

GSM Based Transformer Monitoring And Control

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Abstract: An essential component of electrical energy transmission in electrical power systems is the distribution transformer. In order to prevent overloaded currents, oil overheating, and high voltage spikes from damaging the distribution transformer. Therefore, proper transformer protection is crucial for maintaining a steady supply of power. This defensive approach uses an Arduino controller, which is inexpensive and capable of operating at a high rate of speed and accuracy. The controller continuously measures the load's current and transformer temperature. The protection scheme activates and trips the load if the rating of voltage and current exceeds its pre-set values. A fan would turn on to cool the heated transformer as soon as the temperature exceeded the threshold value set in the system. By using bulbs to increase load, we can cause the over current issue. When an emergency or unusual circumstance arises, the system uses a GSM modem to deliver data via SMS to mobile phones.

Keywords: Distribution transformer, Arduino, GSM, Relay

I. INTRODUCTION

Electrical equipment known as a distribution transformer is used to step down voltage without changing frequency and distribute to the consumer. In this study, a protective system has been designed so that it continuously monitors the transformer's realtime, adjustable operational variables and displays them on an LCD screen.

The continuous transformer parametric data is displayed on an LCD screen. A current transformer serves as a current sensor in this research project. The transformer and C.T. are connected in series. Transformer oil temperature is determined using sensor. In order to implement the tripping mechanism, relays are used. If temperature rises over predetermined levels utilising relay1, a fan would be turned on. On the LCD, the values for voltage, temperature, and current are displayed. It is a significant cost savings, lower power usage, and more reliability are further benefits. To track instances of electrical problems and communicate with a switch to isolate the transformer

from the system, this system uses a microcontroller called Arduino.

II. LITERATURE REVIEW

Various E-medias, IEEE journals, national and international conference literaturesurvey. Authored by Prof. R. B. Pandhare, Mr. Parmanand Waghmare, MS Ashvini Gawande, and Mr. Gopal Bahekar and published in IJIREICE Paperas "Transformer Protection by Using Arduino with GSM Modem" Transformers are crucial components of the transmission and distribution network. The design and construction of a system for tracking the load current, voltage level, transformer oil level, and outside temperature are presented in this work. We used a GSMbased solution to protect the transformer from the aforementioned factors. The transformers benefit from this system's smooth operation and early fault detection. The above parameters are monitored after being placed at the transformer site[1].

[2] Satya Kumar Behera's paper "A Review of Transformer Protection by Using PLC System" was published in the International Journal of Digital Application & Contemporary research. The suggested online monitoring system incorporates sensor packages and a solid state device known as a PLC (programmable logic controller). The suggested plc monitoring system will assist in identifying both internal and exterior failures of the transformer as well as in diagnosing these faults using the desired range of parameters that are programmed.

III. OBJECTIVES

- To create an embedded transformer protection system utilising the Arduino-uno controller.
- To configure the SPI protocol for sensor and Arduino controller communication.
- To use a fan to rectify an unsuitable situation.
- Using GSM, communicate information about corrective action to the authorised individual.
- To implement emergency cut-off conduct in extreme circumstances.

IV. METHODOLOGY

The realtime electrical parameters are sent by SMS using a GSM modem. When the parameters (Voltage, Current, and Temperature) go beyond the predefined limitations, the system is designed to send SMS notifications to the designated individual. In

This system, "Transformer safety and monitoring using GSM," offers transformer safety & monitoring while also taking corrective measures to stop additional transformer damage. The embedded system in the proposed system is integrated with a temperature sensor and a humidity sensor to sense the status of the transformer in terms of the temperature outside and humidity.

A transformer must be isolated from the supply if its temperature rises beyond the first threshold level, at which point the fan and alarm will automatically turn on. If the temperature rises above the second threshold level, which is higher than the first, the transformer is considered to be overheated. In light of the fact that emergency LCD is utilised to display the current sensor data, power will be switched off at threshold 2.

