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Analysis of Distribution Transformer Health Monitoring and Protection using Arduino

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ABSTRACT: In this paper, plan and usage of a versatile inserted framework to screen and record key parameters of a transformer like load currents, Voltage level and encompassing temperature. The possibility of on-line monitoring framework coordinates a Wireless-Fidelity (WI-FI) Modem, with an independent single chip microcontroller and diverse sensors. It is introduced at the circulation transformer site and the above parameters are recorded utilizing the analog to digital converter (ADC) of the installed framework. The got parameters are prepared and recorded in the framework memory with a constant access on LabVIEW. In the event that any irregularity or a crisis circumstance happens the framework sends a trigger to over-burden insurance hardware which turns off the circuit and the IOT stage and LabVIEW containing data about the variation from the norm as per some predefined guidelines modified in the microcontroller for the protection of the transformer. This framework will assist the transformers with operating easily and distinguish issues before any cataclysmic disappointment

KEYWORDS: Transformer, Monitoring, Temperature sensor, Arduino.

I. INTRODUCTION

Transformers are a fundamental piece of the transmission and distribution framework. Monitoring transformers for issues before they happen can anticipate deficiencies that are expensive to repair and result in lost administration. Transformers being the fundamental piece of intensity transmission framework are costly, similar to the cost of intensity intrusions. Due to the cost of booked and unscheduled support, particularly at remote locales, the utility business has started putting resources into instrumentation and monitoring of transformer. [1] A minimal effort framework for deciding the recuperate the state of transformer by utilizing the parameters of oil like dampness content, current, voltage and temperature ascend in the oil are presented.[3] These parameters are consistently checked and are sent utilizing WI-FI innovation to forestall untimely disappointment of transformers and enhancing dependability of administrations to the clients. An Embedded based equipment configuration is produced to secure information from electrical detecting framework [5][4]. It comprises of a detecting framework, progressed implanted equipment, Arduino to show the parameter esteems and blames. An intense WI-FI organizing is intended to send information from a system to other system for appropriate remedial activity at the most punctual. Any adjustment in parameters of transmission is detected to ensure the whole transmission and distribution. The condition and blames happen in the transformer can be dictated by knowing the transformer parameters, for example, current, voltage and specific temperature ascent of oil. [7][9]

Transformer is one of the imperative electrical hardware that is utilized as a part of intensity framework. Monitoring transformer for the issue before they happen can anticipate issues that are expensive to repair and result in lost power. The principle point of the paper is to obtain constant information of transformer remotely finished the web falling under the class of Internet of Things (IOT).[8] For this continuous viewpoint, we take one temperature sensor, one potential transformer and one current transformer for monitoring T, V, I information of the transformer

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and afterward send them to a remote area. These three analog qualities are taken in multiplexing mode and associated with a programmable microcontroller of atmega328 families through an ADC. At that point the estimations of the considerable number of sensors are sent consecutively according to the recurrence of multiplexing of the ADC by Microcontroller. They are then sent specifically to a Wi-Fi module under TCP IP convention to a devoted IP that shows the information continuously graph shape in any web associated PC/Laptop for show in 3 unique outlines. The continuous information is likewise observed at the sending end LCD show interfaced with the microcontroller. [11][12][13].

