BIBLIOGRAPHY OF RELAY LITERATURE, 1992
IEEE COMMITTEE REPORT

Members of the Bibliography and Publicity Working Group of the IEEE Power System Relaying Committee are:
M.S. Sachdev, Chairman, A.G. Folkman, M. Kezunovic, R. Ramaswami, T.S. Sidhu, J.E. Stephens, M.J. Swanson and P.B. Winston

ABSTRACT

The latest of a series of classified lists of power system relaying references, begun in 1927, is presented. This bibliography is in continuation to the bibliographies of relay literature which were published previously and are contained in the following volumes of the IEEE Transactions:

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The entries in each section are listed in alphabetical order by the name of the first author. Each title is listed in only one section even if it covers material that belongs to several sections. A list of the periodicals which have been cited and the addresses of their publishers follows the bibliography.

The abstracts of many articles reported in this paper are available in the Science Abstracts - Section B, the Engineering Index, and other digesting and/or indexing periodicals.

ADDITIONAL REFERENCES

Electrical & Electronics Abstracts, are published monthly by the Institution of Electrical Engineers (U.K.) and the Institute of Electrical and Electronics Engineers, Inc. (USA). Papers and journals published in several countries are covered.

In addition to the papers published in Journals and Conference Proceedings, two books on the subject of power system relaying have come to the attention of the Working Group. A brief description of their contents is included here.

Protective Relaying for Power Systems II, Editor - S.H. Horowitz, IEEE, 560 pp. This book is in continuation to Volume I published in 1980. It is a collection of selected papers prepared by IEEE Committees and individuals which have been published in the IEEE Transactions during the last fifteen years. The subjects covered include fundamental considerations, input sources, digital relays, monitoring and, protection of transmission lines, substation equipment and rotating machines.

transformers, protection of transmission lines, transformers, reactors, capacitors, station bus and rotating machinery. Philosophy underlying the selection of relaying systems is presented and relaying practices in U.S.A., Europe and Asia are compared.

3150 RELAYING ALGORITHMS


Frequency-Domain Characterization of Kalman Filters as Applied to Power System Protection, G. Bennouyal, IEEE Trans. on Power Delivery, Vol. 7, No. 3, 1992, p. 1129-38. This paper shows that conventional tools such as frequency response and time response to a unit sine wave step function can be successfully applied for performance analysis. The influence of noise is considered.


A New Kalman Filter Approach to Digital Relaying, J.L. Pinto de Sa, IEEE Trans. on Power Delivery, Vol. 7, No. 3, 1992, p 1652-60. This paper shows how to include the analog pre-filters' transients in the Kalman Filter state space. The coloring effect that the pre-filters and the network itself have upon the noise can also be handled by slightly augmenting the Kalman Filter system model.


Detection of High Impedance Arcing Faults Using an Artificial Neural Network, G.W. Swift, A.F. Sultan and D.J. Fedirchuk, 19th Annual Western Protective Relay Conference, Oct 20-22, 1992. This paper discusses the development of an algorithm which identifies high impedance faults. Results of various tests are also presented.


3151 DISTRIBUTION AND NETWORK PROTECTION


3151.1 Industrial and Power Station Auxiliaries

Polyethylene Current Limiters for Short-Circuit Protection, T. Hansson, ABB Review, 1992, pp. 35-3. This paper describes a new current limiter developed using doped polymers which when connected in series with a circuit breaker offers cost-effective short-circuit protection in industrial applications. Current limiters employing this technology respond to fault currents in 0.1 to 1.0 ms.

3151.2 Primary Distribution Systems

Integration of Digital Protection, Control and Monitoring in Distribution Substations, J.B. Bunch, D.P. Das, S.C. Paul and G.W. Cunningham, 45th Annual Texas A&M Protective Relay Conference, Apr 13-15, 1992. The inclusion of protection, control and monitoring functions into an integrated system approach can provide significant economic and operational benefits. This paper discusses some of these issues as they relate to the future utility direction.

