DOWNLOAD PDF PROTECTION OF TRANSMISSION LINES USING GPS SEMINAR REPORT

Chapter 1 : Smell Transmission PDF Seminar Report

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That is why a transmission line requires much more protective schemes than a transformer and an alternator. Protection of line should have some special features, such as- During fault, the only circuit breaker closest to the fault point should be tripped. If the circuit breaker closest to the faulty point, fails to trip, the circuit breaker just next to this breaker will trip as back up. The operating time of relay associated with protection of line should be as minimum as possible in order to prevent unnecessary tripping of circuit breakers associated with other healthy parts of power system. These above mentioned requirements cause protection of transmission line much different from protection of transformer and other equipment of power systems. The main three methods of transmission line protection are - Time graded over current protection. Time Graded Over Current Protection This may also be referred simply as over-current protection of electrical power transmission line. Protection of Radial Feeder In radial feeder, the power flows in one direction only, which is from source to load. This type of feeders can easily be protected by using either definite time relays or inverse time relays. Here total line is divided into different sections and each section is provided with definite time relay. The relay nearest to the end of the line has minimum time setting while time setting of other relays successively increased, towards the source. For example, suppose there is a source at point A, in the figure below At point D the circuit breaker CB-3 is installed with definite time of relay operation 0. Successively, at point C another circuit breaker CB-2 is installed with definite time of relay operation 1 sec. The next circuit breaker CB-1 is installed at point B which is nearest of the point A. At point B, the relay is set at time of operation 1. Now, assume a fault occurs at point F. Due to this fault, the faulty current flow through all the current transformers or CTs connected in the line. But as the time of operation of relay at point D is minimum the CB-3, associated with this relay will trip first to isolate the faulty zone from rest part of the line. In case due to any reason, CB-3 fails to trip, then next higher timed relay will operate to initiate the associated CB to trip. In this case, CB-2 will trip. If CB-2 also fails to trip, then next circuit breaker i. CB-1 will trip to isolate major portion of the line. The second major advantage is, during fault, only nearest CB towards the source from fault point will operate to isolate the specific position of the line. Disadvantage of Definite Time Line Protection If the number of sections in the line is quite large, the time setting of relay nearest to the source would be very long. So during any fault nearer to the source will take much time to be isolated. This may cause severe destructive effect on the system. Over Current Line Protection by Inverse Relay The drawback as we discussed just in definite time over current protection of transmission line, can easily be overcome by using inverse time relays. In inverse relay the time of operation is inversely proportional to fault current. In the above figure, overall time setting of relay at point D is minimum and successively this time setting is increased for the relays associated with the points towards the point A. In case of any fault at point F will obviously trip CB-3 at point D. In failure of opening CB-3, CB-2 will be operated as overall time setting is higher in that relay at point C. Although, the time setting of relay nearest to the source is maximum but still it will trip in shorter period, if major fault occurs near the source, as the time of operation of relay is inversely proportional to faulty current. Over Current Protection of Parallel Feeders For maintaining stability of the system it is required to feed a load from source by two or more than two feeders in parallel. If fault occurs in any of the feeders, only that faulty feeder should be isolated from the system in order to maintain continuity of supply from source to load. This requirement makes the protection of parallel feeders little bit more complex than simple non direction over current protection of line as in the case of radial feeders. The protection of parallel feeder requires to use directional relays and to grade the time setting of relay for selective tripping. There are two feeders connected in parallel from source to load. Both of the feeders have non-directional over current relay at source end. These relays should be inverse time relay. Also both of the feeders have directional relay or reverse power relay at their load end. The reverse power relays used here should be instantaneous type. That means these relays should be operated as soon as flow of power in the feeder is reversed. The normal direction of power is from source to load. Now, suppose a fault occurs at point F, say the fault current is If. This is clearly shown in figure below, where IA and IB are current of fault shared by feeder-1 and feeder-2 respectively. As the direction of flow of CB-P is reversed it will trip instantly. But CB-Q will not trip as flow of current power in this circuit breaker is not reversed. As soon as CB-P is tripped, the fault current IB stops flowing through feeder and hence there is no question of further operating of inverse time over current relay. IA still continues to flow even CB-P is tripped. In this way the faulty feeder is isolated from system. Differential Pilot Wire Protection This is simply a differential protection scheme applied to feeders. Several differential schemes are applied for protection of line but Mess Price Voltage balance system and Translay Scheme are most popularly used. In this scheme of line protection, identical CT is connected to each of the both ends of the line. The polarity of the CTs is same. The secondary of these current transformer and operating coil of two instantaneous relays are formed a closed loop as shown in the figure below. In the loop pilot wire is used to connect both CT secondary and both relay coil as shown. Now, from the figure it is quite clear that when the system is under normal condition, there would not be any current flowing through the loop as the secondary current of one CT will cancel out secondary current of other CT. Now, if any fault occurs in the portion of the line between these two CTs, the secondary current of one CT will no longer equal and opposite of secondary current of other CT. Hence there would be a resultant circulating current in the loop. Due to this circulating current, the coil of both relays will close the trip circuit of associate circuit breaker. Hence, the faulty line will be isolated from both ends.

