

A Literature Survey on Leakage Current Detection in Power Transmission Line Insulators Using IoT.

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Abstract- *Insulation plays an important role in the electrical systems as they provide necessary insulation and support to the Power transmission lines. Insulators undergo various type of exposure to different contaminants like climatic conditions, pollution etc., Insulation failure leads to damage and can also collapse the transmission and distribution lines. The performance of insulators is degraded by many elements such as temperature, humidity, pollutants, electrical stresses, current leakage. Different sensors and different technologies are used to detect leakage current, temperature and humidity. In this paper we have done a review on the various methods which are required to detect and monitor leakage current.*

Keywords- *Current Leakage, Sensors, Insulators, Pollution, Transmission line, IoT*

Date of Submission: 07-05-2023

Date of acceptance: 18-05-2023

I. Introduction

Insulators- Insulators play a major role in transmission and distribution lines remaining in the field for long periods. As outdoor substations go through frequent exposure to polluting contaminants namely dust, rain, emission of vehicles and salts which gets concentrated on exposed surfaces. When the exposed surface is dry, the sludge affects the performance of the insulator. However, the presence of moisture content in the environment, creates conditions that produce a conductive solution on the surface of the insulator, causing a decrease in the dielectric properties of the insulator and increasing the probability of failure as a direct result of the pollution present. Since pollution is a major problem for the reliability of a power system, importance for effective control and the maintenance of pollution at permissible levels that do not cause circuit outages.[1]

In any electrical installation, some current will flow through the protective ground conductor to ground. This is usually called leakage current. Leakage current most commonly flows in the insulation surrounding conductors. In the absence of a grounding connection, it is the current that could flow from any conductive part. There are always extraneous currents flowing in the safety ground conductor.

Reasons of occurrence are - Contamination of Insulators, Ageing of insulation materials, Aggressive weather condition such as temperature and humidity.

The leakage current increases as the level of pollution increases which eventually results in the occurrence of a flash over affecting long-term insulation performance. Due to local heating, the formation of dry bands is aided by the insulators. Resistive surface begins to deteriorate and exhibit non-linear characteristics. As a result, a leakage current with harmonics are produced. Therefore, monitoring based on current leakage enables monitoring of the operating conditions of insulators.

II. Technologies used for Leakage current Detection.

There are different techniques used for detection of leakage current such as:

➤ **Zig Bee Technology-** Is used in wireless networking standard that is aimed at remote control and sensor applications.[2]

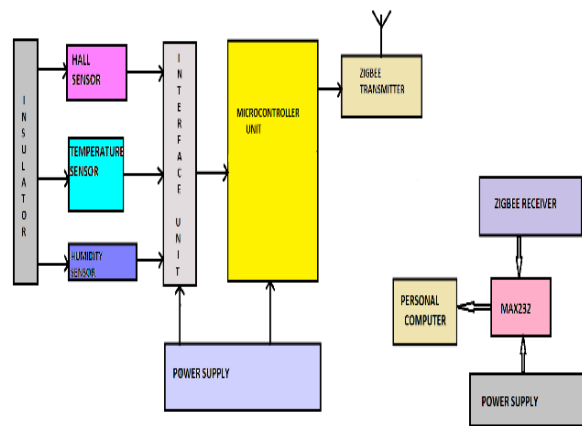


Figure.1

➤ **Optical Fiber Cable technology**-A optic fiber-based leakage current monitoring system has been developed and installed in various transmission line insulators.[4]

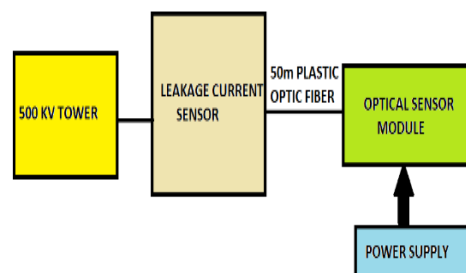


Figure.2

➤ **IoT technology**- Designing of real-time current leakage monitoring on high voltage power line insulators using hall effect Sensor is being carried out and information accessing through the IOT technology is being developed.[1]

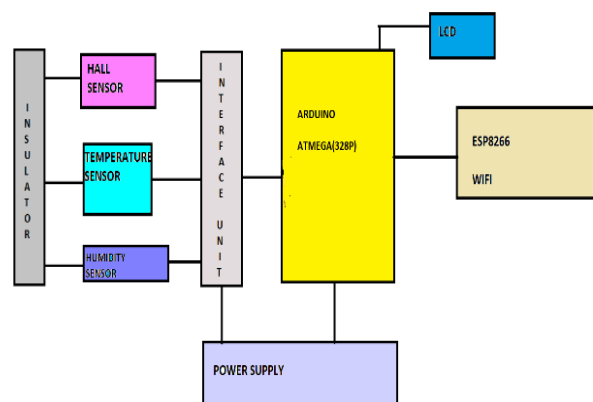


Figure.3

With the usage of different methods as listed above, evolution of current leakage models based on climatic conditions also development of pollution monitoring system by means of continuously measuring the leakage current for the development of smart grid applications can be ensured. Methodology of monitoring the leakage current is to obtain the data of Leakage current pulses, accumulate the peaks, classify and analyze them.

These are the different techniques in which we opted for IoT based Technology because of its accuracy and consistency.

III. Internet of Things (IoT)

IoT (Internet of Things) defines the collection of networks which are inter connected together to establish a communication between the cloud, devices and also among themselves.

Characteristics of IoT

- **Cost Effective-** Sensors are easily available and consistent in performance which makes IoT technology convenient of usage for the users.
- **Network connection** – Data transfer is made more efficient with the usage of various network protocols for the connection between sensors and cloud.
- **Cloud computing platforms.**

The increasing usage of cloud platforms has enabled the users to acquire the infrastructure in which there is no concern to manage.

IV. Conclusion

Based on the review carried out, different technologies are in practice to detect and monitor the leakage current. Different methods like Zigbee technology, optical fiber cable (OFC) and IoT technology are studied.

Due to robustness and accuracy compared to other technologies, IoT technology is being inculcated for monitoring of current leakage.

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