Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 7 Issue 02, February-2018

A Modelling of High Voltage Transmission Line by Using MATLAB Simulation

Amjad Ansari
Department of Electrical Engineering
Theem College of Engineering
Boisar-Maharashtra ,India.

Hashim Haidarali Ansari
Department of Electrical Engineering
Theem College of Engineering
Boisar-Maharashtra,India.

Shashibhushan Mishra
Department of Electrical Engineering
Theem College of Engineering
Boisar- Maharashtra, India.

Pranay Anil Kulkarni
Department of Electrical Engineering
Theem College of Engineering
Boisar-Maharashtra,India.

***Abstract*— Electrical power is increases day by day and transmits more electrical power transmission line capacity from one station to another station.The main aim of this project is to detect and identified the location of the different faults on High transmission lines. During some faults are occurred in the High Voltage transmission line system, such as Single Line to Ground Fault (L-G), Double Line to Ground (LL-G), Triple Line to Ground Fault (LLL-G) and Line to Line fault (L-L). These types faults are affecting the electrical power system component which are connect in High Voltage Transmission Line. The major faults in HV transmission lines is Single Line to Ground Fault which are harmful to the electrical equipment. The Complete proposed model of HV transmission lines are simulated in MATLAB software to Detect and Identified the faults.Fault element was taken from the Sim-Power system block library. The whole simulation of different operating and different conditions of fault on UHV transmission line, their faults are L-G fault, LL-G fault, and LLL-G fault circuit of the proposed all work presented in this Report.**

Keywords*— *UHV Transmission line, MATLAB Software, L-G fault. fault, 2L-G fault, 3L-G

I. INTRODUCTION

In High Voltage Transmission lines there are different types of fault occurs in electrical power system and then in the process of ,transmission line fault analysis and detection, determination of bus voltage and the line current. The electrical power system is terms bus voltage and bus current of high transmission line are very important. The main purpose is to study the general fault types which are balance and unbalance faults of long transmission line in the electrical power system and we have to perform the detect and analysis and obtain the result of various MATLAB software .

This methods to find out such types of fault analysis and detection, direction estimation and faults distance location can be classified into the following three categories name are transient signals-based methods, power frequency components- based methods and superimposed components-based methods .In this case of three phases electrical power system mainly they are two faults occurs such as three phase balance fault and three phase unbalance fault on transmission line of electrical power system faults are classified are L-G fault, 2L-G fault and 3L-G fault .The extra high voltage transmission line fault detection and analysis helps to selected and developing for a better to protection purpose and their protection of transmission line. Protected system are circuit breakers and its rating is totally depends on L-L-L fault. The triple line fault current is much higher as compare to other faults current.

Simulation is done by using MATLAB simulation in computer and then analysis of Maximum voltage transmission line faults can be easily Detect and analysis. When different fault are occurred two or more conductors come in contact to each other or ground in three phase systems, for it is at such times that the electrical power system components are the greatest stresses from excessive currents. L-G, LL-G and LLL- G faults gradually rise to serious damage on electrical power system equipment . When there a major fault which occurring on long transmission lines not only affects the all equipment and it also effect the electrical power quality. So, it is necessary to determine the types of fault and location of fault on the transmission line and clear the faults as soon as possible in order not to cause some damages. A flash over, lightning strikes to birds, wind, snow and ice load lead to short circuits. The deformation of insulator materials are also to occurs a short circuit faults. Thus it is essential to detect and analysis the fault quickly and separate the faulty part of the HV transmission line. We find out the ground faults quickly they are more important for safety, economy and electric power quality. Now this transient wavelet or waveform based fault analysis, detect and compare the faults levels of wavelets of each phase and zero sequence currents and thus detecting and classifying the faults.

II. METHODOLOGY

In three phase electrical power system mainly they are two faults occurs such as three phase balance fault and three phase unbalance fault on transmission line of electrical power

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 7 Issue 02, February-2018

system faults are classified are L-G fault, 2L- G fault and 3L-G fault . The extra high voltage transmission line fault detection and analysis helps to selected and developing for a better to protection purpose and their protection of transmission line.

The power system under consideration consists of two 865 KV single lines having 300 km length. The single lines are feed from generators at 13.8 KV as is represented in the block diagram. The single line models are distributed parameter lines.The lines are assumed to be transposed and their parameters R, L, C /km are specified in positive- and zero- sequence components. We analysis and detected the faults currents will give information about the nature of the fault.

