Feeder fault Automation by Fault Pass Indicator (FPI)

Rajendra P. Rathod[1], Asst. Prof. Shri. P. S. Swami[2]

[1]Student, Department of Electrical Engineering, Government College of Engineering, Aurangabad, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra, India.

[2]Asst. Prof, Department of Electrical Engineering, Government College of Engineering, Aurangabad, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra, India.

Abstract: Inside the present days the field of electrical has took lot of tendencies and the security offerings in the presence and the absence of manpower. The electric gadget protection from over voltage is one of the trends made to manipulate the system. This assignment is made for discover the line fault using MATLAB. This paper outlines the techniques and alertness considerations for determining the vicinity of a fault on ac transmission lines. This undertaking we paintings on the one terminal or two terminal impedance based totally technique. In this we find out the end result & evaluate it to the MATLAB result.

Index Terms— Fault Pass Indicator, AC Transmission Lines, Matlab, Discrete Wavelet Transform (DWT), etc.

I. INTRODUCTION

High depletion of conventional energy sources and increasing power demand has eventually led the world in to a wave of renewable and green energy revolution. Policy makers together with energy research and regulating organizations are aggressively working to find more viable solutions to problems of different size and scope, which include finding new ways of renewable energy production, deeper understanding of current renewable sources for improving the interaction between them with the present grid system for reliable and 'smart' operation, deriving grid codes based on the study and present grid structure, helping utilities achieve those standards etc. Out of the renewable energy technologies, wind and solar were the most promising one and have been subjected to high research and development and evolved themselves from a mere distribution level low reliable generation to utility scale generation facilities with improved reliability at the cost of increased sophisticated technology. Wind energy seems to have a smaller but debatable upper hand over solar for the fact that it can be utilized to produce energy day and night. May be because of this reason wind energy farms are getting bigger in size more rapidly and haven't stopped compared to solar power plants. Also huge investment done in the research and study for understanding the complexity of problems associated with wind energy generation and integration to power grid might have helped it gain prominence among other renewable energy resources.

1.2 Problem Statement: -

To find our fault we have to send the wireman and see in which are fault occurred by physically examining the fault pass indicator as it gives red light when fault occurs. So we are automating this process and sending the fault data directly to MSEB office. So they can send their wireman directly to that place and repair. And they can switch on the electricity of other lines.

II. LITERATURE SURVEY

Related Work:

1. "Analysis of Transmission Line Faults with Linear and Dynamic Loads."

The fault-generated transient components, which contain abundant fault information and are immune to the system's inconstancy, have been widely used in the fault detection and classification by means of travelling-wave or high-frequency transients. The analysis of faults with different loads helps in the detection of transients which ultimately helps in the localization, detection and classification of power system faults to provide efficient protection system. This paper addresses the variations in the system voltages and load currents during the faulty conditions with linear and non-linear loads. The investigated faults include line to ground fault, double line fault, double line to ground fault, and three phase faults. The detailed simulation study of transmission line faults with linear and non-linear loads has been carried out in MATLAB/Simulink environment. The simulation results show the impacts of faults on the system voltages and load currents.

2. "Faults Detection and Diagnosis of Transmission Lines using Wavelet Transformed based Technique."

The demand of electrical power energy has grown exponentially in recent times and to meet this demand electrical power system network needs more sophistication and consequently more complexity. Transmission lines, expanded over several kilometers, are the backbone of the electrical power system which acts as interconnection between power houses and electricity consumers. Transmission lines are mostly located in the open and therefore, environmental effects can result in fault occurrences. The ability to detect and diagnose the faults can help greatly in the protection of transmission line. This paper presents modern solution of fault detection and diagnosis of overhead transmission lines by implementing Discrete Wavelet Transform (DWT). Faults in transmission line of various categories have been created using MATLAB/Simulink.

3. "Transmission Line Fault Detection and Classification."