II. PROPOSED METHODOLOGY & SIMULATION RESULTS

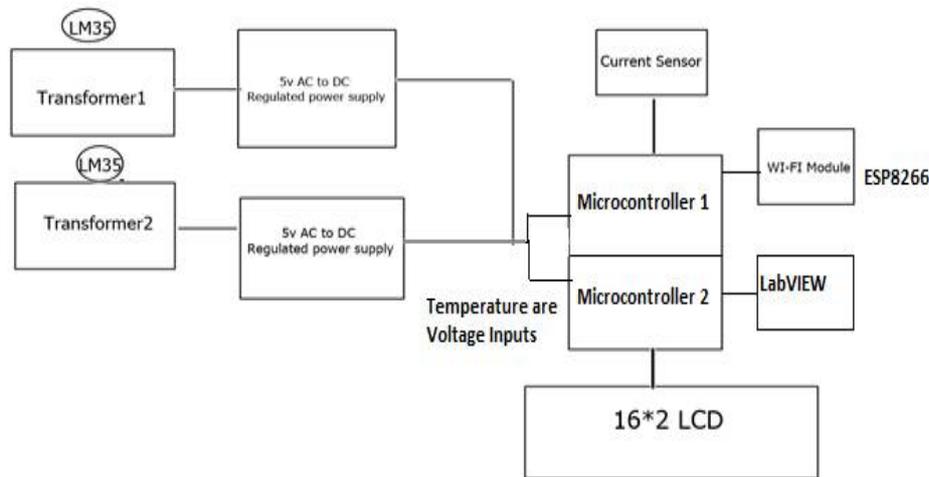


Figure 1: Block Diagram

Figure 1: shows the proposed implemented block diagram of the monitoring and protection system. All blocks are explained in the below sections.

Our system is working properly and showing data on both LCD and as well as in the internet .the device sensed data is voltage 9V,current in AMP, and temperature-28°C.This system would be minimizing the requirement of human power and thus providing efficiency and accuracy in the power system. This paper gives almost accurate details of transformer. This will also help to manage to sense the parameters and also record details for any overload or this system also protects the load from over voltage and over temperature. This method assures the safety and helps to decrease in failure level and would not result in any harm to the environment.

III.RESULTS

Fault No.1: When device detects low voltage (set values), it will send the data to controller as well as IOT channel and also controller will trigger circuit breaker for cut off supply.

Fault No.2: If Temperature of Transformer is high or it will be increase it senses through the sensor LM-35 and gives Signal through IOT and cut-off supply.

Figure 2, 3, 4 and 5 shows the waveform of working model in LabVIEW Interface.

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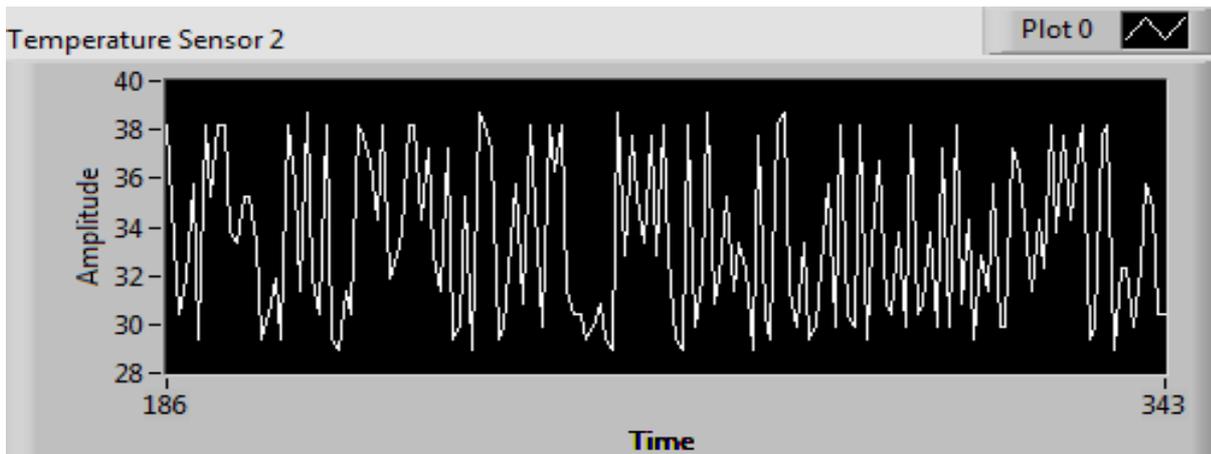