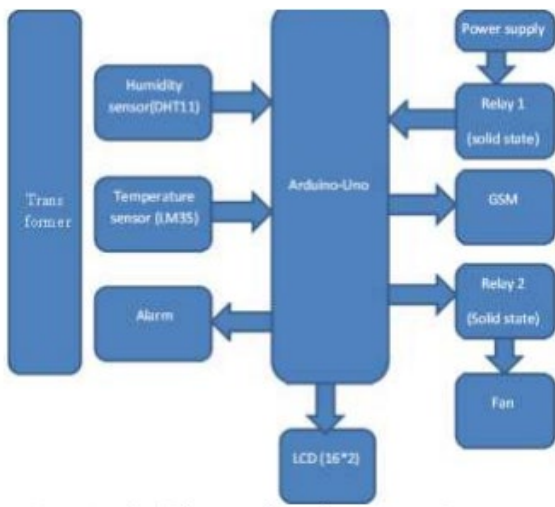


Figure 1:Block Diagram Representation

V SYSTEM DISCRPTION

Arduino controller:

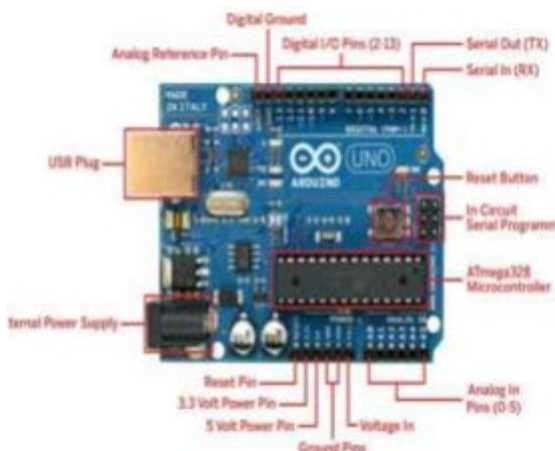


Figure 2: Arduino Controller

The freely available digital system Arduino features user-friendly hardware and software. These have the capacity to

read inputs from a sensor and convert them into outputs. The Arduino board is an Atmega 328-based microcontroller. There are 14 input/output pins, of which 6 can be utilised as PWM outputs. The Arduino carries out specific tasks. It has a serial monitor that enables straightforward text data to be delivered to and received from the Arduino boards. It interfaces with the GSM module system's parameters. In Arduino, a common form factor separates the microcontroller's functionalities into a more usable packaging.

GSM:



Figure 3: GSM

GSM was designed to be a safe wireless network. GSM is however susceptible to various attack types, each of which targets a different area of the network. In contrast to GSM, which only authenticates the user to the network (and not the other way around), UMTS includes an optional USIM that employs a longer authentication key to provide more security as well as mutually authenticating the network and the user. As a result, the security model provides confidentiality and authentication, but has limited permission options and does not support nonrepudiation. If there is an issue with the specified parameters in the system, a message will be sent to the user immediately. Sending a message is crucial to fixing the transformer problem.

Temperature Sensor:

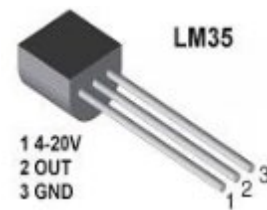


Figure 4: LM35

The output voltage of the LM35 series precision integrated circuit temperature sensors is linearly proportional to the temperature.

erature in degrees Celsius. In comparison to linear temperature sensors calibrated in Kelvin, the LM35 device has an advantage because it does not require the user to deduct a significant constant voltage from the output in order to gain convenient Centigrade scaling. The LM35 gadget provides typical accuracies of 14°C at room temperature and 34° Cover a complete 55°C to 150°C temperature range without the need for any extra calibration or trimming

LCD:



Figure 5: LCD

The proposed setup uses a 16x2 LCD to display the current sensor values for the temperature and humidity sensors. A flat-panel display or other electronically manipulated optical device that makes advantage of liquid crystals' light-modulating abilities is known as a liquid crystal display (LCD). Liquid crystals don't directly emit light; instead, they create images in either colour or monochrome via a backlight or reflector. There are LCDs that can show arbitrary graphics (like those on a general-purpose computer display) or fixed images with little information that can be seen or hidden, such pre-programmed text, digits, and 7-segment displays, like those on a digital clock.

Humidity Sensor:



Figure 6: DHT11

A composite sensor, the DHT11 digital temperature and humidity sensor. A sensor's calibrated digital signal output for temperature and humidity is present. To ensure that the product has great dependability and outstanding long-term stability, temperature and humidity monitoring technology is applied along with a specific digital module collection technology.

