DISTRIBUTION TRANSFORMER DATA MONITORING AND ANALYSIS OF LOAD AND FAULT RECTIFICATION

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ABSTRACT

Electricity demand is increasing for household, commercial, and industrial loads. Moreover, the management of distribution systems has become more and more complex. Lack of base station information on the status of the distribution network is considered a significant impediment to its effective monitoring and control. The work described is the development of the security of the Raspberry-PI controller-based power distribution system, whose purpose is to effectively monitor and control the power distribution system. The powerful IOT network is designed to transmit data from the distribution side to the substation, and a Visual Studio system is created to display the data. In general, the proposed design is developed for users, which allows users to quickly identify whether the supply transformer is safe or unsafe and whether the supply line is faulty. The ultimate goal is to continually monitor the status of the supply line to protect the supply line from errors such as overvoltage, under-voltage, SLG, and DLG errors. Also, the data can be used to continuously monitor the voltage and current of the supply transformer so that the actual load capacity of the distribution transformer can be monitored and analyzed.

Keywords: Raspberry-PI, IOT (Internet of Things), DLG, SLG.

I INTRODUCTION

Power system line protection has been proposed based on the amplitude or phase comparison of Faulty location or power quality using either an electromechanical or solid-state devices. These methods involve voltage and current measurement ratio of voltages and currents current difference, Low voltage balance, Fault current switching, and Fault device. In the existing power system, to improve transient stability, high-speed fault detection is always desired. The rotational kinetic energy of the power system introduced during the fault period is proportional to the square of the fault's time. Therefore, the large source high-speed spacing of the near-generation error reduces the acceleration of the system beyond any other type of motion control, which can be used after the system accelerates. This requirement eliminates the need for very fast detection and error from improving stability. High-speed fault clearance based on techniques of traveling-wave voltages and currents transients is reported. Unfortunately, these approaches do not have the ability to adapt dynamically to system operating conditions, and at the same time majority of the existing power system protection techniques are unable to deal with the parameter information contained in the post fault voltage/current signals.

II LITERATRUE SURVEY

This presents an application of (SVC) in electrical transmission lines and PSS in two areas, two generator test power system. Using to design and implements a control system and study the effect of damping oscillations instability power system after proposed faults in transmission lines of the research model that used (PSS-generic and multiband) types and automatic voltage regulator (AVR) [1]. The power system is disturbed by electromagnetic interference and crosstalk between the transmission link layers in the transmission and distribution process, and it is easy to produce a transmission distribution fault. In order to improve the efficiency of fault diagnosis, a method of fault diagnosis for a power system based on a neural network algorithm is proposed [2]. DC line fault is a significant threat to the Ultra High Voltage Direct-Current (UHVDC) system in terms of reliability since the long-distance bulk-power is involved. This method proposes a forward fault identification element for DC line protection in the UHVDC system [3]. The selectivity and the speed requirement of DC protections, in this method, proposes a new

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DC protection scheme for DC substation systems. This scheme is developed based on the single-ended natural variation characteristics of DC current and its first and second derivatives under fault transients [4]. When a pole-to-pole dc fault occurs, it is desirable that the stations continue contributing to power transfer, rather than blocking. Thus, the current limiting module is connected in series with each arm branch to reduce the large current before the faulty lines are totally isolated by DC circuit breakers [5].The design, analysis, and implementation of a fault diagnosis method for photovoltaic (PV) energy conversion systems. We present a model-based state estimation approach for detecting and identifying three types of faults converter input faults (e.g., faults in a PV panel), converter component faults (e.g., switch faults or passive component degradation), and sensor faults voltage and current sensors for PV panel-integrated power electronics systems[6]. Future distribution systems are conceived to be largely based on hybrid ac/dc power system architectures, thus reaping the benefits of both ac and dc power systems. Directional protection is expected to play an important role in selective fault identification in such distribution systems [7]. New fault detection and identification framework for drivetrain gearboxes of wind turbines equipped with doubly-fed induction generators (DFIGs) based on the fusion of DFIG stator and rotor current signals. First, the characteristic frequencies of gearbox faults in DFIG stator and rotor currents are analyzed [8]. In this work, the main aim is to address the multiple POD problems by exploiting the compressive system identification (CSI) - a time-efficient approach in complex network analysis. A typical power network (PN) is considered as a single graph, and the mathematical formulation of the POD problem is initialized using the DC power-flow model and graph theory concepts [9]. Existing quick or early detection and identification methods for short fault are based on the sharp increase of the short current to extract the fault features in the low-voltage system. They all have a technical bottleneck problem of a miscarriage of justice, which is affected by the noise of the distribution system and the non-fault running state interference caused by different load starting or switching[10].