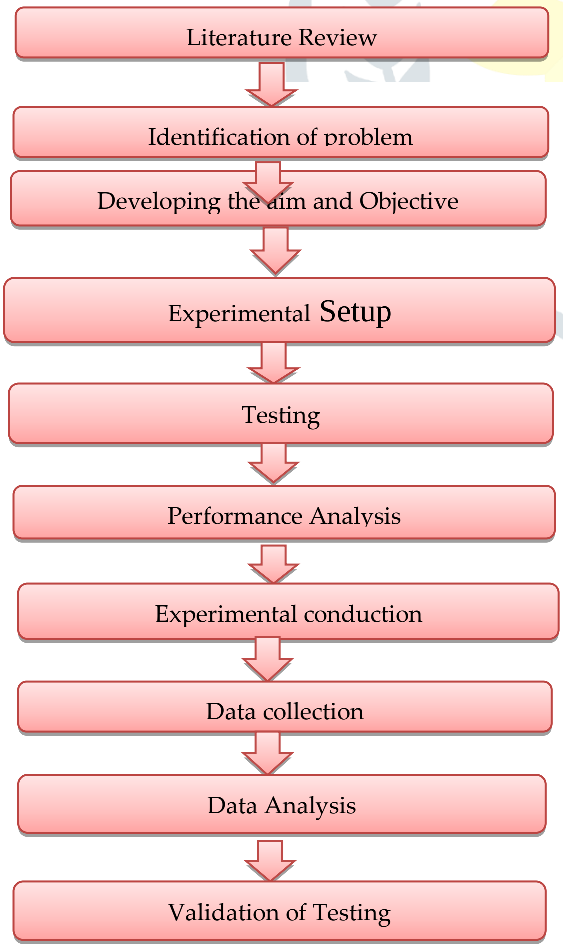
Transmission line protection is an important issue in power system engineering because 85-87% of power system faults are occurring in transmission lines. This paper presents a technique to detect and classify the different shunt faults on a transmission lines for quick and reliable operation of protection schemes. Discrimination among different types of faults on the transmission lines is achieved by application of evolutionary programming tools.

4. "MATLAB Based Simulation for Identify Transmission Line Fault Location."

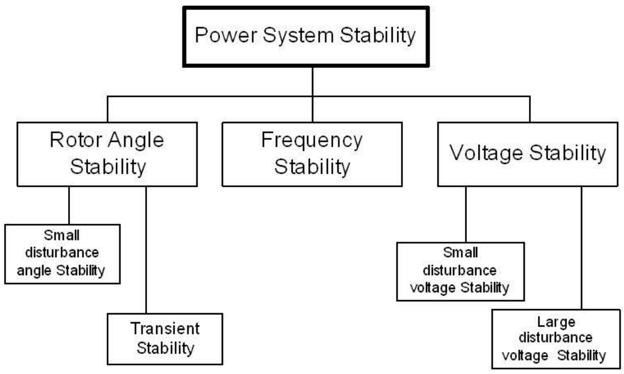
An accurate fault detection and classification is required to transmit power from generating station to various load centers reliably. Transmission network Bus voltage and current is normally use for detect the fault in line. Using symmetrical component one can analyze the unbalance system. In this paper using symmetrical component sequence current is finding for different fault in transmission line. Faults are detected and classify using sequence current. Work carried out shows the simulation of fault location for double-circuit transmission lines based on only the voltage data of both ends of the faulted circuit. The ratio between the magnitudes of negative-sequence voltages measured at both ends of the faulted circuit is utilized to estimate the fault location. For detection of different fault and identification of fault location for L-G fault 400kv, 200km long transmission line is simulating using MATLAB software.

III. METHODOLOGY

The progress in the research work can be observed as,



Block Diagram



Working:

The basic theme is to find our fault in the transmission line using a sensor hanging on the line The sensor is called fault pass indicator it works on the basics of electromagnetic induction. And this sensor is available with MSEB They import it from Russia Now what more we are doing is making this Indicators.

And sending their data directly to the MSEB office. That in which area there is fault

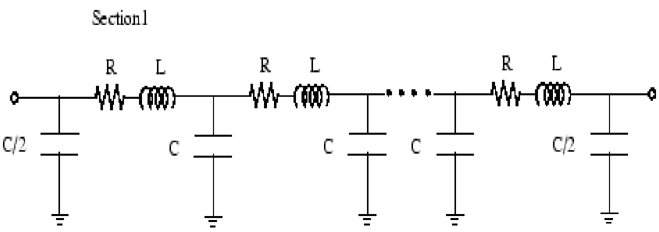
IV. TOOLS AND PLATFORM

Software requirement

- **Matlab**

The PI Section Line block implements a single-phase transmission line with parameters lumped in PI sections.

For a transmission line, the resistance, inductance, and capacitance are uniformly distributed along the line. An approximate model of the distributed parameter line is obtained by cascading several identical PI sections, as shown in the following figure.



Unlike the Distributed Parameter Line block, which has an infinite number of states, the PI section linear model has a finite number of states that permit you to compute a linear state-space model. The number of sections to be used depends on the frequency range to be represented.

An approximation of the maximum frequency range represented by the PI line model is given by the following equation:

fmax=N·v/8·ltot

where,

N	Number of PI sections
v	Propagation speed (km/s) = 1=G*lc*; *l* in H/km, *c* in F/km
ltot	Line length (km)

For example, for a 100 km aerial line having a propagation speed of 300,000 km/s, the maximum frequency range represented with a single PI section is approximately 375 Hz. For studying interactions between a power system and a control system, this simple model could be sufficient. However, for switching surge studies involving high-frequency transients in the kHz range, much shorter PI sections should be used. In fact, you can obtain the most accurate results by using a distributed parameters line model.