Figure 2: Simulated LabVIEW Waveform of T1

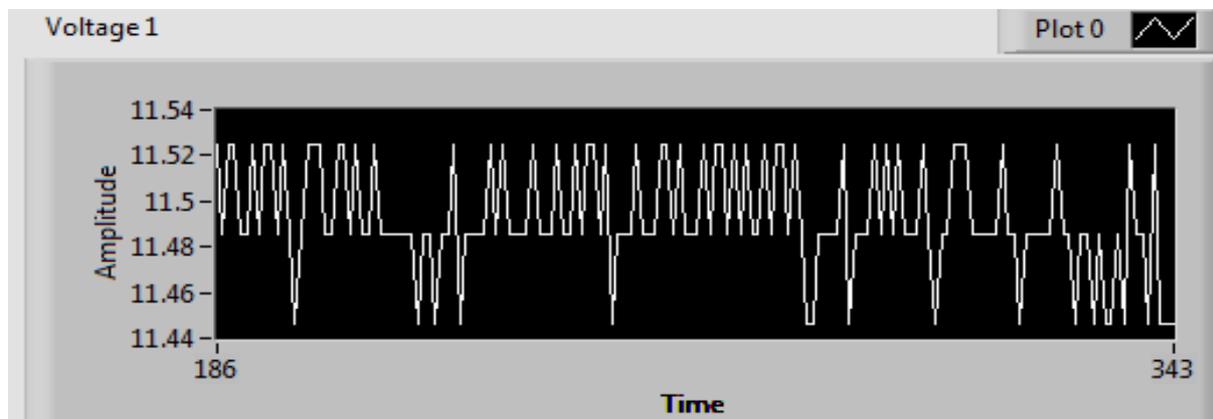


Figure 3: Simulated LabVIEW Waveform of V1

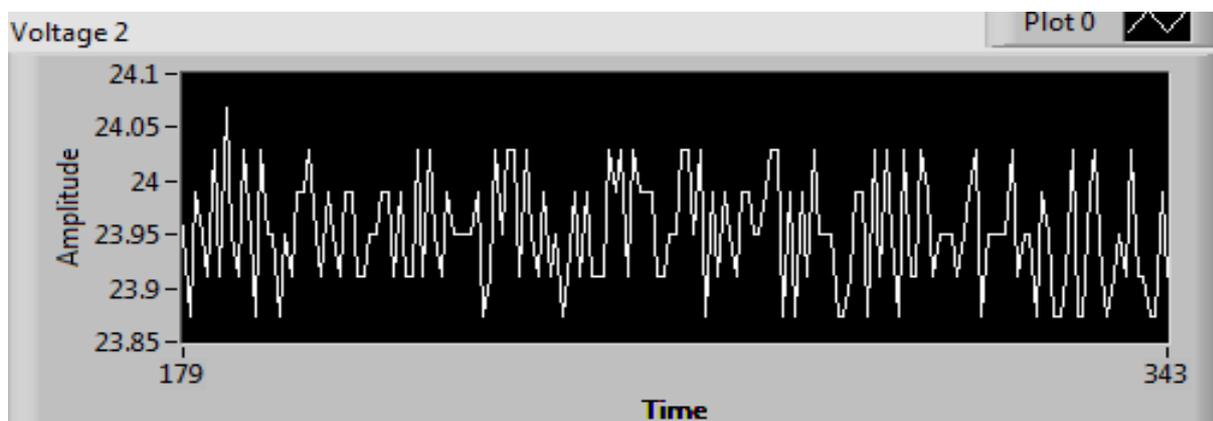


Figure 4: Simulated LabVIEW Waveform of V2

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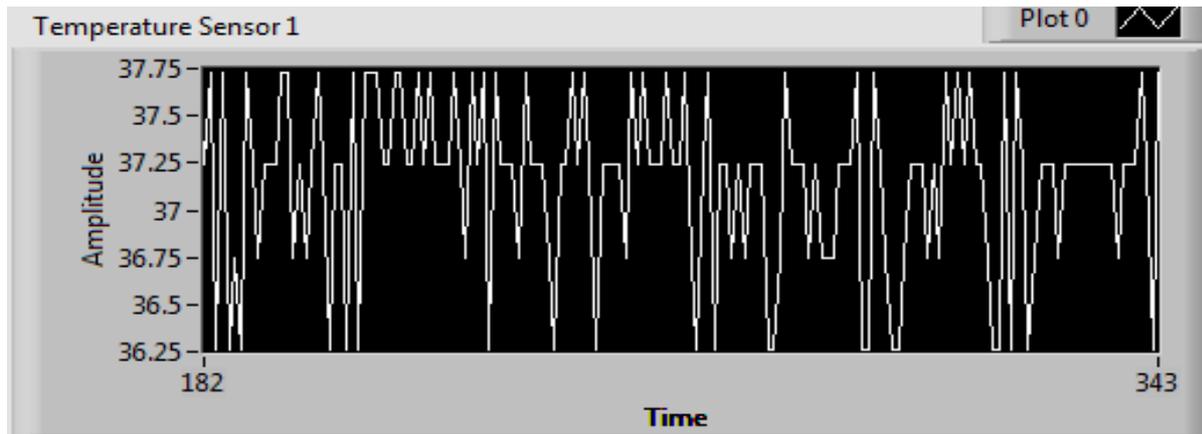