Serving Non-Typical Distribution Loads at Nashville Electric Service, R.M. Hale and L.E. Leech, 46th Annual Georgia Tech Protective Relaying Conference, Apr 29-May 1, 1992. A small number of customers, because of the size of their load, or more often because of other characteristics of the load, require closer attention and special arrangements for service. This paper discusses how one utility has dealt with this situation.


Application of New Microprocessor Distribution Protection and Monitoring Devices, B.W. Jackson, 46th Annual Georgia Tech Protective Relaying Conference, Apr 29-May 1, 1992. This paper
reviews the improvements in protection that a utility has implemented and describes the functions that are available on the new microprocessor equipment.

Overcurrent Relay Coordination Margins. J.J. Kilic, S.E. Hicks and R.T. Casey, 46th Annual Georgia Tech Protective Relaying Conference, Apr 29-May 1, 1992. This paper is an investigation into the question, "How much coordination margin is necessary between a bus tie relay and a feeder relay in a distribution substation?"


An Adaptive Relaying Approach to Distribution System Protection. M.S. Sachdev, B. Chattopadhyay and T.S. Sidhu, 19th Annual Western Protective Relay Conference, Oct 20-22, 1992. This paper outlines the design features of an adaptive relaying system for a distribution network, including a description of the software and hardware. The implemented scheme is briefly outlined. The paper examines the consequences of communication failure between the relays and the station computers.

Microcomputer Based Adaptive Relaying for a Distribution System - A Case Study. M.S. Sachdev, B. Chattopadhyay and T.S. Sidhu, Trans. CEA &O Div., Vol. 31, 1992, Paper No. 92-SP-176. The paper presents the design of an adaptive relaying scheme for the "City of Saskatoon" distribution system. The software developed for the application is described. The implementation of the scheme and some system studies are presented.


Detection of High Impedance Arcing Faults Using Multi-Layer Perceptron. A.F. Sultan, G.S. Swift and D.J. Fedirchuk, IEEE Trans. on Power Delivery, Vol. 7, No. 4, 1992, p 1871-7. An artificial neural network was trained by high impedance fault, fault-like load, and normal load patterns. Neural network parameters were embodied in a high impedance arcing fault detection algorithm. The algorithm was tested by normal load currents disturbed by currents of faults on dry and wet soil, an arc welder, computers, and fluorescent lights.

Improvements in Distribution Feeder Protective Relaying. R.P. Taylor, A.T. Giuliani and J. Gosalia, 19th Annual Western Protective Relay Conference, Oct 20-22, 1992. This paper describes some features of a new line of microprocessor-based overcurrent relays which have built-in communication ports to allow remote access. Also discussed are some of the barriers that must be overcome to take full advantage of this technology and use it effectively.


3152 TRANSMISSION LINE PROTECTION

Theoretical Concept and Digital Simulation of the Pramod Scheme for UHV Protection of EHV Transmission Lines. P. Agrawal, IEEE Trans. on Power Delivery, Vol. 7, No. 3, 1992, p 1104-11. This paper describes the theoretical concept of the Pramod scheme. The principle is based on detection of fault induced high frequency signals in the kilo Hertz range. A technique for digital simulation of the transmission line and detecting circuit is explained.

A Digital Protection Technique for Parallel Transmission Lines Using a Single Relay at Each End. M.I. Gilary, O.P. Malik and G.S. Hope, IEEE Trans. on Power Delivery, Vol. 7, No. 1, 1992, p 118-25. The described scheme uses the average current of corresponding phases in a single relay at each end of the two lines. Operating time is about 5 ms. The stability of the relay under different operating conditions is also examined.

Microprocessor Based Three Step Quadrilateral Distance Relay for the Protection of EHV/UHV Transmission Lines. G. Gongadharan and P. Anbalagan, IEEE Trans. on Power Delivery, Vol. 7, No. 1, 1992, p 91-7. The described relay uses the Fourier transform method to extract fundamental components of current and voltage. Any quadrilateral characteristic may be obtained. A maximum operating time of 15 ms is exhibited for zone 1 operation.