III PROPOSED SYSTEM

Electricity demand is increasing for household, commercial, and industrial loads. Moreover, the management of distribution systems has become more and more complex. Lack of base station information on the status of the distribution network is considered a major impediment to its effective monitoring and control. The work described is the development of the security of the Raspberry-PI controller-based power distribution system, whose purpose is to effectively monitor and control the power distribution system. The powerful IOT network is designed to transmit data from the distribution side to the substation, and a Visual Studio system is created to display the data. In general, the proposed design is developed for users, which allows users to easily identify whether the supply transformer is safe or unsafe and whether the supply line is faulty. The ultimate goal is to constantly monitor the status of the supply line to protect the supply line from errors such as overvoltage, under-voltage, SLG, and DLG errors.

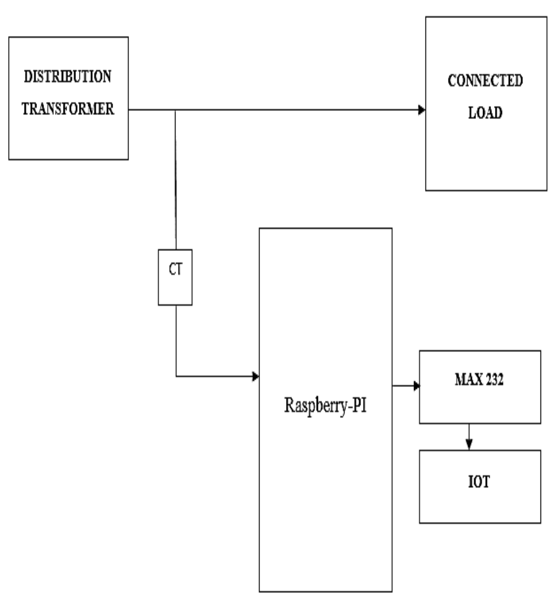

Figure 1 Proposed Block Diagram

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3.1 SINGLE-LINE-TO-GROUND FAULT

A short circuit between a line to the ground and a short circuit is usually caused by physical contact, for example by lightning or other. Single line ground faults occur in any of the three phases. However, this is likely to be the case, which is only sufficient for analysis

3.2 DOUBLE-LINE-TO GROUND FAULT

Two lines come into contact with the ground (and each other), also commonly due to stormy weather or some other means.

3.3 TRANSFORMER PROTECTION

Transformers are important and expensive components of power systems. Because of the long duration of repair and replacement of transformers, the main purpose of transformer protection is to control damage to the wrong transformer and protect it from long-range power outages from thieves. Multi-function safety relays provide comprehensive transformer protection for important transformers for all applications. The systematic theft of transmission line transformers from the field is blooming across the country, causing millions of distribution agents and consumers to lose their appalling numbers. Last value in electronic transformers. Therefore, to improve the stability of the system and to detect the efficiency of the electrical system, a security system based on a microcontroller should be implemented.

3.4 LINES-TO-LINE FAULT

A short circuit between the wires causes ionization of the air, or when the wires come into physical contact due to broken capacitors. For wire-to-wire faults, the current are too high because the fault current is limited by the most impedance fault points of the inherent (natural) series power system (see Ohm's law).