Figure5: Simulated LabVIEW Waveform of T2

Figure 6, 7, 8, 9 and 10 shows the outputs in the thingspeak platform for IOT interface.



Figure 6: Thingspeak Platform T1



Figure 7: Thingspeak Platform T2

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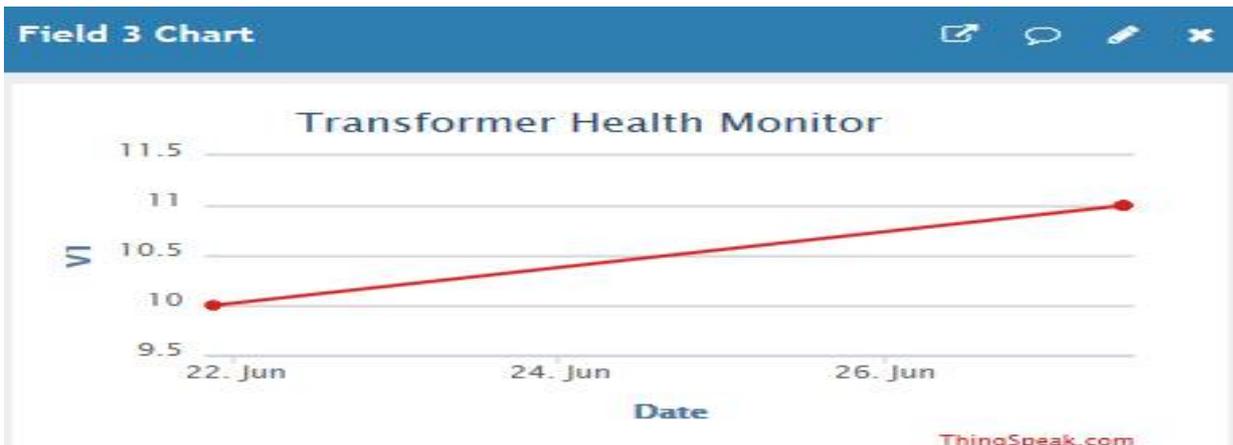