A 865 KV Ultra high voltage transmission line system has been modelling and simulated to detection. Figure 1 shows a block diagram of UHV transmission line fault has been used throughout the work. The long transmission line system consist of one generators of 865Kv is located on long transmission line are three phase simulator used to simulate faults at mid position on Ultra high-voltage transmission line. The faulted on UHV transmission line is represented by distributed paramete

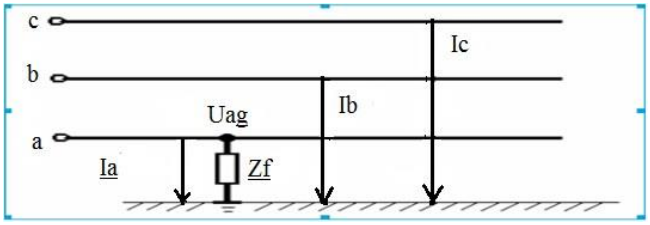

Fig:1 Single line-to-ground fault:-

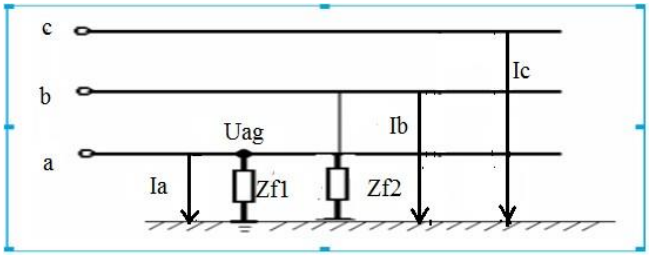

Fig 2: Double line-to-ground fault:-

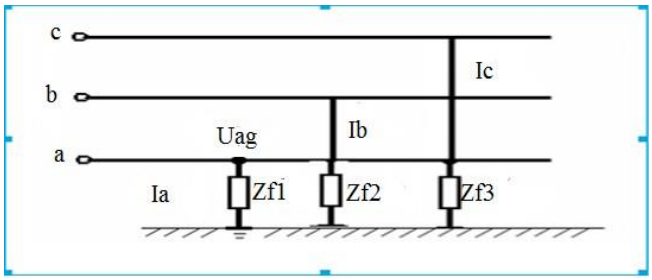

Fig 3: Tripple line-to-ground fault:-

III. DEVELOPMENT.

To model the Transmission Line, it is divided into three parts:

1. Generating Section.
2. Transmission line.
3. Load.

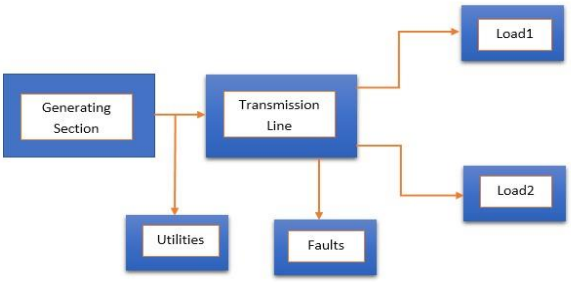

Figure 3.4: Block Diagram Of High Voltage Transmission Line

1. Generating Section: In This Section , Power Generated at Power Station ,which are stepped up to paricular High Voltage and Transmitted towards Consumer through a Transmission line.

2. Tranmission Line : Transmission Line is a connecting link between Generating section and Load. The fault generally occur at Transmission Line. The different type of fault are as follow :

a. Line to ground Fault (L-G)

b. Line to Line Fault (L-L)

c. Double Line to ground Fault (LL-G)

3: Load : The different type of load connected to transmission line such as commercial load ,domestic load ,etc. which vary according to the demand.

Using the Block Diagram 3.4, we will simulate and analyzed the different type of fault Occuring in the high voltage transmission Line.we will be using various tools from Matlab Sim Power system Library.

IV. SIMULATION RESULTS

In High transmission line is one of the important components in electric power system. In HV, transmission lines connect the stations (generating station) and load centres. When their generating stations are far away from the load centres and they run over few hundreds of kilometres. It is an accurate faults location on their high voltage transmission line it is the most important requirement for a permanent fault.

