A Review on fault location algorithm for Mho relay in series compensated transmission line.

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***Abstract*—**In this paper the review of a new algorithm for correct problem location algorithm for Mho relay in series compensated power supplying line with series compensated transmission line with complete working control system of TCSC used for algorithm. The algorithm contains two checking sub-parts considering errors in the power line section I.e. before TCSC and after TCSC. The sub-parts selection of the algorithm is performed under the parameter using the Fault Section pointer. Fault Section pointer is the part of the TCSC measured during the first part of error inception. The first part of fault section pointer tends to the error part or faulty part and a complete method to find the complete problematic location estimation. The simulations are carried out using MATLAB 2016a on a 400kV, 400km power transmission line system with TCSC installed in the center of the line. That the results confirm the ability of FSI for correct identification of the faults or errors and accuracy of proposed error location algorithm.

Index Term*— *Distance protection, flexible AC transmission system (FACTS), thyristor-controlled series compensator (TCSC), effect of error, fixed series compensation.

I. INTRODUCTION

In power system there are so many types of faults are always a concern to supply stable power without any interruption to the buyers. This part of transmission is key requirement for the power generation and supplying brands. So that finding precise fault location is very important for the brands and repair correct the fault in minimum time[1,2,5].A error finder is cast off for finding the error location in supplying line the operation of the details are divided in two partial parts first detail is works on regular frequency part and second detail is works on higher frequency part which works on supplying waves on supplying line[1,3].

Add on, the error location methods are classified on required data from supplying lines points. So there are main two divisions first is based on needed from the supplying line termination. In this detail error location is not accurate so that in other words the supply line repairing will take more time for maintenance. In second detail the synchronized and unsynchronized measured power examples are used at two ends. But this detail needs the link channels [1,2]. In power system the THYSRISTOR CONTROLLED SERIES COMPENSATOR is most needed part in facts breed. It is able for vary the line impedance and load current endlessly. A TCSC device is mainly consists of serial capacitor with inductor which identified by TCR[1].Nevertheless the installation of TCSC creates the new errors in the identification of the error in supplying lines and causes the transient conditions during errors[1-4]. The error identification in serial compensated line is always a problem in publications, so the mounted capacitor and their errors are not described in supplying line with TCSC [4].

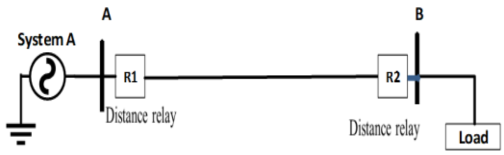
It has been noted that a fault identification for serial compensation supplying line with mounted capacitor and owns it for operation in small compensation quality when TCSC operates with angle of 170<beta<180. But for maximum compensation the error identification is not negligible. By focusing on the TCSC, for the turning on method there are four details are stop mode, divert mode, Vernier mode.[1,3-5,6]

So that detection of error for the safety of supplying line with TCSC is must necessary in frame to be sure the power system stability and safety too.

II. SYSTEM CONFIGURATION

Decryption of system configuration is consists of an generator at the sending end and at the end of the supplying line the load is connected in the figure one top diagram is shown the system without the serial compensation which is represented by an single line diagram [1-2-5].

1. Single line diagram of uncompensated system.



2. Single line diagram of TCSC compensated system

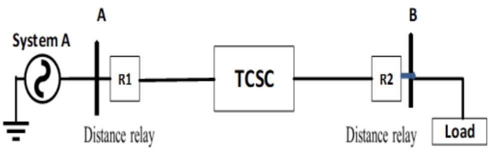


Fig.1. System configuration.

On the other hand the bottom diagram is consists of the TCSC in the system configuration where the TCSC is used to compromise the reactive power and to maintained the power at the receiving end side of the supplying power line. The whole system configuration is guarded with the distance relay for the safety of the system. And the distance relay are provides the tripping signals to the breaker [1-5].

III. DIFFERENT METHODS OF TURN ON TCSC.

This section describes different methods in detail. Different methods of turn on TCSC as follow [6].

- Diverted thyristor Mode.
- Stopped thyristor Mode.
- Vernier operating Mode.

A. Diverted thyristor Mode.

In power electronics switching devices are triggered continuously to make full conduction angle of 180 degree. The TCSC behaves like parallel connection of series capacitor with inductor. When gate pulse are applied to gate terminal of thyristor reaches to zero which Xl/Xc = 0.1-0.3 used for used for reduce the capacitor stress during the errors situations.

B. Stopped thyristor Mode

This is waiting mode because of firing pulses to thyristor values blocked. The TCSC performs like a fixed serial capacitor, generally dc off set voltage of capacitor are monitored in this operation mode of TCSC [6-7].

C. Vernier operating Mode

The TCSC dynamics are verified by continuously controlling the firing angle from 0-90 degree each of half cycle. The Vernier operating mode subdivided into two parts [5-7].

(1) Capacitive hike mode

Capacitor voltage and current are opposite polarity then thyristor are fired TCR current has opposite direction which cause loop current increases voltage across fixed capacitors [5-6].

