A Review Paper on Matlab Simulation For Fault Analysis Of Electrical Circuit

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ABSTRACT

The power systems contains generation, transmission, Distribution. 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 analysis.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.

Keywords *Measurement ; Power systems ; Faults ; Analysis of faults on transmission line; MATLAB Simulation*

1. INTRODUCTION

The faults on transmission lines may highly affect the power system outputs The speed and accuracy hence are important factors for fault clearance. If a fault is not properly detected and removed, widespread damage or a power system blackout may take place. The behavior of protective devices may change with the various types of loads such as linear and non-linear loads connected with the distribution system .The components of transient generated during the faults in the system contain the abundant fault information which has been widely used in the fault detection and classification by means of travelling-wave or high frequency transients. The transients during faulty conditions also depend on the type of load as well as the power system network complexity .

A transmission line is one of the important elements of an electric power system .Since 1945, power transmission lines have been rapidly developed in number and length. One important factor of an electrical power transmission system is to continuously deliver electrical power to consumers. Therefore, efficient and effective protection of the transmission lines is required. This requires the analysis of power system faults in various power system conditions, loads, generating sources and faulty conditions. The literature has been reported on the different aspects of the faults in the power system. This report presents a detailed study of the transmission line fault behavior with the linear and non-linear loads. A study of the voltage and loads currents with the linear and non-linear loads during the faults.

2. LITERATURE REVIEW

Power transmission is a major issue in electrical engineering after power generation. Fault in transmission line is common and main problem to deal with in this stream . The faults occurring in power systems can be broadly classified into symmetrical faults and unsymmetrical faults, there is yet another classification of fault types namely, shunt type of faults and series type of fault ,in this paper we are analyzing only shunt type of faults, this shunt type of fault involve short circuit between the conductors and or between conductor and ground . They are characterizedby increases in current and fall in voltage and frequency in faulted phase .

The different kinds of shunt faults are single line to ground fault ,double line to ground fault and three line to ground fault.The study of these faults are necessary to ensure that reliability and stability of the power system. Then paper approaches MATLAB software in which user friendly tool box will assist using that transmission line model design and various fault time will be given with the help of signal builder. After that various effects on bus system due to different are shown such as voltage ,current and fault current output in terms of waveforms .By analyzing waveforms we can calculate which fault occurring is maximum and what are the safety measurement that we can include in the power system to overcome this fault.

3. IDENTIFIED GAPS IN THE LITERATURE AND OBJECTIVES OF THE RESEARCH

On the idea of theoretical calculation of the faults parameters it could be much easier to make fault analysis with the matlab simulation .it can be either applied for any faults may be symmetrical or and unsymmetrical.

4. METHODOLOGY

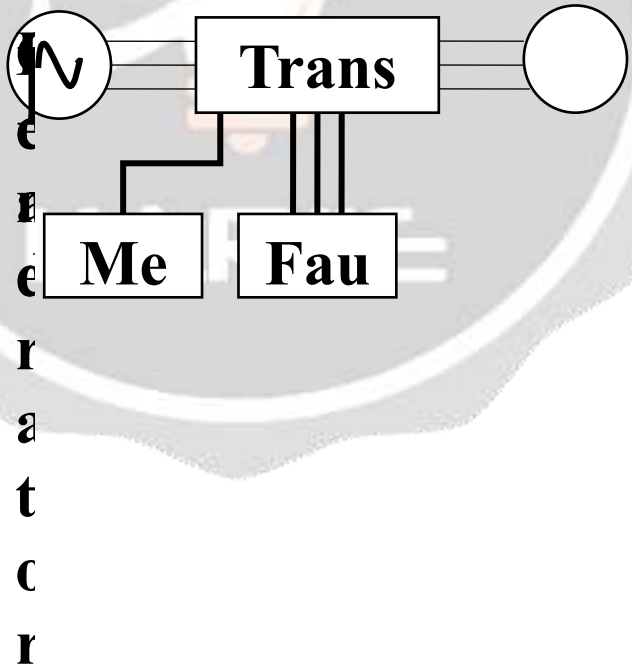

Fig -1: Block Diagram of system

4.1. FAULTS ON TRANSMISSION LINES

Transient Fault -Transient fault is a fault that is no longer present if power is disconnected for a short time and then restored; or an insulation fault which only temporarily affects a device's dielectric properties which are restored after a short time. Many faults in overhead power lines are transient in nature. When a fault occurs, equipment used for power system protection operate to isolate the area of the fault. A transient fault will then clear and the power-line can be returned to service. Typical examples of transient faults include: momentary tree contact; bird or other animal contact; lightning strike ; conductor clashing,etc.