3.5 LOWER VOLTAGE

Low voltage is relatively speaking and can vary according to the definition of the environment. Transmission and distribution lines and different definitions are used in the electronics industry. The "low voltage" circuits defined by the electrical safety regulations go beyond the protection of high voltage requirements. These definitions vary depending on the country and specific codes. Low voltage is defined as the utility point, which is a smaller incoming voltage than the legal limit approved by the Public Service Commission; And / or is less than the rated voltage of connected devices. Low voltages are considered a safety hazard to all industry standards and can lead to premature failure of connected equipment. Equipment can be damaged by low supply voltages.

3.6 OVER VOLTAGE

High voltage protection is a utility point that exceeds the statutory ceiling authorized by the Public Service Commission for high entry tax voltages; And / or exceeds the rated voltage of the connected device. Excessive voltages are considered a safety hazard in all industry standards and can lead to the failure of the connected devices. Overvoltage has been a well-known problem in the industry for many years, but it is not common knowledge as to who should deal with it. The power company cannot control it completely. Common causes of high voltage during cold winter weather

3.7 TRANSFORMER

A transformer is an electrical device used to move an AC voltage up and down. There are two types of transformers: step-up and step-down transformers. The step-transformer increases the voltage, while the step-down transformer reduces the voltage. The ratio of primary and secondary winding transformers is classified as step-up or step-down. For the purpose of this project, consider a transformer with a voltage of approximately 220 volts 1Φ and a step-down rating of 220/12, which is used to represent the actual representation of the 3Φ system.

3.8 BRIDGE RECTIFIER

Main devices require AC power, but almost all electronic circuits require standard DC power. In this project a simple rectifier circuit is described, which converts AC power to DC voltage input. First, power down from the AC input to the low voltage. The AC power is then passed through a rectifier circuit to eliminate the negative cycle of the AC waveform. The resulting signal is filtered to get the DC output. The main part of the circuit is connected to the secondary coil of a transformer with a diode and a capacitor. Although the diode acts as a corrector, the capacitor drains the DC components from the circuit.

3.9 RASPBERRY PI

Raspberry Pi is all about using IOT. Currently, the Internet of Things is made up of a loose set of different private networks. Automobiles are used today, for example, there are many networks that control machine functions, security functions, communication systems and more. Commercial and residential buildings have a variety of control systems such as heating, ventilation and air conditioning, telephone service, security and lighting. With the growth of the Internet of Things, many of these networks will be integrated into additional security, analytics and management functions. It can become even more powerful when it comes to helping people reach the Internet of Things. In addition, if you have any questions about electrical and electronic engineering or ideas, please leave your valuable suggestions in the comment section below.