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Chapter 2 : protection of transmission lines using gps seminar report

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Relay contains a fault detection system together with a communication unit. Relay determine the location of the fault. Aid in fast restoration of power. Communication systems can retrieve fault location information. Faults on the power transmission system cause transients that propagate along the transmission line as waves. Fault location can then be obtained by multiplying the wave velocity by the time difference in line ends. Unlike other fault location systems, the traveling wave fault locator is unaffected by load conditions. Precisely synchronized clocks are the key element in the implementation of this fault location technique. The required level of clock accuracy has only recently been available at reasonable cost with the introduction of the Global Positioning System. Radar equipment is typically mobile or located at substations and requires manual operation. Traveling wave fault locators are becoming popular where higher accuracy is important. GPS-based sub microsecond timing system has proven reliable in several utility traveling wave projects. Originally intended for military applications Allows precise determination of location, velocity, direction and time. GPS satellites circle the earth twice a day. Transmit signal information to earth. Accurate 3-D location require four satellites. Fault resulting produces travelling waves transients. The FL remote time tag the transient arrival times. Travelling time of the transient signal from the point of fault to the adjacent substation is used to determine the fault position. Proposed technique is able to offer a high accuracy in fault location. Unlike traditional protection schemes , this technique offers a new concept in network protection. On Power delivery, vol15 no 4 oct http:

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This is a new technique for the protection of transmission systems by using the global positioning system (GPS) and fault generated transients. In this scheme the relay contains a fault transient detection system together with a communication unit, which is connected to the power line through the high voltage coupling capacitors of the CVT.

