THREE PHASE FAULT ANALYSIS USING SIM POWER SYSTEM

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Abstract: This paper describes the modeling and simulation library for power systems simulation under Simulink environment[2]. The different features of MATLAB tool boxes used in the analysis of power systems are described. Software introduces Simulink environment of MATLAB for implementing user friendly and future expansion. To illustrate the capabilities of Simulink simulation tool, a case study based on a test system is presented and now days we generate electricity more but while transmitting it we face the more problems like loss of energy due heat, transmission line faults in this the major faults are on the transmission lines fault like single-line –ground fault, double-line to ground fault, three line to ground fault[7]. For these faults in our paper we are going to implement the MATLAB Simulink model. In this we are going to use a signal builder to create a fault time. At that time the circuit breaker will open. It isolates the unhealthy part from the healthy part. By this method we can protect our system, and also using this we analysis the different parts. Voltage, current measurements and there variations during the occurrence of fault are also shown. In this paper we give the values like resistor, capacitor and inductor[1]. By using these values we are going to calculate the value of fault current and compare this value with the waveforms we got in output scale. Here the fault studies are used to select and set the proper protective devices and switchgears.

INTRODUCTION:

The electrical power is generated in various power plants; this generated power is transmitted and distributed to various loads through larger interconnected power system[5]. In most of the cases high voltage used for transmission in order to reduce the current values, so that the losses can be reduced.

The primary objective of our paper is to study the fault current and voltage values on different parameter of power system element such as resistance, capacitance and inductance[4] .fault may be defined as, a circuit in any failure which interferes with normal flow of current. In power system there are two

different types of fault such as symmetrical fault and unsymmetrical fault. In three phase system which affect all phases equally and they have same value of current in all the phases are known as symmetrical fault; if only some phases are affected and the current value is different in that faulted phase is known as unsymmetrical fault[2]. In this paper we are creating the following faults

1. Single line to ground fault
2. Double line to ground fault
3. Three line to ground fault

In single line to ground fault one of the phases is given to ground, in that phase the voltage is equal to zero and in reaming phase current is equal to zero. The occurrence of this fault is 70 to 85%.in double line to ground fault the voltage value of that phase is zero and current value is high ,occurrence of this fault is 8-15%.similarly , in three line to ground fault current in all phase are equal and occurrence of this fault is 3-5% .these faults are short circuit fault that may occur due to insulation failure during lightning or other natural event like wind and ice fall, physical accident and other event which causes short circuit between phase to ground these are known as fault ,this value of short circuit current is 6-10% times higher than the normal operating current ,it may damage power system equipment of that system [3]. In order to decrease the effect of fault on transmission line it is necessary to disconnect the faulted part from healthy part as soon as possible by using an circuit breaker.in our paper we analysis the different fault condition on transmission line using MATLAB Simulink.

WORKING PROCEDURE:

In this paper we are going to use MATLAB simulation to analyses the different type of fault. In working condition we are going to analyses faults like line to ground fault, double line to ground fault and three lines to ground fault[1].

In MATLAB various block like signal builder , three phase source , circuit breaker Ideal switch , voltage and current measurement blocks, these have their own specifications. In simulation process is done by giving that values , here in our project we are going to analyses the different faults for that we are creating the fault by using signal builder[3] . In signal builder we are going to give fault time at 0.1sec, at that time fault will create by connecting one of the lines to ground through ideal switch, while double line to ground fault and three lines to ground fault is created by short circuiting two lines and three lines respectively to ground through ideal switch.

Consider single line to ground fault is created , after creating the fault we simulate the model at that time ideal switch is closed ,circuit breaker is open and by using the scope we get the voltage , current and fault current on output screen then we measure the fault current and also observed the current and voltage variation and it can theoretically calculated by using below formula[7].

- Single – line – ground fault

Terminal conditions by assuming phase a is shorted to ground directly

$$V_a = 0$$
$$I_b = 0$$
$$I_c = 0$$

The Fault current can be calculated by using below formula

$$I_f = 3(E_a / Z_1 + Z_2 + Z_3)$$

- Double – line – ground fault

Terminal conditions by assuming phase b and c is shorted to ground directly

$$V_b = 0$$
$$V_c = 0$$
$$I_a = 0$$

The Fault current can be calculated by using the below formula

$$I_f = -3I_{a1}(Z_2 / Z_1 + Z_2)$$

- Three – line – ground fault

Terminal conditions

$$I_a + I_b + I_c = 0$$
$$V_a = V_b = V_c$$

The Fault current can be calculated by using the below formula

$$I_f = E_a/Z$$

SIMULATION MODEL:

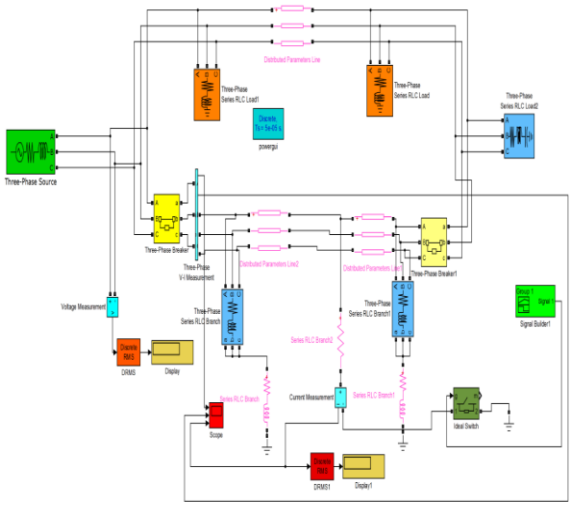

Fig a : Shows the simulink model for three Phase fault analysis

RESULT:

