Wireless device to checking pollution severity of high voltage transmission line insulators

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ABSTRACT

In electrical systems insulation plays major role. The level of insulation safety provided depends upon the amount of leakage current flowing on its surface. This paper proposes detection of leakage current, temperature in transmission line. The proposed system upgrade electrical safety by quick interruption of the power supply such fault events like leakage current, short circuit and has been designed with the goal to be integrated in smart grid or smart sub-station for protecting the electrical equipment. The system also enables real-time monitoring and notification events through a 16*2 LCD display interface using a Microcontroller board. This paper provides an extended description of the proposed system's design and implementation, as well as the experimental validation results. This paper proposes an efficient system for identifying the issues in transmission line based on Internet-of-Things technologies and the parameters like Current flow using CT, Potential transformer for Voltage measurement level and temperature are read using PIC Microcontroller. It has been designed with the goal to be integrated in smart grid or smart sub-station for protecting the electrical equipment. This paper proposes a relay protection device for transmission line based on Internet-of-Things technologies.The system also enables real-time monitoring and notification events through an advanced communication interface using a microcontroller architecture.

Keywords-Internet of things,current transformer,potential transformer,digital relay

1 INTRODUCTION

In terms of power supplies and power conversion, power electronics based converters have their own advantages. Proper condition monitoring for power electronic converter has become necessary which is now in incipient stage. In various industrial applications such as industrial drives, renewable power generation and even in the future of the power grid power electronic converters have been and will be used extensively. Protection systems capability of power electronic-based converters are important for users in terms of economically and reliability. Specifically for the inverters, a fuse is usually used proportional to their range of current to protect them precisely.

2 HIGHLIGHTS OF THE WORK

The over-current relay is considered by using a neural network method. A multifunctional relay with interoperability in a module by using controller. We want to shield these electrical power system work parts from hazardous issue impacts. It ensures constant power supply to help the requirements of the congesting economy. To monitors the faults and prompts a safety measures in order to guard the relay in the event of power overloading.

3. CONVENTIONAL METHOD

The unique achievement of protective relays depends generally on their plan rule that tends to things like selectivity, responsiveness, security, and dependability. Transfer qualities and its exhibition are the pre imperatives for the relay design to meet the modern necessities. Advances in technology enabled new changes in all new substations automation with numerical relays operation with improved dependability as well as better grid-security. Digital relays are immune to parameters variation of components, lowest burden and more flexible because of programmable user friendly and are designing with latest technology. They are prepared because of their fast activity and they can be utilized Continuously Control of power systems contrasted with Electromagnetic relay and Static Transfers. Nowadays, development of power electronic-based converters, protection of them is an important issue. Protection systems capability of power electronic-based converters are important for users in terms of

economically and reliability. Specifically for the inverters, a fuse is usually used proportional to their range of current to protect them.

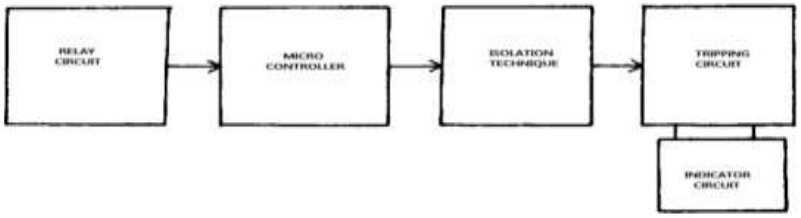

Fig 1 Block diagram for the conventional method

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4. PROPOSED METHOD

In today's world, the technological trend of implementing "smart" technologies, fostered by the emergence of Cloud Computing and the Internet of Things (IoT), led to a transfiguration of ordinary devices and environments to "smart" entities [3]. In this context, traditional electrical protection devices also tend to transcend and become "smart" [4], and consequently offer improved fault-detection and protection, remote monitoring and event notification [5]. By becoming smart, a home is embedded with ubiquitous computing equipment that connects all the household devices to one another and the Internet. A smart city also embeds in the urban landscape computers, sensors, cameras and other sensitive equipment operating in the background. In these circumstances, protecting the power supply grid against faults.