This is a new technique for the protection of transmission systems by using the global positioning system GPS and fault generated transients. In this scheme the relay contains a fault transient detection system together with a communication unit, which is connected to the power line through the high voltage coupling capacitors of the CVT. Relays are installed at each bus bar in a transmission network. These detect the fault generated high frequency voltage transient signals and record the time instant corresponding to when the initial traveling wave generated by the fault arrives at the busbar. The decision to trip is based on the components as they propagate through the system. The communication unit is used to transmit and receive coded digital signals of the local information to and from the associated relays in the system. At each substation , the relay determine the location of the fault by comparing the GPS time stay measured locally with those received from the adjacent substations, extensive simulation studies presented here demonstrate feasibility of the scheme. The majority of protection principles where developed with in the first three decades of century. In particular , the response speed of the relay cannot meet the reqirements when very high speed fault clearance is required. With the continuous development of modern technology, protection relays have advanced with the development of electromechanical, semiconductor, integrated circuits and microprocessor technologies. Al tough decades of research have been put in to the continued development and perfection of the relay technology , many of the basic relaying principles of protection have not been changed and are still playing a dominant role today. Modern development for power system network , the demand for fast fault clearance to improve system stability and the need for alternative protection principles have resulted in the search for methods to increase the speed of relay response. However many distinct advantages of the conventional protection techniques where not retained for eg. Inherent back up protection. In recent years, there is a growing interest in the use of fault generated transients for protection purposes and extensive research work has been conducted to develop new relaying principles and techniques based on there detection.. Among these the positional protection offers attractive solutions for power line protection. This technique is based on the detection of fault generated high frequency transient signals and determine the actual portion of the fault on the line by measuring the traveling time of the high frequency transient voltage or current signals along the line. With this approach not only the close in faults can be detected , but also the problem of low fault inception angle , voltage zero faults is effectively overcome since the faults arc signals vary little with the inception angle. The positional protection uses its associated GPS scheme to determine the instant when it detects the fault generated high frequency transient signals and uses the power line communication system to communicate this information to the relays at the other substations. By comparing the arrival time of the transient at different points in the network , relay is able to identify where the fault is on the system and pin point its location. Electro magnetic transient program EMPT software has been used to simulate a model EHV transmission system in order to examine the response of the protection scheme to a variety of different system and fault condition. Results demonstrate that the proposed technique offer a very fast relay response and high accuracy in fault location. It has also been shown that the scheme is immune to power frequency phenomena which can effect established types of relaying. In conventional protection scheme , the high frequency signals are considered to be noise and filtered out and as a result, considerable research has been spent on the designing of the filters , protection schemes based on detection of fault generated transient, such as the ultra high speed protection schemes are generally limited by the band width of transducers used. It is accepted however that the fault generated high frequency transient components contain a wealth of information about the fault type, location , its directions and duration. The transient based protection technique operate by extracting the fault generated high frequency signals through specially designed detection devices and their associated algorithms. The high frequency current signal are directly extracted from the CT out puts. Following initial analogue filtering, fast signal processing algorithms are then applied to the measured signals for fault identification. The theoretical aspects of the characteristics of the propagation of high frequency signals on transmission lines have been well documented. In time, these signals reach discontinuities on the transmission line and some of the signals is reflected back towards the fault point. The characteristics of these waves are dependent on several factors including , the fault position on the line , fault path resistance and the characteristics impedance of the power conductors. Here relays are located at all of the substations in the power system and independently monitor the power system. The frequency range of interest for monitoring these fault generated high frequency signals is between KHz and the signal processing is designed as to determine the arrival of a high frequency transient characteristics of those generated by a fault. This extracts are high frequency signals associated with the fault generated current transients. A simplified block diagram of the detector arrangement is shown in the figure. Particular emphasis has been placed on the development of digital circuit. The detector is designed to interrogate signals in the range of frequencies from KHz. The signal mixing circuit receive the signal from the 3 phase CTs and continue these to form mode2 and mode3 signals. There are filters to remove any spurious noise. The outputs of the analog circuit are then passed to the digital circuit. The digital processing includes filters sequence recording, amplitude comparison, counters and decision logic. These signals propagate away from the fault point in both directions along the transmission system with velocity close to the speed of light. It has been long recognized that the actual faulted position could be determined on line if the transient signals could time tagged at key points on the power system network. The global positioning system , with its ability to provide synchronization with an accuracy of microsecond over the wide area, provides an ideal tool for performing this time tagging of the receipt of fault generated transients. Relays are installed at the bus bars P,Q,R and S and are responsible for the protection of the network. In time they will reach the monitored bus bar and be detected by the relays connected to them. The relays then code this time information with details of their identification.. All relays are continuously ready to receive the coded massages send by other devices. Data protocols are used to avoid conflict between information sent by different devices along the same line. The actual location where the fault occurs can be clearly identified at each relay location by this method. The communication unit, containing