized for a modern application like controlling of Transformers in a constant.

The RF correspondence needs a baseband processor which will give a remote method of correspondence between a checking installed gadget and the customer by texting about transformers.

For observing transformers numerous techniques have been received.In prior works Oil level, glide level, Temperature level, over-burden has been estimated physically. These levels ought to be checked intermittently by the working staff which will be a dull and wasteful

method for observing. For better checking of transformers, a few works like, Transformer controlled with a microcontroller and sending information through sequential correspondence to a host PC has been actualized.

To observe the parameters of the transformer sensors are used. a sensor is a gadget, module, machine, or subsystem whose reason for existing is to recognize occasions or changes in its condition and send the data to different hardware, as often as possible a PC processor. A sensor is constantly utilized with different hardware.

II. LITERATURE SURVEY

[1] Distribution transformer is an important component of an electrical distribution system. The distribution transformer distributes electrical energy to low voltage users directly.

This paper presents a monitoring system of the distribution transformer. Which is an embedded system used to monitor and regulate different parameters that directly affect the transformer.

Different sensors are used for monitoring current, voltage, and temperature. According to the interpretation of these sensors, the microcontroller takes action to maintain constant operating conditions of transformers. The proposed system is a low cost, easy to use capable of monitoring and displaying data using MatLab.

[2] Transformers come in a variety of sizes commonly ranging from 5 KVA Distribution transformers to 2000 MVA Power Transformers. So, in this proposed system, they selected a 400 KVA, 11/0.433 KV Distribution Transformer to commence their work on transformer health monitoring.

Monitor the level of transformer oil as it is compulsory to maintain a standard level of oil in the transformer. The temperature sensor was mounted on the top of the tank cover to sense the oil temperature of the transformer. These sensors were further connected to the input of SATEC Intelligent MFT EM133 Meter which is a smart, multi-function and GSM based meter. The output terminals of the transformers are also connected to this meter

to acquire various parameters of the transformer. The meter has intelligent features to monitor and acquire the real-time data of the transformer.

[3] The environment conditions specific to substations, are the enemy of any transformer. These cannot be eliminated but we can control some conditions. The project does not provide the overall solution for transformer failure but it can control some major parameters so that it can be a good solution for transformer failure.

[4] The system developed is capable to perform such operations as running the motor through RF, stopping it, measuring, monitoring and controlling the most parameters of the motor like phase currents, phase voltages, wiring temperature, speed. All of these values can be transferred to the host computer, displayed on the interface, represented graphically;

Monitoring and controlling the basic parameters of the industrial motors were examined and achieved in various ways. A new ZigBee technology is a new wireless protocol is used for communication.

This protocol is widely used in various areas for its better reliability, low power consuming profile, excellent Capability, high flexibility, and low cost.

[5] The importance of monitoring and controlling Industrial parameters lies in building efficient SCADA based wireless technology. Its applications range from providing security through intrusion detection to measuring important parameters such as Temperature, Light Intensity, etc. in future Data can be sent in a bi-directional way. The ultimate goal of this project is to develop a technology to aid in the further development of bi-directional communication between a PC and a remote robot.

[6] With the advancement of technology things are becoming simpler and easier for us. Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. The paper proposes the control of the industrial process like speed control of motor and used in other applications by using Arduino and a smartphone.

Here in this project, they introduce low-cost remote control for industries with compactable to any phone that has Bluetooth connectivity. It provides the advantages of smart control. Working range as large as the coverage area of the 60 feet no interference with other controllers.

[7] Remote Monitoring and Control is one of the most important and necessary criteria for increasing production and process plant availability. There is a lot of development in industry and the requirement for industrial monitoring systems is getting higher. The system should be able to acquire, save, analyze, and process real-time data. It is also required controlling particular machines, to change related environment factors and monitoring in the long-distance so that it realizes modern, intelligent, and accurate control. In the project, they achieve these advantages by the substitution of an embedded ARM processor to realize data acquisition and control (DACS).

[8] Transformers are among the most generic and expensive pieces of equipment of the transmission and distribution system. Regular monitoring health condition of the transformer not only is economical also adds to increased reliability.   In the past, the maintenance of transformers was done based on a pre-determined schedule. With the advancement of communication technology now it is possible to receive fault information of the transformer through GSM technology remotely to the operator and authorities so one can able to take possible solutions before converting fault into the fatal situation.

III. PROPOSED METHOD

3.1 BLOCK DIAGRAM:

Figure 1 shows the transformer parameter monitoring is done by the help of a PIC microcontroller.

