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Transmission Line Fault Classification using DWT

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Abstract - *The fault diagnosis of Electric Power System is a process of discriminating the faulted system elements by protective relays and subsequent tripping by circuit breakers. Specially, as soon as some serious faults occur on a power system, a lot of alarm information is transmitted to the control center. Under such situation, the operators are required to judge the cause, location, and the system elements with faults rapidly and accurately. Thus, good fault diagnosis methods can provide accurate and effective diagnostic information to dispatch operators and help them take necessary measures in fault situation so as to guarantee the secure and stable operation of the Electric power system. Wavelet Transform is novel technique in the protection system, which is used for fault detection, fault classification for transmission lines from voltage and current signal. The scheme has been tested by both simulation and experimentally. A Simulation result is obtained from PSCAD.*

***Key Words*: PSCAD, DWT & TRANSMISSION LINE**

1. INTRODUCTION

An electrical power system, as a whole, consists of generation, transmission and distribution. The demand for electricity is increasing day by day, to fulfill this demand generation also increase due the entire power system become complex. So the proper precaution must be taken to ensure that the equipment not only operates as nearly as pick efficiency, but also that it is protected from accidents. The normal path of the electrical current is from the generator, transformer and transmission line to load and it is confined to this path by insulation. The insulation ,however broken down ,either by the effect of temperature and the age or by the physical accident ,so that the current then follows an abnormal path generally known as Short circuits or fault that often occur on a power system. Power system faults not only can cause discontinued supply, they can damage the power system equipment that is costly to replace. Such faults may made infrequent by good design of the power system apparatus, and line and provision of protective devices. The purpose of protective relays and relaying systems is to operate the correct circuit breakers so as to disconnect only the faulty equipment from the system as quickly as possible, thus minimizing the trouble and damage caused by faults when they do occur. Locating transmission line faults quickly and accurately is very important for economy, safety and reliability of power system. The performance of a power system is frequently affected by the transmission line faults, which give rise to disruption in power flow. Therefore the protection of transmission line properly addressed. Distance protection is widely used protection scheme for long transmission line. Existing methods for fault location such as measuring the changes of impedance or voltage and current of line before and after a fault occurred seriously rely on fault type, grounding resistance, load conditions and system running way. Reliability of protection scheme is based on their fault diagnosis, how quickly fault is isolate from power system. In recent years, different methods are used for protection schemes of Introduction

1.1 Power system and Protection

The recent restructuring and deregulation in the electric power sector over the last decade has brought about the need for efficient generation and transfer (transmission and distribution) of electric power to load centers. The mode of power transfer is usually via overhead lines. A very important component of power system design is the provision of adequate protection to detect and isolate faulty elements in the power system. Locating transmission line faults quickly and accurately is very important for economy, safety and reliability of power system. Power system faults not only can cause discontinued supply, they can damage the power system equipment that is costly to replace. Such faults may made infrequent by good design of the power system apparatus, and line and provision of protective devices.

1.2 Types of Fault

An electrical power system fault is the unintentional and undesirable creation of a conducting path or a blockage of electric current. Distribution feeder faults can be sub-divided into two major categories:

- High impedance faults
- Low impedance faults

Lightning strikes can cause a breakdown of the insulation on overhead lines. Consequently, Line to line fault also due to when a tree or a man-made object or animal makes the connection path between two lines.

➢ **Simulation model of transmission line system**

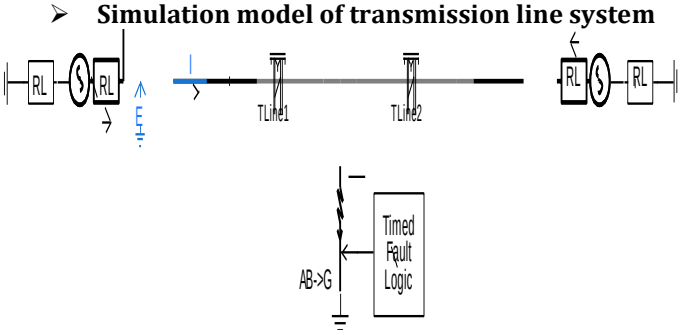

Fig -1: Pscad simulation

A. **Three phase Voltage Source Model**

This component models a 3-phase AC voltage source, with specified source and/or zero-sequence Impedance. A zero-sequence impedance branch is added directly within the component

B. **Volt meter:**

Used for the measure the value of instantaneous voltage of the tree phase.