A. Single Line To Ground Fault At Output Side :

Single line to ground faults occurs in UHV transmission line system are R-G, Y-G and B-G faults. For an example R-G fault is considered here. In this figure shows the voltage and current waveforms of RG or L-G fault system. The R phase signals having more transients or maximum value of current than other phases. Here detailed coefficients are calculated and Detected of energy associated with each phase and ground is tabulated. It is clear that the energy associated with detailed coefficients of R phase and ground is changed and thus this is an R-G fault system.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 7 Issue 02, February-2018

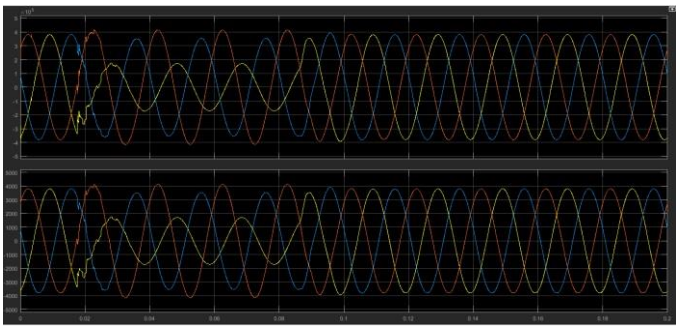

Figure: 4 Output voltage and current waveform Single line to ground in P.U.

B. Double line to ground Fault at output side:- The voltage and current waveforms of RB-G fault system. The R, B and zero signals having more transients fault than other phases. The detailed coefficients are calculated and energy with associated in each phase and ground is below. It is clear that the energy associated with detailed coefficients and analysis of R, B phases and ground is changed and thus this is an R-B-G fault system.

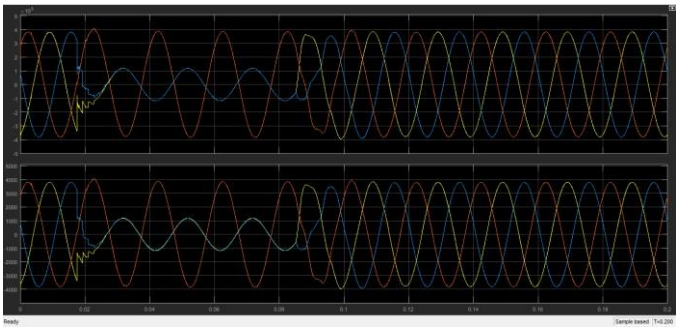

Figure: 5 Output voltage and current waveform Double line to ground in P.U.

C. Tripple Line To Ground Fault At Output Side:- In three phase faults occurs in UHV transmission system are RYB faults and R-Y-B-G faults. Simulation and modelling results of both fault detect are discussed. The figure shows the voltage and current waveforms of R-Y-B fault system. In R, Y and B phase signals having more transient waveform and more faults than other phases. If detailed coefficients are calculated and energy associated with each phase and ground is tabulated below. From the table it is clear that the energy associated with detailed coefficients of R, Y and B phases changed and thus this is an R-Y-B fault system.

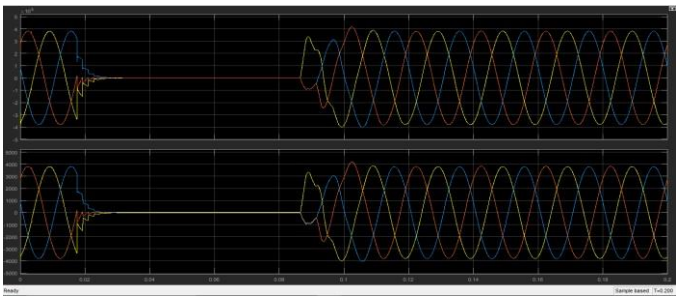

Figure: 6 Output voltage and current waveform Triple line to ground in P.U.

D. Single Line-Ground Fault At Input Side:- Here we have simulation and Modelling on L-G fault occurs their one phase is short to the ground and the fault the impedance is not zero. When their output waveform shows the rise of current on L-G fault occur on UHV transmission line.

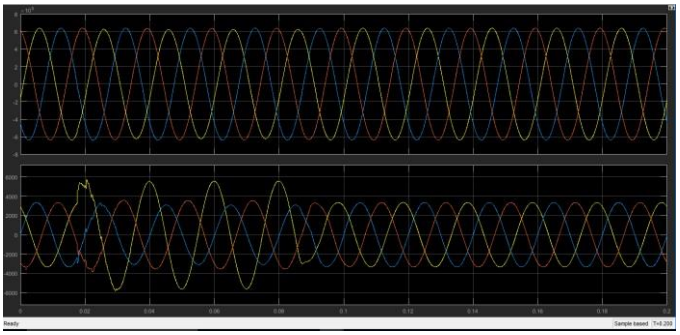

Figure:7 L-G Fault waveform of current at input side in P.U

E. Double Line-Ground Fault At Input Side:- Now simulation and modelling on double line to ground fault occurs their two phases is short to the ground. When the magnitude of the faults current line are higher than the normal input current and the voltage are not change in magnitude and the fault the impedance is not necessary zero and output waveform shows the gradually rise of current where 2L-G fault occur on UHV transmission line.

