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Arduino Based Three Phase Transmission Line Fault Detection

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ABSTRACT:

The most crucial component of the power system is the transmission line. A significant quantity of power is transferred via transmission lines. In the current period, the need for power and its loyalty has increased dramatically, and a transmission line's primary function is to move electric power from the source region to the distribution network. Between limited production and a huge claim, the focus on decreasing power losses has increased dramatically. The main factor is that it has a reactive power and voltage deviation that are significant in the long-range transmission power line. Other losses include transmission loss and speculation factors, such as physical losses to various technical losses.Fault analysis is essentially a very focused topic in power system engineering to swiftly resolve faults and restore the power system with the least amount of disruption. However, detecting the malfunction that disrupts the transmission line is a difficult task in and of itself, making it difficult to look into the issue and increase system reliability.[1]

Key words- Aurdino, GSM module, Relay, LCD, Transmission Line, Transformer

Introduction:

As we can see from our surroundings, transmission line faults are widespread during the rainy season and pose a serious risk to us. All areas of the electrical power system—generation, transmission, distribution, and distribution—are becoming larger and more complicated. As a result, faults in these intricate networks occur, causing numerous financial losses and decreasing the electrical system's dependability. We take care to fix this issue as soon as possible because it could result in a total blackout or grid breakdown if we don't. Typically, between 70% and 90% of overhead line faults are caused by lightning strikes, storms, and flashovers, all of which are extremely detrimental to civilization. There are many different kinds of faults in transmission lines, including line-to-line and line-to-ground problems. Power outages and damage to electrical equipment are caused by faults.[2]

According to a number of studies, between 70% and 90% of problems on the majority of overhead lines are temporary. A problem that is immediately isolated by tripping one or more circuit breakers and that does not return when the line is reenergized is known as a transient fault, such as an insulator flashover. At lower distribution voltages, faults are typically less transient (in the 80% range), but at higher sub transmission and transmission voltages, they are more transient (in the 90% range). The most frequent source of transient faults is lightning, which can partially cause insulator flashover due to the large transient voltages it induces. Swinging cables and brief contact with foreign objects are additional potential reasons.Therefore, it is possible to clear transient faults by temporarily de-energizing the line to give the fault time to clear. The line's service can then be restored by auto-reclosing.[2]

These days, electricity plays a crucial role in our daily lives. Natural disasters can cause a variety of faults in the electricity system, such as lightning strikes or tree branches colliding with transmission lines. Line to line, line to ground, and double line to ground are examples of overloading that can happen as a result of this short circuit or fault. The most common double line to ground fault in the power system that could harm electrical equipment is this one. Therefore, this flaw needs to be fixed as soon as possible. Approximately 80% of power system faults are line-to-ground.

Types of transmission line faults:

Faults in power systems can be classified as either series or shunt faults. Shunt fault: Single line-to-ground faults (SLG) are the most prevalent kind of shunt faults. One conductor falling to the ground or coming into contact with the neutral wire causes this kind of failure. Another possibility is that trees fell during a rainstorm.

line-to-line error: Line-to-Line (LL) faults are the second most common type of shunt faults. When two transmission lines are short-circuited, this is said to happen. For example, if a tree branch falls on top of two electricity transmission lines, or if a big bird stands on one transmission line and touches the other