Transmission and distribution systems use an automatic re-close function which is commonly used on overhead lines to attempt to restore power in the event of a transient fault. This functionality is not as common on underground systems as faults there are typically of a persistent nature. Transient faults may still cause damage both at the site of the original fault or elsewhere in the network as fault current is generated. In persistent fault is present regardless of power being applied. Faults in underground power cables are most often persistent due to mechanical damage to the cable, but are sometimes transient in nature due to lightning.

Table 1. Comparision Of Symmetrical faults &Unsymmetrical Fault In System.

Sr.no	Symmetrical Fault	Unsymmetrical Fault
1)	Equal short circuit current flows from each conductor.	Unequal short circuit current flows from each conductor.
2)	Equal phase displacement i.e.120o	Unequal phase displacement
3)	Fault probability 85%	Fault probability 2-3%
4)	Examples 1. LLL 2. LLLG	Examples 1. LG 65to70% 2. LLG15to20% 3. LL 5to10%

4.2 SYMMETRICAL FAULTS

A three phase symmetrical fault is caused by application of three equal fault impedances Zf to the three phases. If Zf = 0 the fault is called a solid or a bolted fault. These faults can be of two types: (a) line to line to line to ground fault (LLLG fault) or (b) line to line to line fault (LLL fault). Since the three phases are equally affected, the system remains balanced. That is why, this fault is called a symmetrical or a balanced fault and the fault analysis is done on per phase basis. The behaviour of LLLG fault and LLL fault is identical due to the balanced nature of the fault. This is a very severe fault that can occur in a system and if Zf = 0, this is usually the most severe fault that can occur in a system. Fortunately, such faults occur infrequently and only about 5% of the system faults are three phase faults.

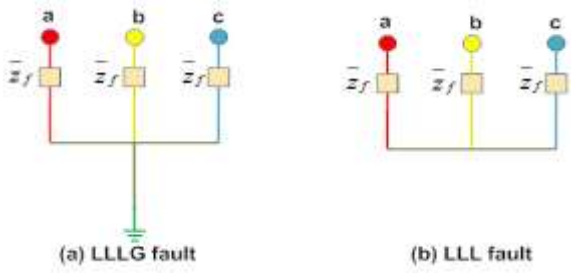

Fig.2. Symmetrical faults on system

4.3. UNSYMMETRICAL FAULTS

Faults in which the balanced state of the network is disturbed are called unsymmetrical or unbalanced faults. The most common type of unbalanced fault in a system is a single line to ground fault (LG fault). Almost 60 to 75% of faults in a system are LG faults. The other types of unbalanced faults are line to line faults (LL faults) and double line to ground faults (LLG faults).

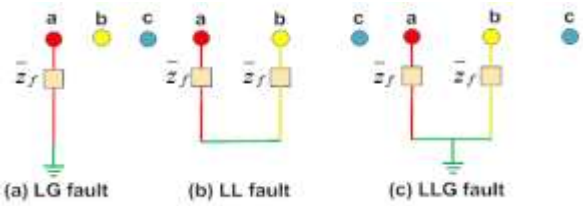

Fig.3. Unsymmetrical faults on system

Majority of the faults occur on transmission lines as they are exposed to external elements. Lightening strokes may cause line insulators to flashover, high velocity winds may cause tower failure, ice loading and wind may result in mechanical failure of line or insulator and tree branches may cause short circuit. Much less common are the faults on cables, circuit breakers, generators, motors and transformers.Fault analysis is necessary for selecting proper circuit breaker rating and for relay settings and coordination. The symmetrical faults are analysed on per phase basis while the unsymmetrical faults are analyzed using symmetrical components. Further, the ZBUS matrix is very usefull for short circuit studies .

5.CONCLUSION

MATLAB to analyze these circuits saves time and provides exact results with minimal prerequisite knowledge of programming. And by using Simulink, we will be able to analyze the circuit using its transfer function representation. With less effort, these techniques allow researchers to solver engineering problems with an excellent graphical picture of the result. The simulation and analysis of three phase fault to achieve results of the transmission line parameter is convenient by using MATLAB software. The future work is to make such algorithm which is effective and more accurate to calculate the response and analysis of any fault on transmission lines.

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