- Espressif's ESP8266EX delivers highly integrated Wi-Fi SoC solution to meet the continuous demands for efficient power usage, compact design and reliable performance in the industry.
- With the complete and self-contained Wi-Fi networking capabilities, It can perform

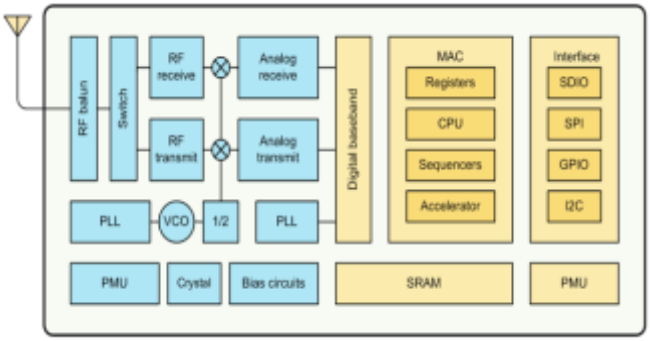

Fig 2 ESP8266EX block diagram

4a THINGSPEAK

The Thing Speak API is an open source interface which listens to incoming data, timestamps it, and outputs it for both human users (along visual graphs) and machines (along easily parse-able code). We look into practical examples using

the arduino micro-controller as well as communication with graphical interface operating systems through a Python script.

- Monitoring and SCADA systems - Most commonly the system is a user-based application that enables the operators to access the plant and monitor it remotely form a mobile device. Different access is provided based on user privilege.

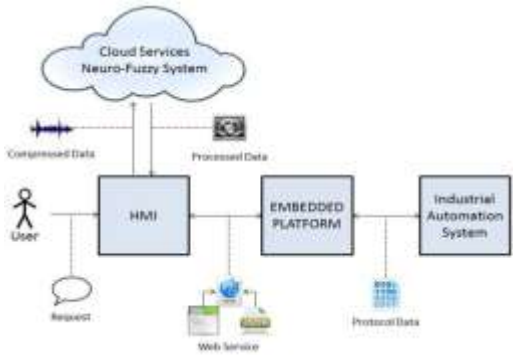

Fig 3 IOT

4b BENEFITS OF IOT

Since IoT allows devices to be controlled remotely across the internet, thus it created opportunities to directly connect & integrate the physical world to the computer-based systems using sensors and internet. The interconnection of these multiple embedded devices will be resulting in automation in nearly all fields and also enabling advanced applications. This is resulting in improved accuracy, efficiency and economic benefit with reduced human intervention. It encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities.

4b IOT HARDWARE

Now you would be wondering what is the required hardware for preparing an IoT solution. The answer to this question is, you'll first require sensors that will sense the environment, then you require a remote dashboard to monitor your output and display it in a clearer & conceivable form. At last, you will require a device with the capability of serving & routing. The key task of the system would be detecting specific conditions and taking actions accordingly. One thing to keep in mind is securing the communication between the devices and the dashboard.

