International Scientific Journal of Engineering and Management ISSN: 2583-6129
Volume: 03 Issue: 05 | May – 2024 DOI: 10.55041/ISJEM01631
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata

Transformer Fault Condition Prognosis Using Vibration Signals Over Cloud Environment

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Abstract*— The Automatic Area Transformer Fault Message Indicator is an innovative system designed to detect and report faults in transformers. It utilizes potential and current transformers, precision rectifiers, and sensors to monitor high/low voltage, current, frequency, and transformer temperature. The data is processed by a microcontroller, displayed on an LCD, and transmitted to the electric utility station via GSM, enabling timely identification and communication of transformer issues for efficient maintenance and grid reliability. This system offers several key benefits. First, its use of advanced sensors and precision rectifiers ensures accurate measurement of critical parameters, allowing for early detection of potential faults.

Keywords*—GSM, Step down transformer, potential and current transformer, Temperature sensor.

I. INTRODUCTION

The Automatic Area Transformer Fault Message Indicator is a groundbreaking project aimed at enhancing the efficiency and reliability of transformer monitoring and maintenance. Transformers play a crucial role in the electrical grid, stepping up or down voltage levels to facilitate the transmission and distribution of electricity. However, transformers are also susceptible to various faults and failures, which can lead to power outages and damage to equipment. The goal of this project is to develop a system that can automatically detect and report faults in transformers, enabling timely maintenance and repairs. The system utilizes a combination of potential and current transformers, precision rectifiers, and sensors to monitor key parameters such as voltage, current, frequency, and temperature. This data is then processed by a microcontroller, which analyzes the information and generates alerts or messages in case of any abnormalities. One of the key innovations of this project is its use of GSM technology to transmit fault messages and data to the electric utility station.

V LITERATURE SURVEY

Title: TransVAT: Transformer Encoder with Variational Attention for Few-Shot Fault Diagnosis

AUTHOR:Yifan Zhan; Rui Yang

ABSTRACT: Fault diagnosis plays a critical role in ensuring safety and minimizing downtime across various industries. However, due to the difficulties in acquiring fault signals in practical engineering systems, labeled samples are often scarce. To address this issue, few-shot learning has emerged as a promising approach for bearing fault diagnosis in recent years. Recent studies with promising results have demonstrated the effectiveness of using Transformer and variational attention in this field. Compared to conventional methods, the Transformer has demonstrated superior performance in feature extraction and classification. Variational attention, on the other hand, permits a distribution of attention weights and enhances the interpretability of models. This method can identify pertinent features and offer perceptions of the root causes of faults. Therefore, the proposed model, TransVAT, is based on the relation network of few-shot learning and replaces the dot-product attention in the Transformer encoder with variational attention for feature extraction. The experimental findings demonstrate that the model performs well with limited data, especially on the one-shot task.

II. EXISTING SYSTEM

. The existing system for monitoring transformer faults typically relies on manual inspections and periodic testing. This approach has several limitations, including the inability to detect faults in real time and the reliance on human operators to identify and report issues. Manual inspections are often time-consuming and labor-intensive, requiring trained personnel to visit each transformer site regularly.Another common method used in the existing system is the use of protective relays, which are designed to detect abnormal conditions such as overcurrent, overvoltage, and under-frequency.

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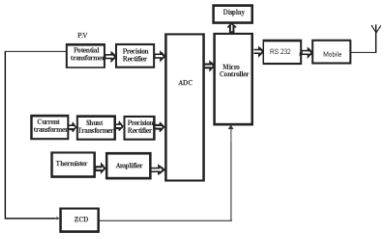
IV PROPOSED SYSTEM

The proposed Automatic Area Transformer Fault Message Indicator system represents a significant advancement in transformer monitoring technology. Unlike the existing manual and semi-automated systems, the proposed system is designed to provide real-time monitoring and reporting of transformer faults, enabling timely maintenance and repairs. The system utilizes a combination of advanced sensors, including potential and current transformers, precision rectifiers, and temperature sensors, to continuously monitor critical parameters such as voltage, current, frequency, and temperature.

V BLOCK DIAGRAM

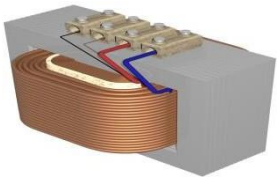


A. *LCD Display*

- A **liquid crystal display** (**LCD**) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly.
- They are used in a wide range of applications including: computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones. LCDs have displaced cathode ray tube(CRT) displays in most applications.

B. *Potential transformer*

. Voltage transformers (VT) or potential transformers (PT) are another type of instrument transformer, used for metering and protection in high-voltage circuits. They are designed to present negligible load to the supply being measured and to have a precise voltage ratio to accurately step down high voltages so that metering and protective relay equipment can be operated at a lower potential. Typically the secondary of a voltage transformer is rated for 69 V or 120 V at rated primary voltage, to match the input ratings of protection relays.



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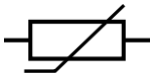
C. *Thermister*

A thermistor is a type of resistor whose resistance varies with temperature. The word is a portmanteau of thermal and resistor. Thermistor are widely used as inrush current limiters, temperature sensors, self-resetting over current protectors, and self-regulating heating elements.



Thermistor symbol

VI Conclusion

In conclusion, the Automatic Area Transformer Fault Message Indicator project represents a significant advancement in transformer monitoring technology. By combining advanced sensors, precision rectifiers, and a microcontroller, this system offers a comprehensive solution for detecting and reporting transformer faults. Its real-time monitoring capabilities, remote monitoring capabilities, and ability to provide detailed fault information make it a valuable tool for ensuring the reliability and efficiency of transformer operations.One of the key benefits of this project is its potential to reduce downtime and improve maintenance efficiency. By enabling timely detection and communication of transformer faults, the system allows for prompt maintenance and repairs, reducing the risk of transformer failures and power outages.

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