# THREE PHASE TRANSMISSION LINE FAULT DETECTION

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**ABSTRACT**

*Electrical power transmission system is very important part for transmitted the electrical power. In transmission system there are different type of fault occurred. The good state of the power line can be restored by accurate fault detection. Moreover, accurate fault prediction plays an important role in network planning and operation. A novel approach for long transmission line fault detection, classification and prediction is presented in this paper. Different types of transmission line faults like line-to-ground (LG), line-to-line (LL), Line-line-ground (LLG), Line-line-line (LLL), Line-line-line-ground (LLLG), etc. have been introduced. The fault detection and classification are done online using a deep neural network (DNN) for better accuracy. This approach can deal with non-linear problems with very high accuracy. In addition to this, the proposed uses the instantaneous measure of the fault parameters like current, voltage, etc. online.Hence a perfect and most accurate fault prediction method can definitely improve the reliability and hence power quality of the system. The data extracted from the MATLAB workspace is analyzed in detail using seven different types of machine learning methods like logistic regression, SVM, Naïve Bayes, etc. in the Python platform individually. A comparative analysis is made to identify the most suitable predictive method for the proposed system.*

**Keywords:** *Three phase transmission line fault, Symmetrical fault, Unsymmetrical fault,Overhead line transmission fault*

## INTRODUCTION

Regarding the distribution system, transmission lines perform the most important part that is to transfer electric power from the generating station to load centres. Since the development of the distribution and transmission system, power system engineers have been an object for locating and detecting faults. As long as the fault detected in short duration, it provides a good service for protecting the apparatus as well as an open way for disconnecting the part where this incident happened at fault, and with the help of this, it gives safe way to the system from any damages. So it is needed to detect the fault otherwise due to fault it causes any disturbance which further tough time to the interconnected system that based on limitations. The structure of the transmission line constructed to investigate the location of the fault and can give separation only the part where the fault occurs. Stimulating method help in identify and isolate the fault in short period. A stable voltage can be achieved by the use of a series capacitor achieved. Series capacitors line inductance can be reduced by along the line. If the line current leads the voltage, mean voltage increase. On the other side, there could be a voltage drop if line voltage is lagging by the line current. In this outlook, the voltage that has been boosted up and the voltage dropped decreased by the series capacitor as if the line inductance is smaller for the series recompensed line as associated with the unpaid line. Suppose when more than two conductors develop contact each other or with the
contact take place on the ground to 3 phase systems that are considered at fault which could be
a balanced fault or unbalanced fault. Due to these faults stresses are produced in power system equipment that could damage the power system components. So to avoid these harms and to make power quality better, it is essential to

know the reasons of fault as well as the location of the transmission lines and solve it properly. The problem of finding the type of Photovoltaic Module Once more, the voltage of a single element is not optimal for the applications requiring the least amount of power. An inverter is used by the PV cluster to transmit DC power through AC energy, supplying it for the generator, lighting, and other loads modules are linked to have a greater voltage before being used in accordance with the current decision.

1. Under-impedance;
2. Torque;
3. Over-current Technique;

A wide range of relaying techniques are developed for the relaying and data-acquisition purpose. Somehow, they fulfilled the basic requirement and classification. However, the techniques are highly affected by the nature of the faults, modeling of the system, system parameters and other functionality as ambient temperature. The purpose of this paper is to present an accurate method to classify the different fault in the line including the recorder for the report generation.

**Table I Occurrences and severity level of Fault**

| *Type of Fault* | *Percentage Occurrences* | *Severity Level* |
|---|---|---|
| *L-G* | 70-74% | Minor(less) |
| *LL* | 12-14% | More |
| *LL-G* | 16-18% | More |
| LLL | 2-4% | Highly Severe |

## LITERATURE SURVEY

[1] Sharma, Ankit Nirwan, Ajay Singh Shekhawat proposed " Fault Analysis on Three Phase Transmission Lines and its Detection" Power system failure can cause instability loss and serious damage to either the defective or nearby healthy equipment. Additionally, the stability proposal is regarded as a crucial element in the management of energy and the planning of power systems Numerous studies have revealed that up to 90% of faults on most overhead lines are transient, ranging from 70% to 90%. When one or more circuit breakers are immediately tripped to isolate a problem, such as an insulator flashover, the fault is cleared and does not reoccur.

[2] Prof. Vikramsingh R. Parihar1, Shivani Jijankar, Anand Dhore, Arti Sanganwar, Kapil Chalkhure., proposed" Automatic Fault Detection in Transmission Lines using GSM Technology" There are numerous.

## WORKING & SIMULATION WITH RESULT

The following block diagram represents the actual BLOCK diagram of the WEB BASED MONITORING OF SUBSTATION TRANSFORMER. It consists of various blocks such as microcontroller, measurement devices and sensor unit along with interfacing IC. The parameters for e.g. VOLTAGE, CURRENT, TEMPERATURE, HUMIDITY by using microcontroller which is further connects with a PC or laptop this collected data will further send to server which will situated at any part of world through internet communication. In further connection in case of fault such as unbalanced voltage, under voltage, overvoltage etc. the fault is being analyzed by microcontroller programming and the signal is being send to the driver relay to disconnect the contactor and isolate the substation. As shown in the figure the power transformer is used to step down the voltage of 230V single phase to 12V. The 12V supply is being rectified to 12V by using the full wave rectifier. This rectified supply is regulated to 5V. This 5V of supply is need for the working of MICROCONTROLLER, and the various equipped sensors. The P.T. and the current transducer are energized by the line conductors. The LCD used to display the monitored parameters on the station substation itself. The driver IC is used as a current booster to amplify the current from the microcontroller, used to drive the relay. The microcontroller is being programmed to certain limits. The oil temperature, oil level and the humidity within the transformer. Whenever the fault occurs such as overvoltage, over current, under voltage, phase failure etc. the direct effect will be developed on the transformer. So in case of fault condition the microcontroller will give the command to driver IC, so that the relay is to be tripped and the transmission line will isolate.