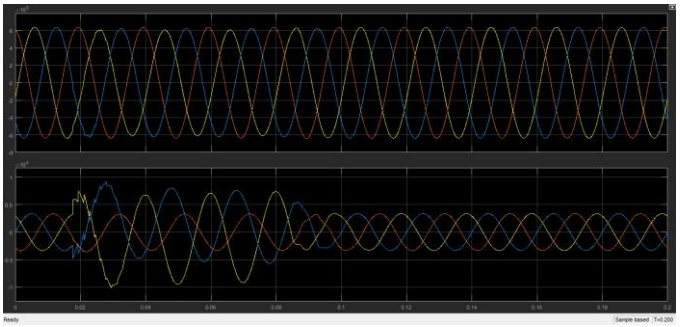

Figure: 8 LL-G Fault waveform of current at input side in P.U.

F. Triple Line-Ground Fault At Input Side:- Modelling on triple line to ground fault occurs when three phases is short to the ground. When their magnitude of the faults current line are higher than the normal input current and the voltage are not change in magnitude. Thus output waveform shows the increasing of current when LLL-G fault occur on UHV transmission line.

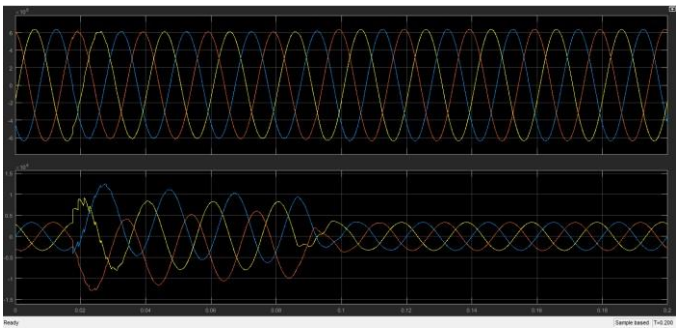

Figure: 9 LLL-G Fault waveform of current at input side in P.U.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 7 Issue 02, February-2018

G. Without fault Waveform:-

In UHV transmission line when we applied balance input and there is no fault in their UHV transmission thus output will be normal and balance value of current and voltage. These energies are the reference parameters. There is some change in these parameters, and then their phase is considered as faulty condition.

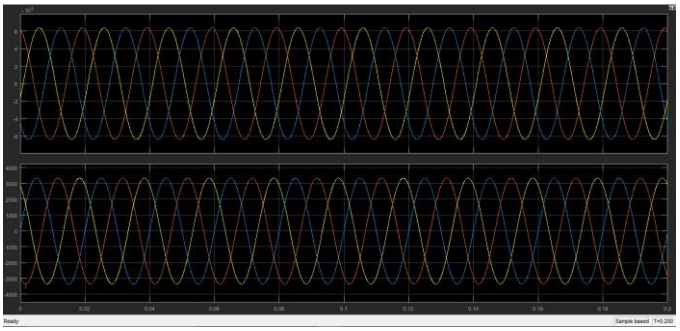

Figure: 10 Voltage and Current waveform of healthy network in P.U.