Figure 8: Thingspeak PlatformV1



Figure 9: Thingspeak Platform V2



Figure 10: Thingspeak Platform Current Sensor

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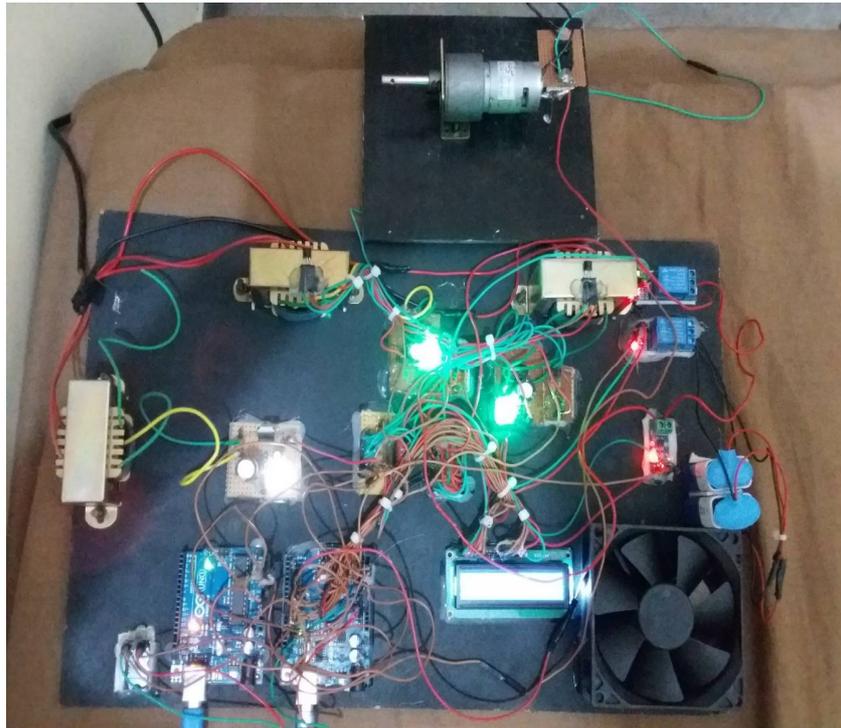


Figure 11: Project picture

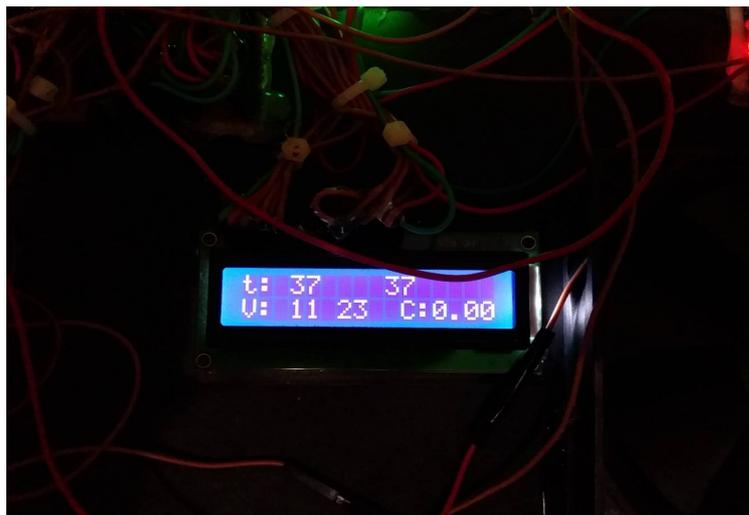


Figure 12: Project implementation picture of LCD in hardware

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III. CONCLUSION

Power Transformer being the vital and essential device in electric network has gained the maximum importance. In operating condition of power transformer it experiences the electrical, electromagnetic, thermal and mechanical stress which leads to an incipient fault. These incipient fault leads to failure of power transformer and failure leads to unplanned outage or sudden breakdown of power transformer. This may reduce the designed life span of power transformer and hence cost effectiveness. In this research work a novel Transformer fault detection system of transformer is developed and denoted as transformer fault detection system. In this system the Transformer incipient fault on either side of the power transformer is detected by continuously measuring primary side voltage, current and transformer load pattern. The developed transformer fault detection system is experimentally verified and compared with the simulation results in the laboratory.

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