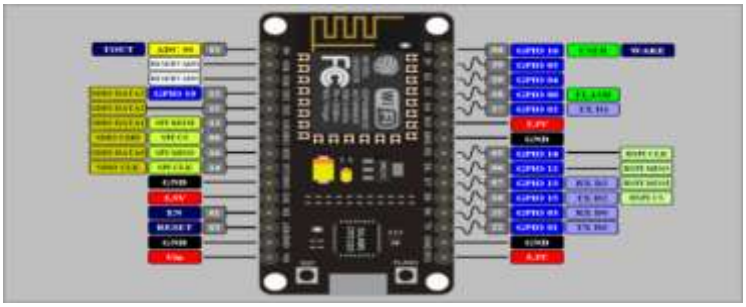

Fig 4 Node Mcu

1. **SIMULATION OUTPUT**

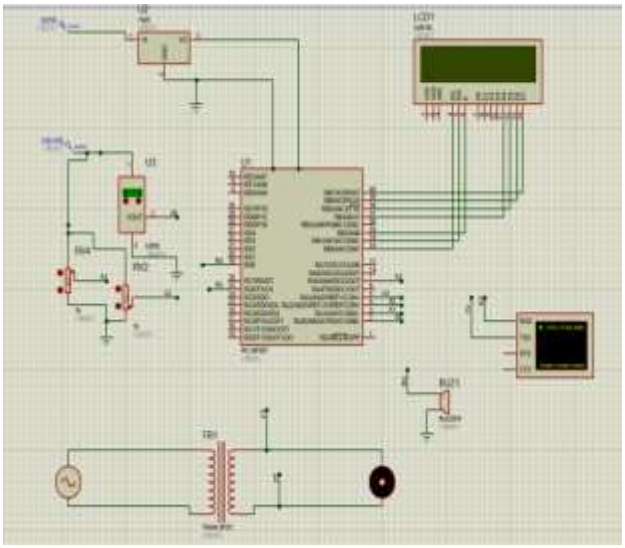

Fig 5 Complete Simulation File

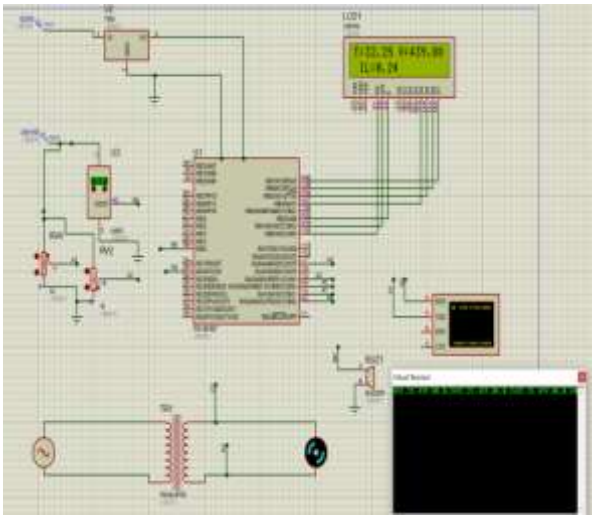

Fig 6 Simulation Output Screenshot

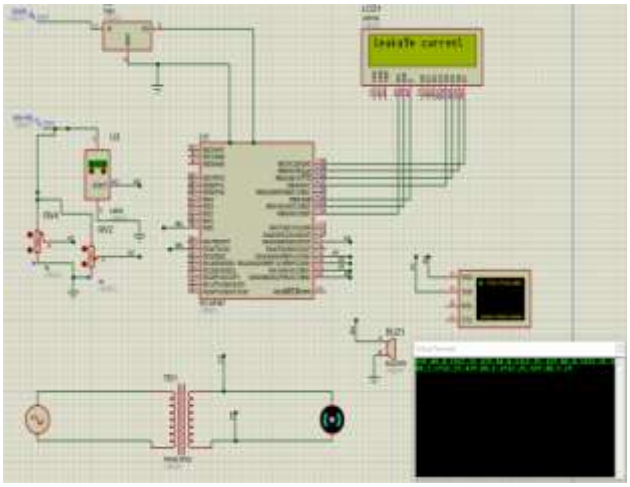

Fig 7 Leakage Current Detection

5.HARDWARE OUTPUT

Prototype

- The hardware developed with the help of PIC C Compiler software, embedded C programming language is used in this project
- Hall sensor and LM35 sensor are used to measure the current and temperature respectively.
- ESP8266 WiFi module is used to send the data to the internet
- The current and temperature values are displayed in LCD with the help of a PIC microcontroller

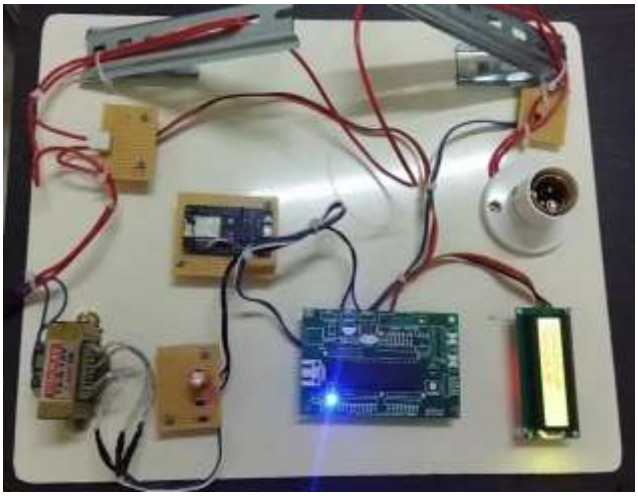

Fig 8 Output with And Without Load

CONCLUSION

This paper described the design, implementation and functional validation of an advanced Transmission line protection device with IoT-based support for integration. The protection device ensures the safety of electrical consumers connected to the public power supply grid by disconnecting the electrical supply in the event of several faults: overvoltage, over current, and leakage current. The proposed system transcends the traditional functionalities of a classic circuit breaker not only by providing protection against additional faults but also by "becoming smart" in the sense that each protection device communicates using concentrator-type architecture with a Web server for reporting the recorded events.

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