H. L-G Fault Waveform At Fault Point:-

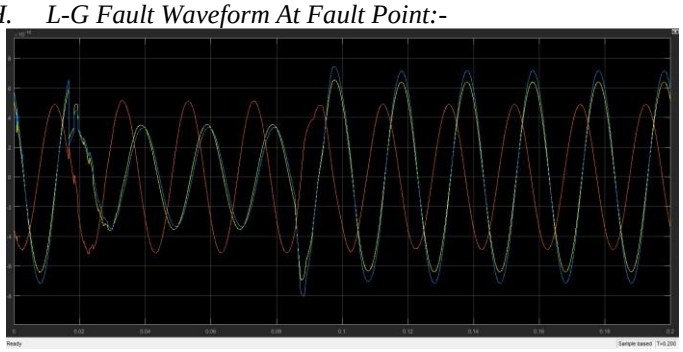

Figure: 11 Fault Current waveform of L-G fault location

I. 2L-G Fault Waveform At Fault Point:-

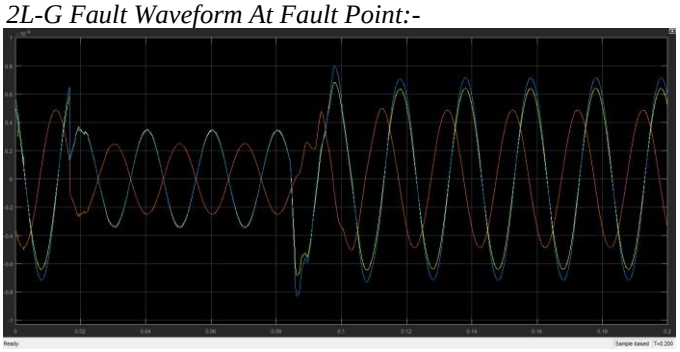

Figure: 12 Fault Current waveform of LL-G fault Location

J. 3L-G Fault Waveform At Fault Point:-

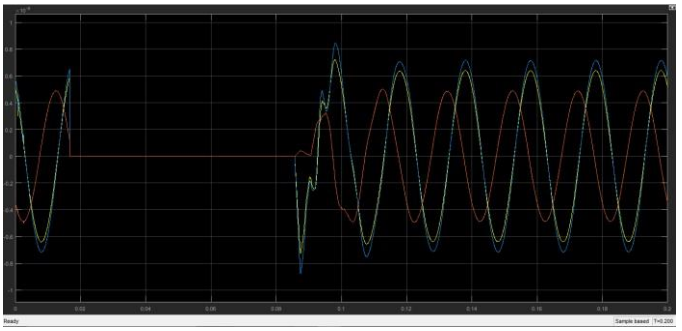

Figure: 13 Fault Current waveform of LLL-G fault Location

VI. CONCLUSION

We had collected details on "Transmission Line Fault Detection."In particular, "A Modelling of Transmission Line Using Matlab Simulation" along with all types of Transmission Line faults and their solutions were studied.

The ultimate aim of the project would be simulation of the circuitry on MATLAB and implementing in MATLAB with most positive results and least limitations.

VII. REFERENCES

[1] Kincic and Papic, "Impact of series compensation on the voltage profile of transmission lines," Power and Energy Society General Meeting (PES), 2013.

[2] S. A. Kumar, R. and G. Choudhary, "A new digital distance relaying algorithm for first-zone protection for series- compensated double-circuit transmission lines," Advances in Computing and Communications (ICACC), 2013.

[3] R. E. Saha, M.M. and J. Izykowski, "A fault location algorithm for series compensated transmission lines incorporated in current differential protective relays," The International Conference on Advanced Power System Automation and Protection, pp. 706-711, 2011.

[4] A. Osman and O. Malik, "Protection of parallel transmission lines using wavelet transform," IEEE Transactions on power delivery, vol. 19, no. 1, 2004.

[5] B. K. G. V. S. Ashok, V. and V. Murthy, "Identification and classification of transmission line faults using wavelet analysis," ITSI Transactions on Electrical and Electronics Engineering, vol. 1, no. 1, pp. 117- 122, 2013.

[6] N. V. P. C. Roshni, U. and R. Srinivas, "Location of faults in transmission line using fast fourier transform and discrete wavelet transform in power systems," Undergraduate Academic Research Journal (UARJ), 2012.

[7] M. Solanki and Y. Song, "Transient protection of ehv transmission lineusing discrete wavelet analysis," Power Engineering Society General Meeting, IEEE, 2011.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 7 Issue 02, February-2018

[8] K. R. Nidhi, B. and A. Sinha, "Neural network and fuzzy logic based protection of series compensated double circuit transmission line," International Journal of Engineering Research and Applications (IJERA), 2013.

[9] L. Andradeand T. deLeao, "Impedance based fault location analysis for transmission lines," Transmission and Distribution Conference and Exposition (T&D), 2012 IEEE PES, 2012.

[10] B.P. Saravanababu, K. and K. Sathiyasekar, "Transmission line faults detection, classification, and location using discrete wavelet transform," International Conference on Power, Energy and Control (ICPEC), 2013.

[11] O.A.S.Youssef, "Fault classification based on wavelet transform," Transmission and Distribution Conference and Exposition IEEE/PES, 2014.

[12] K. M. S. M. Reddy, R.B. and C. Prasanth Babu, "Fault detection, classification and location on transmission lines using wavelet transform," Electrical Insulation and Dielectric Phenomena, 2009.

[13] S. K. G. Ravindra Malkar, Vaibhav Magdum, "Transmission line fault analysis using wavelet theory," International Journal of Engineering Science and Technology (IJEST), 2012.