(2) Inductive hike Mode

In the Inductive hike mode the passing current in the Thyristor controlled series compensator the thyristor division is maximum than the fringe current [5]. The peak voltage is in closely to the turn on the poor waveform and the high valve stress make the inductive boost mode less efficient for steady state operation [5].

IV. TCSC PARAMETERS CALCULATIONS

(1) Line inductance per kilometer = 1.044mH

= 1.044*400
= 417.6mH

(2) Total line inductance = 2*pi*f*L

= 131.126Ohm

(3) Line capacitance = 0.74*Xl

= 0.74*131.126
= 97.03324uF

(4) TCSC capacitance = 1/2*pi*f*c

= 32.80uF

(5) Total line reactance = 0.27*Xl

= 0.27*97.03324
= 26.19Ohm

(6) Total TCSC inductance = 26.19/2*pi*f

=83.36mH

V. PROPOSED ALGORITHM FOR ERROR LOCATION.

A. Error location determination

If error occurs in the first half of a power transmission line in between sending end and TCSC error circle seen from sending end does not include TCSC however if error is in the second half between TCSC and receiving end, the error circle seen from sending end includes TCSC. In each case a related sub-parts is used for indication of problem location[1,5-8,9]. the subroutine of error determination is as follows:

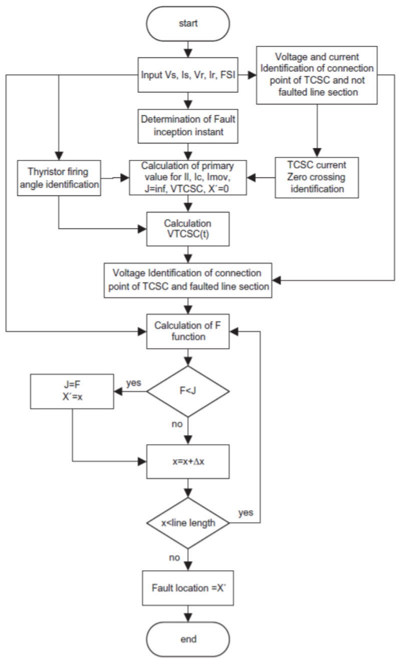


Fig.2. Proposed algorithm for error location [1].

B. Error before the TCSC

At before error condition TCSC current can be calculated by voltage and current measured in sending end and receiving end [11]. voltage of sending end of TCSC can be calculated by the voltage and current of sending end, and the voltage of receiving end by the power in receiving end. then the TCSC voltage can be determined [1].

C. Error after the TCSC

For the error indication place in this case, the strategy is same as in above exposition with some changes [1]. The voltage and current in sending end bus is calculated by sending end bus voltage and current using assign model of the power transmission supplying line. The voltage and current are in receiving end are calculated by control parameters are model of TCSC [1]. the voltage of the error node is calculated from receiving end. The optimized voltage and current samples and the calculated receiving end voltage and current[1-5].

VI. THE RELAY MODEL

The design of Mho relay model for problem location algorithm for Mho relay in serial compensated power transmission line is shown in figure 3[14].

The relay has (2) 3-phase input points, three phase voltage from the current voltage transformer and the 3line current from the current transformer (CT's), and provides single logical output, the logical output gives the trip identification signal to defend the backup system of serial compensated power supplying transmission line. The relay is compromised in three parts of fundamental blocks [14].

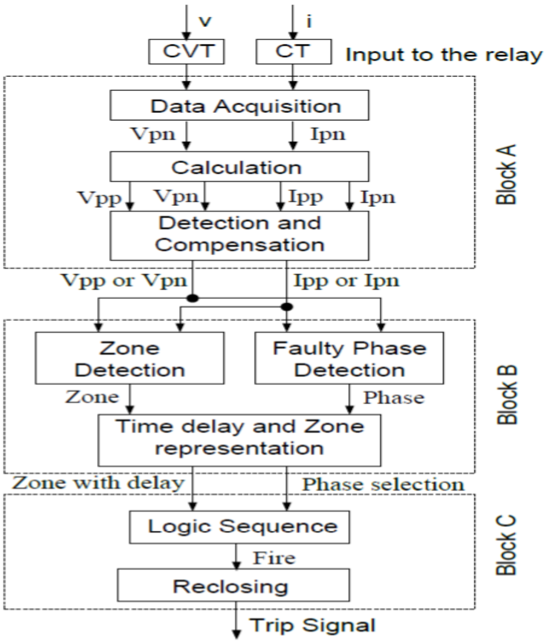


Fig.2. The Relay model[14].

Where,
Block A = Error detection and compensation Block
Block B = Zone detection Block
Block C = Logic Block.

VII. CONCLUSION

In this paper reviewed on the concept of TCSC is part of the power transmission line to over come the problems by using the TCSC. The study on reactance nature is considered for the examine the benefits of TCSC. The reliability of TCSC one each phase of power transmission line is improves the power transfer capabilities and allows the power flow at any rate. The relay performance was determined by and tripping time is less then one cycle. The immunity of relay model and its process at other error location, serial improvement of the compensation at the center of the line and back error conditions.

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