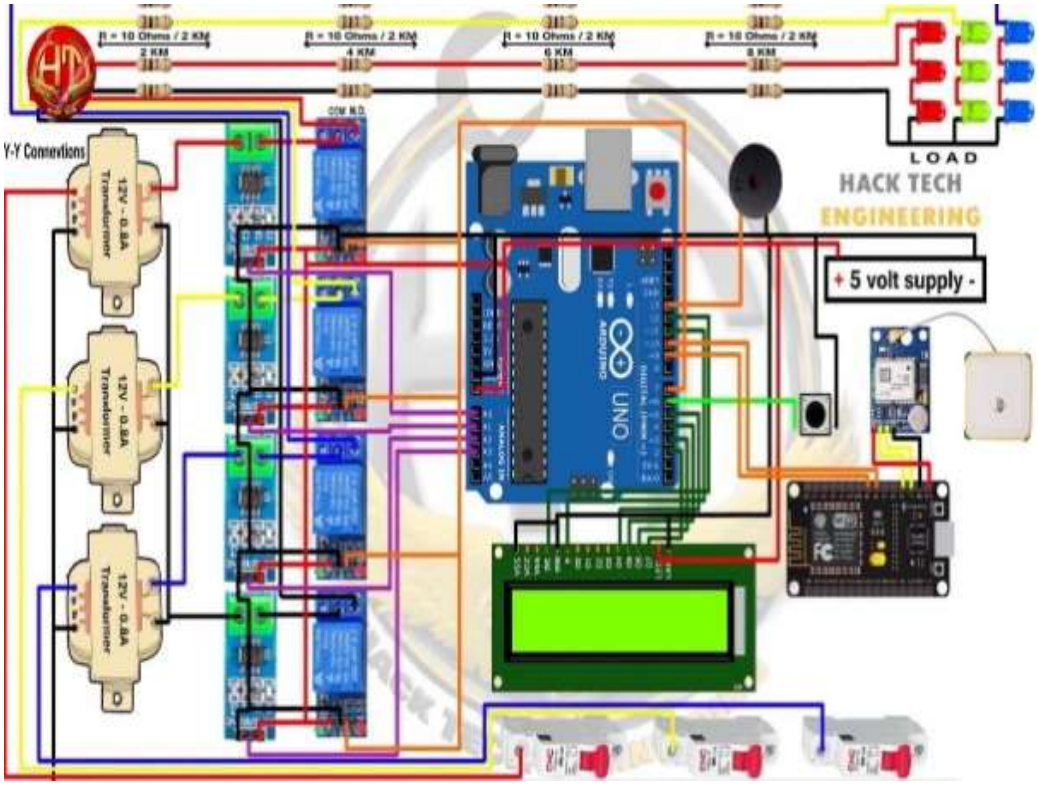
line-to-ground fault: The Double Line-to-Ground fault (DLG) is the third kind of shunt fault. There are a number of possible reasons for this, including a tree falling on two power lines.

Balanced three phase: This is the fourth and most common type of fault, and it can arise from a variety of contacts between the three power lines.[5]

Objectives:

Using Assembly Language, design and program a numerical relay based on a PIC microcontroller to identify transmission line faults. The precise position of the defect was identified and pinpointed using a sophisticated GSM-based fault detection and location system. Because the system automatically and precisely gives fault location information, the amount of time needed to find a defect is significantly decreased. to provide a reliable and effective automatic fault detection and locating system for overhead and subterranean power transmission lines that is based on impedance. to shorten the time it takes to fix problems and protect costly transformers from theft or damage, which typically happens during extended power outages. to boost technical crew productivity because it will take less time to find errors. to guarantee the nation's power supply system's stability and dependability in order to promote economic progress.[6]

Block Diagram



Working:

Maintaining a continuous power supply is essential due to the expanding population's demand for electricity and technological advancements. If a transmission or distribution fault arises, it must be fixed as soon as possible to ensure that consumers have a steady supply. We have developed an IoT and GSM-based project to monitor the current and voltage flow in the transmission line and to detect any phase faults in the system. The three-phase AC transmission line supply, which is a real-time three-phase power AC power supply, is represented by the power supply unit in the block diagram [9]–[19]. To lower the voltage supplied as input to the Arduino, a step-down transformer and voltage sensor are attached to the three-phase AC supply. The voltage sensor controls the voltage provided to the Arduino and measures the voltage flow in the line. In order to convert the AC to DC for the Arduino's input, the step-down transformer is connected to a rectifier circuit. The LCD display, GSM module, and Internet of Things module are all connected to the Arduino. The voltage and current values are shown on the LCD. Data about the voltage and current in the transmission line are uploaded via the IoT module.When a transmission line problem occurs, the GSM module serves as a device that notifies the authorized individual and maintenance team via SMS. The Arduino provides signals to the GSM and IoT modules when there is a phase defect in the transmission line or a change in the current and voltage values. These modules then send the data to the cloud and send an alarm message to the authorized person's mobile phone that is connected to the Arduino program. This technology will make it simple to keep an eye on transmission line problems and fix them as soon as they arise.[8]

Advantages

- Work in real time response inter
- Coverage area in large compared to existing system
- cost efficient
- Devices enable by wireless communication • Number of components are used
- Economically reliable and low cost

Applications

- Used in transmission line
- Used in distribution lineUsed in villages

Future scope:

We can have a global positioning system (GPS) connected to it so it will send accurate location (latitude and longitude) of fault occur in transmission line. In future we can used appropriate programming for finding distance of fault from substation.

Conclusion:

In this paper a model design to solve the problems faced by consumer by using Aurdino. We can easily detect the type fault and solve it and there distance in real time, this prototype model is very effective. It is works in less time perfect distance of fault is locate. Avoid the future problem in transmission line.[1]

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