Relay:



Figure 7: Relay

An electrically controlled switch is a relay. Solid-state relays are one type of working principle, although many relays employ an electromagnet to mechanically operate a switch. Relays are employed when multiple circuits need to be controlled by a single signal or when a separate low-power signal is required to control each circuit separately

Flowchart:

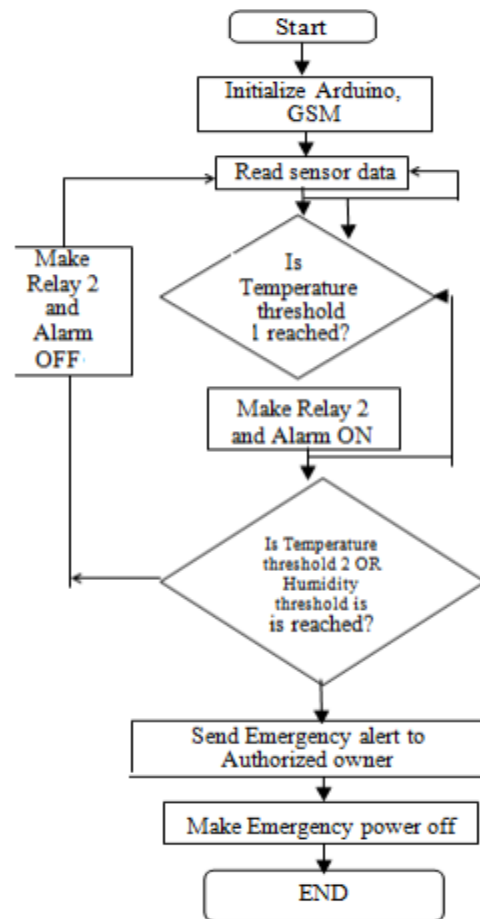


Figure 8:Flowchart

Software requirement:

ARDUINO 1.8.5: Writing code and uploading it to the board are both made simple by the free and open-source Arduino Software (IDE). It is compatible with Windows, Mac OS X, and Linux. The environment is created using Processing and other opensource technologies and is written in Java. Any Arduino board can be used with this software.

Pooja B. Pawar published in International Journal of Machine Learning and Computing, Vol. 2, No. 1, February 2015

[4] Sathyakumar Behera, Ravi Masand, Dr.S.P.Shukla, A Review of Transformer Protection by using PLC System, International Journal of Digital Application and Contemporary Research (Volume 3, ISSUE 2, September 2014)

VI Result

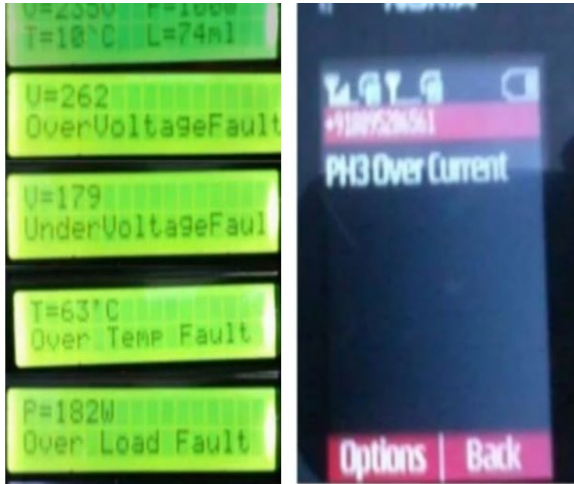


Figure 9:LCD Displaying the results

If $180 > \text{voltage} > 260$ --- voltage fault

Temperature $> 150^\circ\text{C}$ --- temperature fault

Power $> 125\text{W}$ --- over load

Oil level $< 100\text{ml}$ --- oil level fault

If any change occurred in above rating is show in LCD and some data is sent as SMS and at the same time transformer gets disconnected from supply with the help of relay

VI Conclusion

This project is made easier for self-clearing transient faults. It also has the benefit of using net fault amounts as opposed to total fault quantities. Relay is used to safeguard the system against harm and disconnect it from the power source in the event of a breakdown. This method offers a different and simple way to obtain early information about the distribution transformer's status for fault detection, quick reaction, and potential power response.

References

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[2] “A Review of Transformer Protection by Using PLC System” authored by Satya Kumar Behera published in International Journal of Digital Application & Contemporary research” Volume2,

[3] Thermal Overload Protection of Distribution Transformer” authored by Chetan S.Patil, Prashant A. Gite,