C. **Three- phase fault block:**

Type of faults considered are A-G, B-G, C-G, AB-G, AC-G, BC-G, AB, AC, BC and ABC. For simulating these faults, the three-phase fault block is used. Data required for simulation of these faults is type of fault.

D. **Time logic fault:**

The output of this component is used specifically for controlling the fault state at different instants and duration of fault.

E. **Modeling of Transmission Line:**

There are three types of model available for overhead line configuration in PSCAD; Bergeron model, Phase model and Mode model. The Bergeron model is very simple, constant frequency model based on travelling wave. It is useful for studies where it is required to get the steady state impedance/admittance of the line. The termination style used is Direct Connection type.

➢ **Fault detection based on wavelet transform**

The fault detection of transmission line based on the norm of approximation coefficients of the all phase current. The high value of energy of approximate coefficient is compare to predetermine threshold value, based on comparison fault detection has been done.

Threshold selection:

The magnitude of threshold is based on the state of current. When the impact of the change of current is being reflected in the magnitude of the threshold, then it is considered as an adaptive threshold during normal condition, the current can vary due to load or generation effects. So the threshold value change dynamically according to these conditions. It has been found under all the loading conditions with threshold (m) of the maximum loading condition, a value of threshold is less than 1.2, for increase detection sensitivity its selected 1.5