The major component in this diagram is the Potential Transformer Current transformer, ADC, Microcontroller, GSM. The thermistor senses the temperature in the transformer and it is fed to PIC.
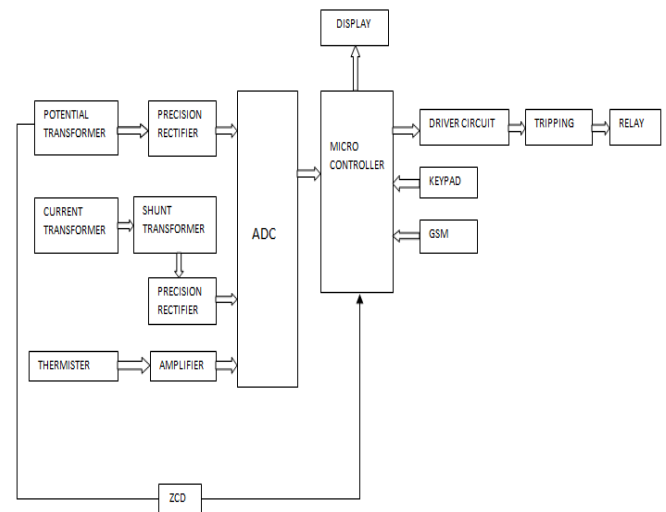

Fig: 1 Transformer monitoring system

Voltage to the transformer or load is measured with the help of a potential transformer. The potential transformer will convert the mains supply voltage to low voltage AC. That AC voltage will be rectified with the help of a precision rectifier. Then the rectified output will be given to the microcontroller through an analog to digital converter.

The current consumed by the transformer or load is measured with the help of a current transformer. The current transformer will convert the load current into lower values that current output will be converted into voltage with the help of the shunt resistor. Then the corresponding AC voltage will be rectified with the help of a precision rectifier.

Then the rectified output will be given to the microcontroller through an analog to digital converter. Analog to digital converter convert the input analog signal to the corresponding digital signal which is given to the microcontroller.

Frequency will be measured with the help of the Zero Crossing Detector. The zero-crossing detector output will be in $\pm 12V$. That should be converted to the TTL logic pulses with the help of zero-crossing detectors. Then the amplified signals will be given to the microcontroller through a buffer. The temperature sensor is used to monitor temperature level

in the transformer. The temperature sensor output is given to microcontroller through amplifier.

Then the micro controller will receive above mentioned parameter and displayed on the LCD display which equal to monitored parameters. In this project the key pad is used to set the desired normal value. The microcontroller compares the set values with normal values. If anyone value is exceeding above the normal value, the microcontroller activates the relay driver circuit to trip the incoming power to the transformers.GSM is used to send the information to the EB.

3.2 HARDWARE SETUP:
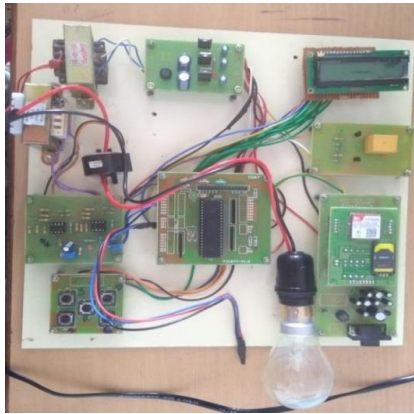
Fig 2: Hardware setup

3.3 WORKING:

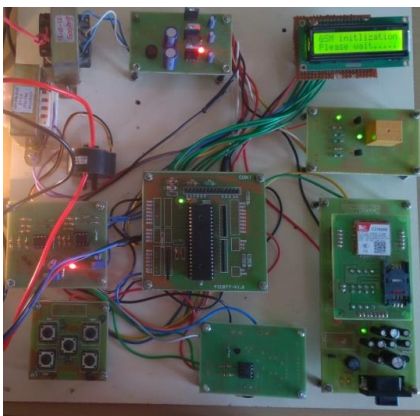The working of the kit is given below as in pictures.The first image is shows the GSM in the kit.

Fig 3: GSM initialization

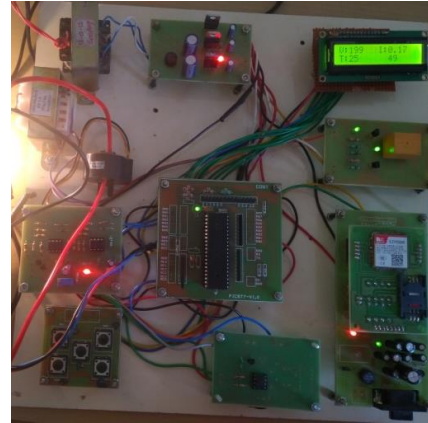After the initialization process,the kit is operating normally.It is showed in the below picture.