Hyperbolic Correction of RLC Elements

For short line sections (approximately *lsec* <50 km) the RLC elements for each line section are simply given by:

R=*r*·*lsecL*=*l*·*lsecC*=*c*·*lsec*

Where,

r	Resistance per unit length (Ω/km)
l	Inductance per unit length (H/km)
c	Capacitance per unit length (F/km)
f	Frequency (Hz)
lsec	Line section length = *ltot* / *N* (km)

However, for long line sections, the RLC elements given by the above equations must be corrected in order to get an exact line model at a specified frequency. The RLC elements are then computed using hyperbolic functions as explained below.

$\omega=2\pi f$

Per unit length series impedance at frequency *f* is

$z=r+j\omega l$

Per unit length shunt admittance at frequency *f* is

$y=j\omega c$

Characteristic impedance is

Z_C=G*z*/*y*

Propagation constant is

γ=G*z*·*y*

$Z=R+j\omega L=Z_C\cdot\sinh(\gamma\cdot lsec)$

$R=\mathrm{real}(Z)$

$L=\mathrm{imag}(Z)/\omega$

Y= 2Z_C·tanh (*γ*· lsec2)

$C=\mathrm{imag}(Y)/\omega$

Hyperbolic corrections result in RLC values slightly different from the non-corrected values. R and L are decreased while C is increased. These corrections become more important as line section length is increasing. For example, let us consider a 735 kV line with the following positive-sequence and zero-sequence parameters

Positive sequence	r = 0.01273 Ω/km
	l = 0.9337×10^{-3}H/km
	c = 12.74×10^{-9}F/km
Zero sequence	r = 0.3864 Ω/km
	l = 4.1264×10^{-3}H/km
	c = 7.751×10^{-9}F/km

For a 350 km line section, non-corrected RLC positive-sequence values are:

R=0.01273×350=4.455 ΩL=0.9337×10^{-3}×350=0.3268 HC=12.74×10^{-9}×350=4.459×10^{-6} F

Hyperbolic correction at 60 Hz yields:

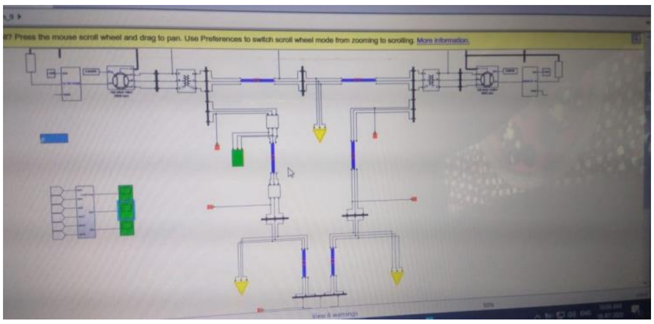
R=4.153 ΩL=0.3156 HC=4.538×10^{-6} F

For these particular parameters and long line section (350 km), corrections for positive-sequence RLC elements are relatively important (respectively −6.8%, −3.4%, and + 1.8%). For zero-sequence parameters, you can verify that even higher RLC corrections must be applied (respectively −18%, −8.5%, and +4.9%).

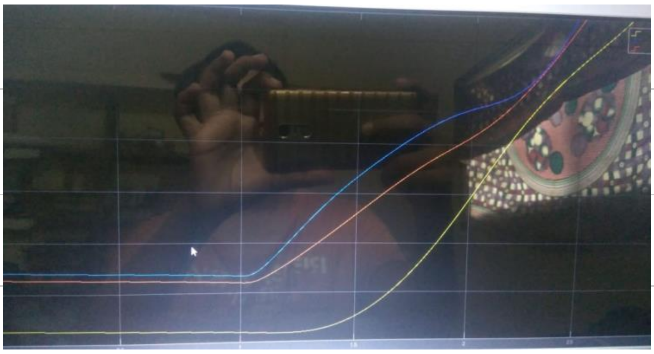
V. DESIGN AND IMPLEMENTATION

Results

Model Diagram



$$Pe = \frac{E' E_B}{X_T} sin\delta = P_{max} sin\delta$$



$$P_{max} = \frac{E' E_B}{X_T}$$

δ = Angle between transient voltages E' and E_B

VI. CONCLUSION

Sentiment Conclusion and future Scope:

A correct method of identity and category of faults on transmission line has been proposed. The approach utilizes the samples of cutting-edge and voltage extracted from the fault point.

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