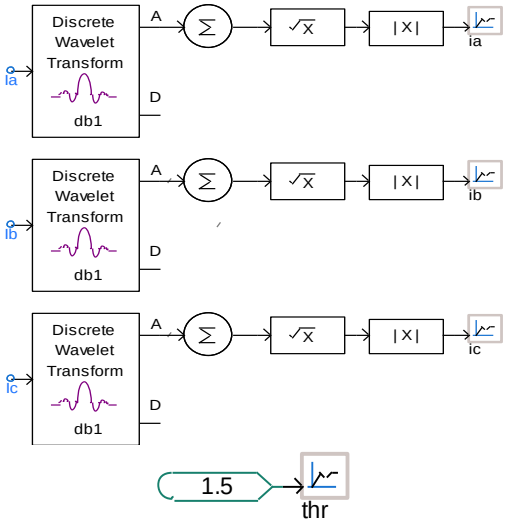

Fig 2. Fault detection scheme

- **Flow chart**

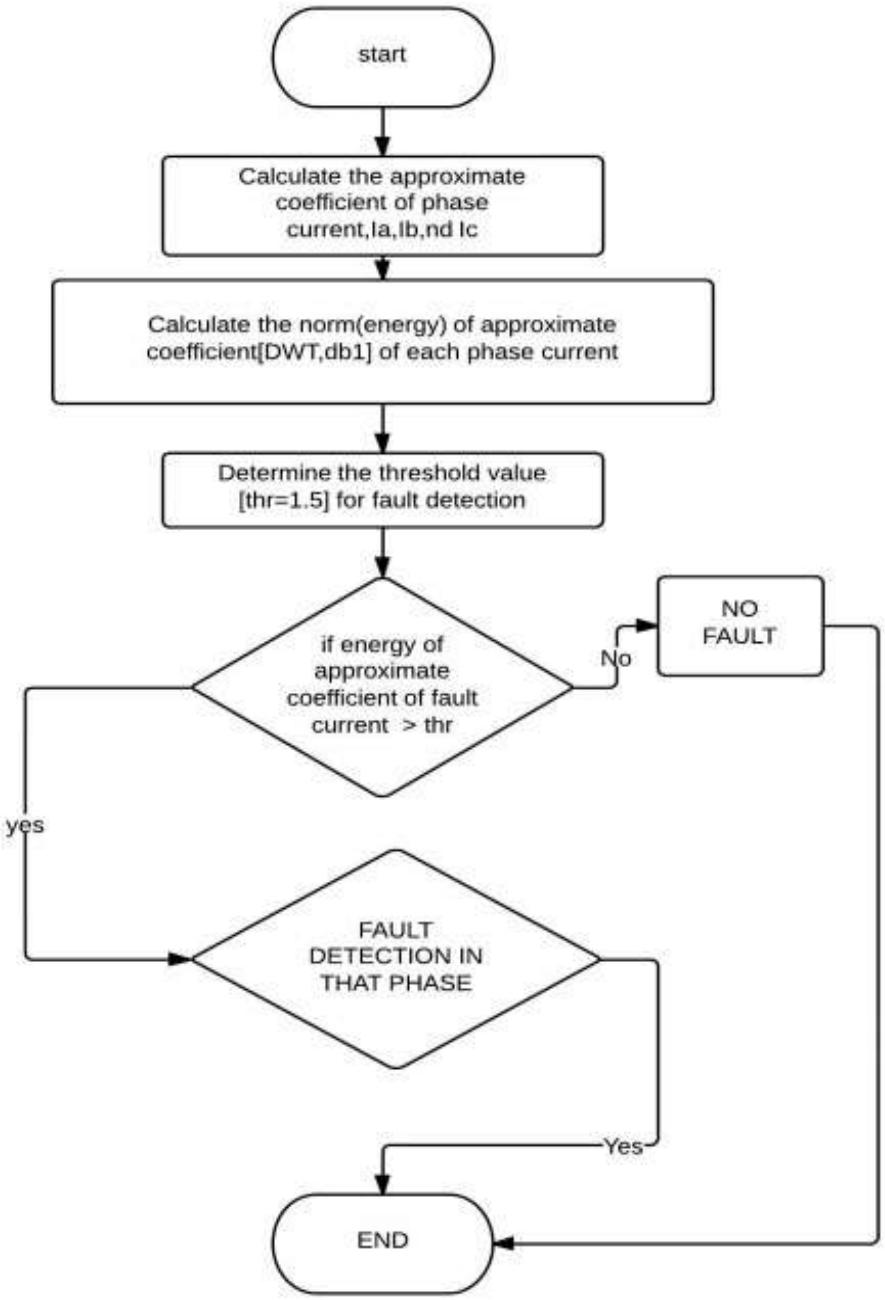

Fig 2. Flow Chart

2. SIMULATION RESULT

- A-G FAULT

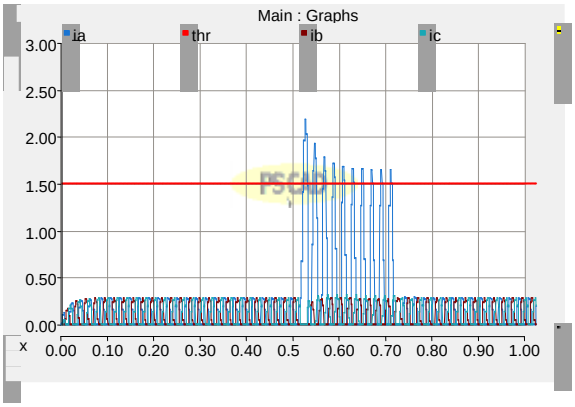

FIG4. A-G Fault

- B-G FAULT

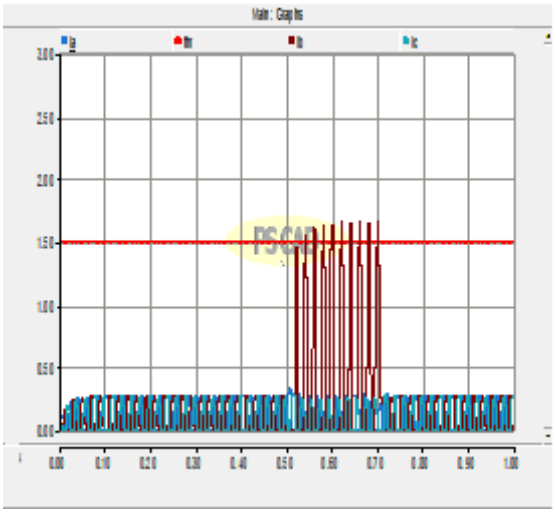

Fig5. B-G FAULT

L-L FAULT

- A-B FAULT

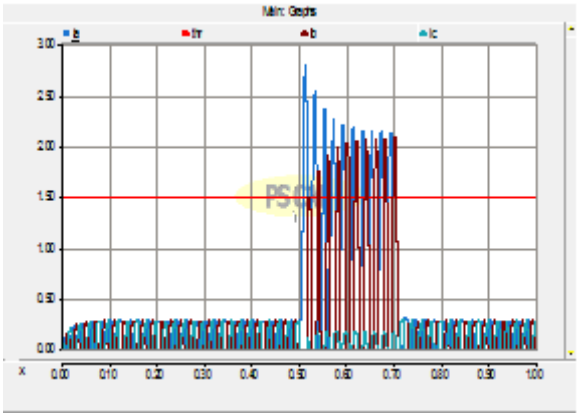

Fig 3.5: A-B FAULT

- B-C FAULT

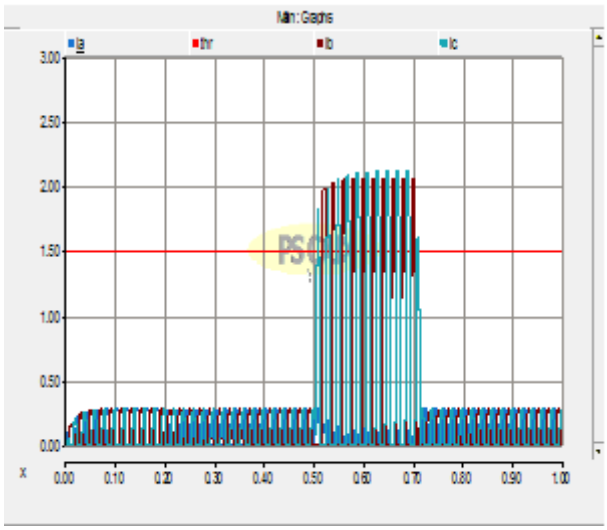

Fig 3.6: B-C FAULT

L-L-L FAULT

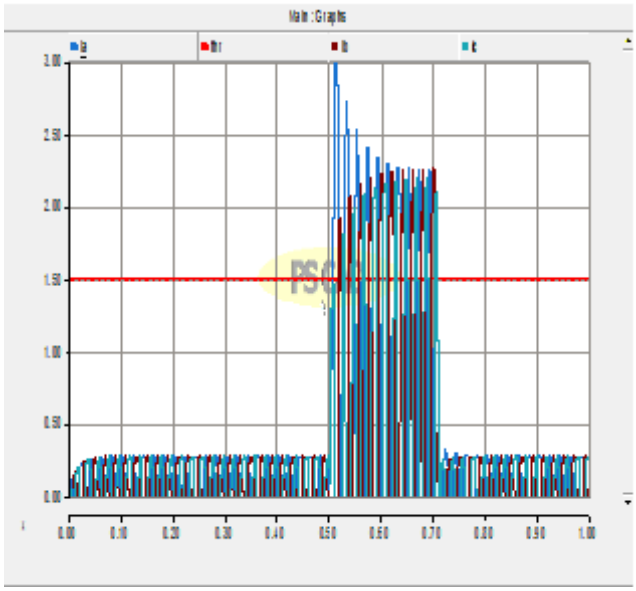

Fig 3.7: symmetrical fault

- **About Tool**

PSCAD (Power Systems Computer Aided Design) is a time domain simulation software for analyzing transients in electrical networks. It is a collection of programs, providing a graphical Unix-based user interface to electromagnetic transients program (EMTP). It is also known as PSCAD /EMTDC. EMTDC (Electromagnetic Transients with DC Analysis) was first developed in 1976 and has been constantly evolving in its scope and capabilities. It is an integral part of PSCAD as it is the library of power system component models and procedures, which establish the simulation software provided with PSCAD. Together they

provide a fast, flexible and accurate solution for the efficient time-domain program for simulating a variety of electrical power system transients and control networks.