Fig 4:Normal operation of transformer

The next image is shows rhe low voltage operation of the transformer.After sensing the low voltage the relay is operated to trip the circuit and at the same time message is sent to thr EB.
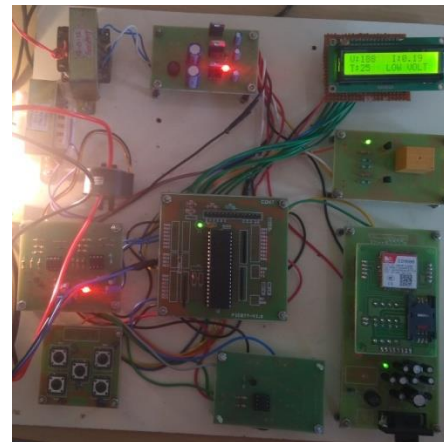

Fig 4:Low voltage operation

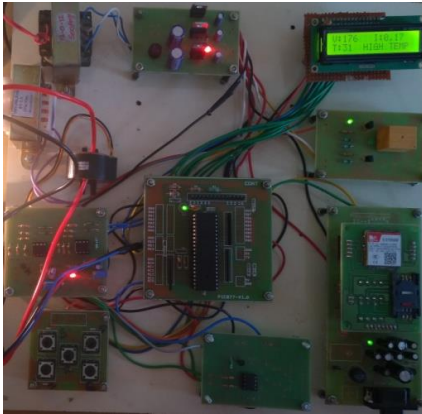The next image shows the temperature rise in the transformer.

Fig 5:High temperature
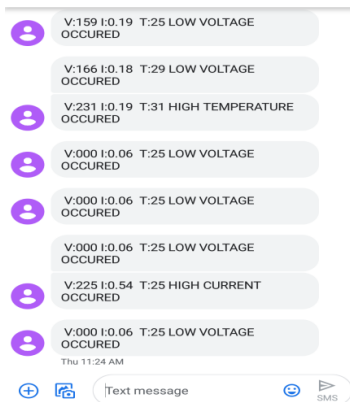
The screenshot of the messages to the EB is shown below.

Fig 6:Screenshot of the messages

3.4 DISTRIBUTION TRANSFORMER:

A distribution transformer or administration transformer is a transformer that gives the last voltage change in the electric framework, the voltage utilized in the conveyance lines to the level utilized by the client. The development of a commonsense effective transformer made AC power conveyance practical to the world; a framework utilizing distribution transformer was exhibited as right on time as 1882.

Distribution transformer ordinarily have evaluations under 200 kVA,albeit some national gauges can take into account units up to 5000 kVA to be portrayed as dispersion

transformers. Since conveyance transformers are empowered for 24 hours every, decreasing iron misfortunes has a significant job in their plan.

Fig 7: Distribution transformer

3.5 MICRO CONTROLLER:

A microcontroller is a little PC on a solitary metal-oxide-semiconductor (MOS) co-ordinated circuit chip. A microcontroller contains at least one CPUs alongside memory and programmable info/yield peripherals.
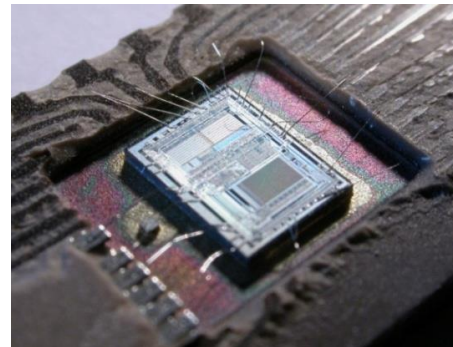

Fig 8: Micro controller

3.6 ADC:

In hardware, a Analog to Digital converter is a framework that changes over a simple sign, for example, a sound got by an amplifier or light entering a computerized camera, these analog signals are converted to digital signals. Ordinarily the advanced yield is a two's complement of the

number that is corresponding to the information, however there are different conceivable outcomes.

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V. CONCLUSION

In this paper the distribution transformer key parameters like voltage, current; temperature, oil level and frequency are monitored using PIC micro controller. If any fault occurs in the transformer the information is intimated to the Electricity Board through PIC micro controller. At the same time a relay is operated to trip the faulted area to save the entire circuit.

VI. FUTURE WORK

In this project the fault is only intimated and monitored and relay is operated to trip the circuit. In future it may be developed such as it will automatically rectify and repair the fault itself using robotic.This project can be extended by using GPRS technology. System can make solar panel operated.

BIBLIOGRAPHY:

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