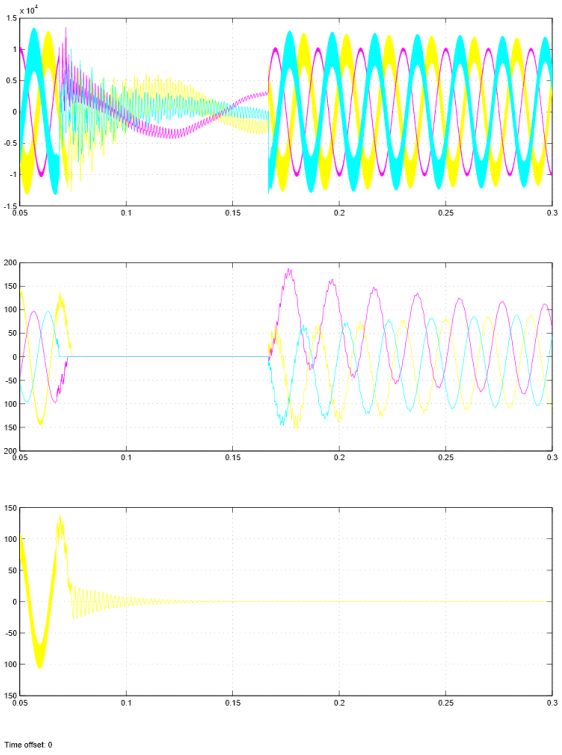

Fig b : shows waveforms of single line to ground fault

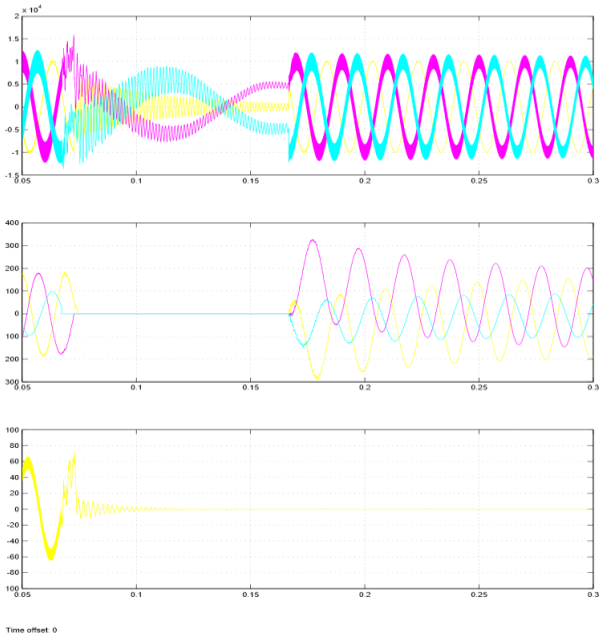

Fig c : shows the waveforms of double line to ground fault

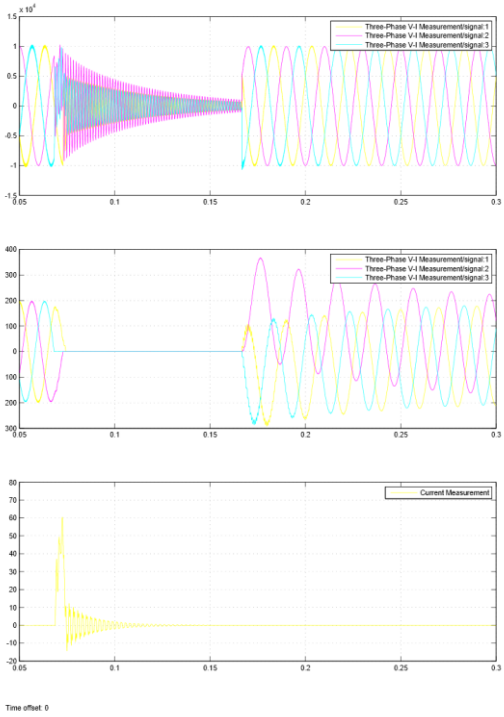

Fig d : Shows the waveforms of three line to ground fault

CONCLUSION:

Faults in the transmission lines are one of the elements that the reliability of the system is affected by[4]. The more faults that take place, the less reliable the system is, since they could cause outages in the power system, which may result in an interruption of the service hence this paper gives the idea to analyze the shunt faults, by analyzing this faults we can give the solutions for avoiding this fault, for analyzing this fault we are using MATLAB Simulink which gives rapid and easy output analysis.

ACKNOWLEDGEMENTS:

This work would not possible without the support and encouragement of Mr.Chetan H R and Mr.Nandish B M(Asst.Professor) would like to thanks, which is greatly appreciated.

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