a transmitter and a receiver circuits , also uses the CVTs together with a hybrid unit to separate the transmitted and received transmitted signal. The transient detector is responsible for detecting the fault generated fast transient signals and recording the time tag obtained from the GPS clock. The transmitter circuit sends this time tag corresponding to the instant when the transient is captured, to the receivers of the other relays installed involved in the network scheme. Previous research has investigated the use of digital filters to detect the high frequency signals generated by the fault and had shown that the accuracy of fault location was a function of the sampling rate used to digitalize the measured signal. Ie an analog system and a pass band filter tuned to operate between 40 and 80 KHz. The protection technique is therefore divorced from the power system frequency. The communication link used in the scheme modeled and shown in fig. Used power line carrier techniques. Although this has several advantages , other communication system could be used, such as pilot wire , optical fibre or microwave. The decision to trip the local breaker depends on the comparison between the times measured by the GPS system at that location and those measured by other relays. Unlike the convectional protection scheme , where each relay associates with one circuit breaker on that line section, the proposed relaying scheme will be responsible for protection of several lines connected to the bus bar where it is installed. For eg as shown in fig the relay at bus bar R responsible for the protection of both line section , connected to the busbar, by controlling both circuit breakers CB-RP and CB-RQ. Therefore the technique offers a network protection scheme rather than than one which concentrates on specific units of plant. This provides several technical advantages over conventional relaying. EMTP is a general purpose computer program for simulating high speed transient effects in electric power systems. The EMTP program features an extremely wide variety of modeling capabilities encompassing electro magnetic and electro mechanical oscillations ranging in duration from micro seconds. Its main application include switching and lightning surge analysis, insulation co-ordinations, shaft torsional oscillations ferro resonance and HVDC converter control and operations. The EMTP simulation studies include 1. Additional simulations used to develop recommended procedure for line and transformer energization. Comparison of several recorded waveforms with the result of EMTP simulation of same events. The line lengths , source capacities and fault position studies are shown 9in fig. Fig 3 a shows the primary system voltage at the bus bars experienced during a earth fault at the point F1 in the fig. It is evident that the high frequency components are produced at the faulted and unfaulted phases. Fig 3 b shows the corresponding transient voltage signals captured by the relays at P,Q and R. Upon detecting the arrival of the transient signal , each relay time tag the signal and details of the time are send to other relay locations. The time taken for the communication will depend on the communication system used. Determining which is the faulted section is reduced to a comparison of time tags recorded when the fault transients where detected at the relaying points through out the network. From the response shown in fig indicates that the fault occurs on the line section PQ. Since this a TEED feeder , the trip decision will be made up by the relays at locations P,Q and R respectively and subsequently these relays trip their associated circuit breakers, as shown in fig 5 b. The distance we to the fault is calculated at both terminals line section between bus bar P and Q. The tripping signals shown assume a high speed communication system. In this case , the time difference between Tp and Tq , Tp and Tr correspond to the wave travel time from P to Q and P to R respectively, and therefore the fault is onside the area considered in the study. The relay located on the bus bar P will respond in a similar manner. Again although the magnitude of the signal s captured are relatively lower due to increase in fault path resistance , the result clearly shows that the scheme is still able to operate. Switching operations at any substation will also generate high frequency transients, which will be detected by the relays. However the time difference between the time tags will correspond to the transient time along the feeders and the protection will diagnose that the disturbance is not on the protected feeders. The GPS clock has an accuracy of 1 microseconds roughly corresponds to an accuracy in fault location of meters. This assumes that the transients travel at the speed of light in vacuum, where as their speed will be less along the power conductors. Error in the time tagging to introduce an uncertainity for faults occurring close to a bus bar. In the complete scheme , the direction a fault as determined at a bus bar also be transmitted to the adjacent relays using the communication link. The traveling time of the transient high frequency signal from the point of fault to the adjacent substation is used to determine the fault positions. Simulations studies have been carried out the operation of the system when applied to an EHV transmission network containing both plain and TEED feeders. Results show that the proposed scheme is able to identify the faulted section of a transmission network and issue the trip command to the circuit breaker associated with the faulted section. The protection is inherently high speed but is dictated by the data communication system used. Studies show that the proposed technique is able to offer a high accuracy in fault location. Since the accuracy of fault location is proportional to digital sampling was chosen, ie an analog fault detector. Unlike traditional protection schemes , this technique offers a new concept in network protection. The protection inherently monitors the network to which it is connected and is not limited to individual units of plant. T Dai and M A redfern Positional technique for power transmission lines in IPEC 99 proceedings of the international power engg conference o Protective relays application guide:

Chapter 4 : protection of transmission lines using gps ppt

protection of transmission systems by using the global positioning system ppt, positioning, protection of transmission lines using gps, protection of transmission systems, CHAPTER 1 ABSTRACT This is a new technique for the protection of transmission systems by using the global positioning system (GPS) and fault generated transients.

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Chapter 5 : Protection of Lines or Feeder

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Chapter 7 : protection of transmission line by using GPS

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Chapter 8 : A SEMINAR REPORT ON EDDY CURRENT BRAKES

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Chapter 9 : SOLAR TREE SEMINAR REPORT

Protection Of Transmission Lines Using Gps Full Report & Paper Presentation A century has passed since the application of the first electro chemical over current relays in power system protection. The majority of protection principles where developed with in the first three decades of century.a rough guide to there development.