IV RESULT AND DISCUSSION

4.1 CIRCUIT DIAGRAM

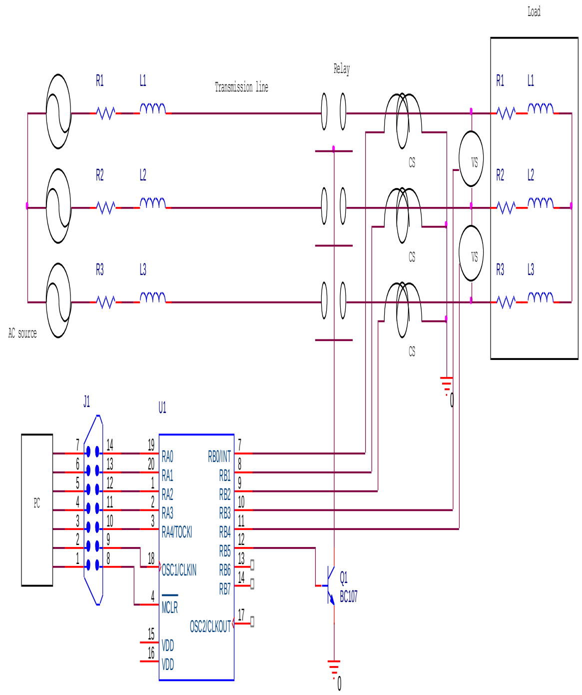

Figure 3 Circuit Diagram

- The protective scheme against fault condition of transmission line. Three CTs are installed, one on each phase of the feeder and are connected across the three relay coils.
- In case of a fault condition is occurred the solenoid plunger system of the relays work to close the trip coil circuit, which in turn presents the circuit breaker, thereby disconnecting the protected feeder and send the message to the concern via IOT

4.2 HARDWARE SPECIFICATION

Hardware	Specification	Input Ranges	Output Ranges
Power generation	Input power	230v	230V
Transformer	Step down	230v	110V

Rectifier	Input power	110V AC	230V DC
Inverter	Output power	110V DC	110V AC
Current sensor	Analogy signal	5V	0-5A
Transformer	step-up	110v AC	230v AC
Load	Load	230V	4A

4.3 HARDWARE MODEL OF THE PROPOSED SYSTEM

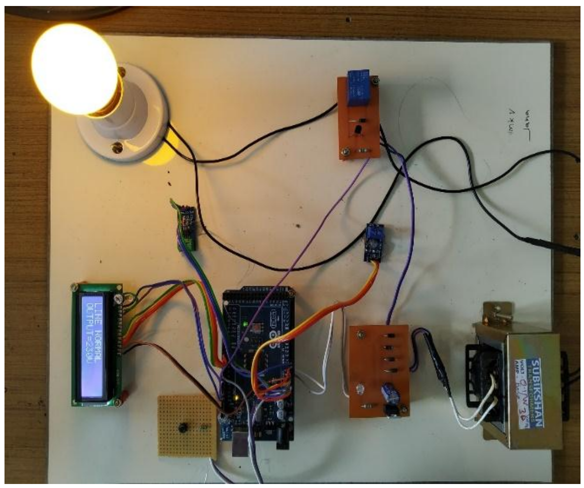

Figure 4 Hardware Model Diagram

- The proposed system hardware model for the Transformer parameter analysis, this model consist of generating power, step-down transformer, rectifier, current sensor, step-up transformer, load.
- The operation of this hardware model is generating station is give the source voltage and it is step-down the voltage from 230v to 110v with help of step-down transformer.
- The 110v AC is given to the rectifier circuit and is converted to the 110v dc supply of the given model.
- This 110v dc is converted to ac voltage with help of inverter circuit and given to the step-up transformer this transformer step-up the 110v ac to 230v ac.
- The current transformer is used to sense the output current if any variation is occur in this load the output is cutoff. The step-up transformer output voltage is given to the load.

4.4 ADVANTAGES

- The sub sequent fault identification is helpful overcome the frequent fault occur in the duty which result in protection of transformers.
- If there is any line fault occurs the protection fuse of the distribution transformer will blow and leads to interruption in supply this will be intimate via SMS alert to concern field staff and official.
- The nature of fault will be intimate through controller.
- Due to this project the interruption time will be minimized.
- The continuous monitoring of the data which is helpful to identify weather the distribution transformer is over loaded or not which results in reduce the failure rate of DT due to over load.

V CONCLUSION

Raspberry PI and IOT based protection system is a reliable technique for monitoring and controlling the electric distribution system, and the Raspberry Pi works up to some degree temperature. For long-distance data transmission, IOT technology is a reliable and robust one. Any kind of fault occurring in the distribution system results in the IOT modules to send instant messages automatically to the base station. The continuous monitoring of the data, which is helpful to identify whether the distribution transformer is overloaded or not, which results in reduce the failure rate of DT due to overload. The subsequent fault identification is helpful in overcoming the frequent fault that occurs in the duty, which results in the protection of transformers.

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