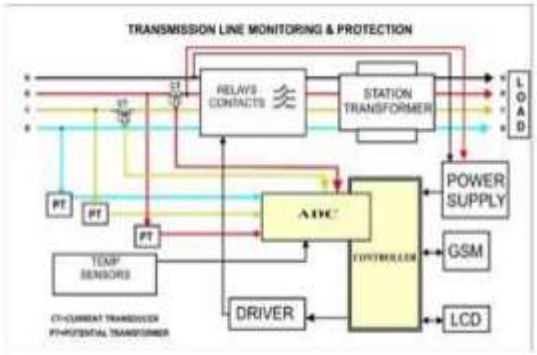



Fig.Block Diagram

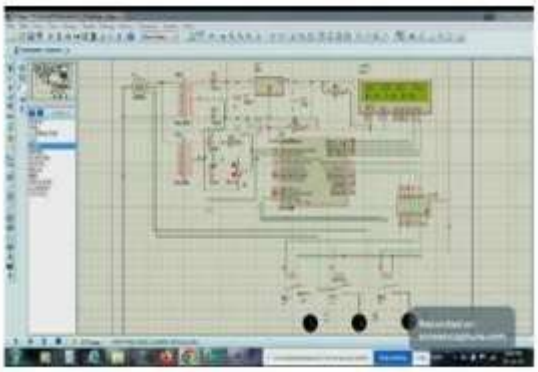


**Fig.1 Similation at no fault condition**

**Fig.2 Simulation at fault condition**

## PROPOSED SYSTEM

Different approaches can be adopted for dealing with the transmission line failure. Here, we have used the GSM network to detect fault and send a SMS alert once the fault is detected. Here the Arduino microcontroller serves as a heart of system enables access to real time state of the system. The LCD display displays the monitored parameter in the system. Here we are using relay for tripping the circuit. Arduino is an open-source hardware and software firm, project, and user community. It is act as a heart of the entire system that enables access to the real time state of the system. It receives the perceived parameter during the power transmission and detect the breach in short circuit limit set by comparing the current sensed with the pre-set short circuit limit. The Arduino microcontroller sends a signal for the relay to trip off the system, else the system remains connected. When the relay trips of the system, an SMS is automatically sent to the avail mobile phone via the GSM network. The GSM module and liquid crystal display (LCD) module are also connected to the Arduino microcontroller. The LCD display displayed the parameters and monitored in the system.

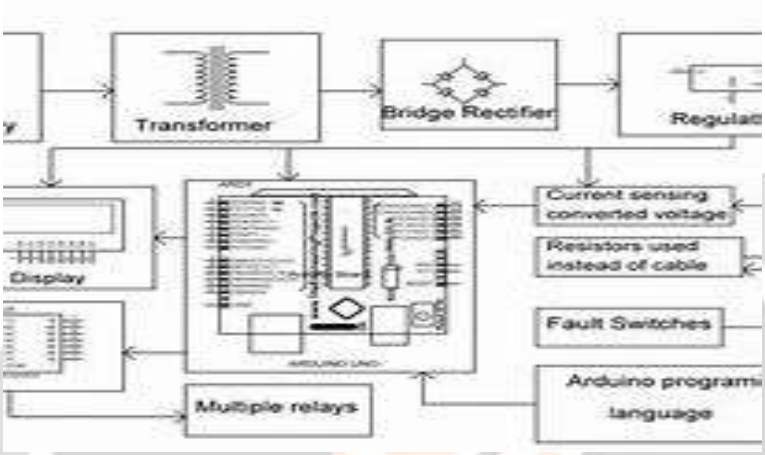
## CLASSIFICATION OF FAULTS

Symmetric faults- In a three-phase system, if a fault affects all three phases equally, it is called a symmetric or a balanced fault. Generally symmetric faults constitute about 5% of the total faults.

Asymmetric faults An unbalanced fault or asymmetric fault results in unequal effect of fault on each of the three phases. Asymmetric faults are further classified as LL or Line to Line fault, LG or Line to Ground fault and LLG or Double Line to Ground fault. LL fault is a short circuit between two lines, caused by ionization of air, or when lines come into physical

- contact, for example due to a broken insulator. LG Fault is a short circuit between one line and ground due to physical contact caused by lightning or storm.
- LLG fault occurs when two lines come in contact with the ground and each other. This is mainly caused by storm damage.

Transient faults- In a system, if a fault diminishes when power is disconnected for a short period of time and then restored, the fault is referred as a transient fault. A transient fault may also be an insulation fault that temporarily affects a device's dielectric properties. Transient faults may be caused due to momentary tree contact, animal contact, lightning strike, etc.




## CONCLUSION

This three phase fault analysis system is built using single phase transformers. The input to the transformers is 220 volt and output is 12 volt. For introducing faults on the low voltage side, set of switches are used that create LL, LG, and 3L faults. The supply returns to the load in the case of a short duration fault and is referred as a temporary trip while long duration disconnection of supply and load shall result in a permanent trip.

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