3. CONCLUSION

Fault detection, fault classification are very important in any protection scheme. The fault diagnoses is done by various techniques like Fuzzy logic, ANN, WT, DFT etc. but the WT is more reliable & accurate than other conventional method, because it gives both time domain as well as frequency domain information. The simulation has been carried out by PSCAD software.

REFERENCES

[1] The paper proposed by A. H. Osman, Student Member, IEEE, and O. P. Malik, Life Fellow, IEEE "Transmission Line Distance Protection Based on Wavelet Transform".

[2] Shalini Singh, Anu Bhalla, Pallavi Saxena, and Ramesh Padarla on "Wavelet Transform Based Fault Detection And Classification In Transmission Line", IJREAS Volume 2, Issue 5 (May 2012) ISSN: 2249-3905

[3] PSCAD/EMTDC User's Manual, Manitoba HVDC Research Centre, Winnipeg, MB, Canada, 2001

[4] Wavelet Toolbox User's Guide MATLAB, October 2004 Revised for Version 3.0.1 (Release 14SP1)

[5] The paper proposed by Kola Venkataramana Babu1, Manoj Tripathy and Asheesh K Singh "Recent techniques used in transmission line protection: a review", International Journal of Engineering, Science and Technology Vol. 3, No. 3, 2011, pp. 1-8

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