3152.1 Distance and Ground Relaying

Ground Distance Relaying: Problems and Principles. G.E. Alexander and J.G. Andrichak, 19th Annual Western Protective Relay Conference, Oct 20-22, 1992. Discussed in this paper are the operating principles of ground distance functions and some of the limitations or problems that can be encountered in their application. This paper discusses distance functions of the "phase angle comparator" design.

Evaluating and Replacing Back-up Line Distance Relays. J.M. Carrasco, Transmission and Distribution, Vol. 44, No. 2, 1992, p 26-33. This paper describes the evaluation that the City of Riverside Public Utilities Department underwent to replace outdated electro-magnetic distance relays with new microprocessor based relays.

Auto-Loop Management System Allows Certain Functions to be Remotely Controlled. L. Criso, Transmission and Distribution, Vol. 44, No. 12, 1992, p 38-44. Relays and controls provide automatic sectionalizing of distribution circuits to promote improved service reliability.

Applying Pattern Recognition in Distance Relaying Part 1: Concepts. S.K. Chakravarthy, C.V. Nayar and N.R. Achuhans, IEEE Proceedings-C, Vol. 139, No. 4, 1992, p 301-5. Limitations of the existing operating characteristics of distance relays are discussed. The paper then introduces the concept of obtaining the operating
characteristics of distance relays by applying the method of pattern recognition.

Applying Pattern Recognition in Distance Relaying Part 2: Feasibility. S.K. Chakravarthy, C.V. Nayar and N.R. Achuthan, IEEE Proceedings-C, Vol. 139, No. 4, 1992, p 306-14. This part of the paper reports results of testing the concept of applying pattern recognition to distance relays. The performance of the discriminant function in selecting an operating characteristic for a distance relay is evaluated for zone-1 operation. Generation of learning sets to establish the operating characteristic of distance relays is also discussed.

Zero Sequence Mutual Effects on Ground Distance Relays and Fault Locators. W.A. Elmore, 45th Annual Texas A&M Protective Relay Conference, Apr 13-15, 1992. Zero sequence mutual effects have been a source of concern for many years and extensive studies have been conducted. This paper describes the phenomenon in basic terms and provides some assistance in evaluating the severity of its influence.


Performance of Adaptive Distance Protection Under High Resistance Earth Faults. P.J. Moore and A.T. Johns, CIGRE, Paris, Aug 30-Sep 5, 1992, Paper No. 34-203. The paper reviews the problem of incorrect distance relay operation during high resistance earth faults. Three methods of adapting digital distance relays to achieve better performance during high resistance earth faults are examined. One of the methods is shown to provide a significant improvement.

Reliable Directional Relay Based on Compensated Voltage Comparison for EHV Transmission Lines. Y.Q. Xia, J.L. He and K.K. Li, IEEE Trans. on Power Delivery, Vol. 7, No. 4, 1992, p 1853-60. Charge Comparison is a completely digital relaying/communications system, suitable for analog voice band channels as well as wide-band digital or fiber-optics. In addition to charge comparison data, numerous auxiliary messages are sent. To accommodate all this information in a 7200 bps bit-stream, a unique message structure was devised.

NSD70 - A New Family of Programmable, Digital Protection Signalling Equipment. H. Spiess, ABB Review, 1992, p 3-10. This paper presents a new family of digital teleprotection equipment named NSD 750. It is programmable and has the versatility needed for transmitting protection signal over digital as well as analog channels.


Design of a Dependable Microprocessor-Based Relay for Transmission Line Protection. M.S. Sachdev and T. Adu, Trans. CEA E&O Div., Vol. 31, 1992, Paper No. 92-SP-159. The paper describes the design of a dependable microprocessor-based transmission line relay which incorporates three digital algorithms operating in parallel. The results presented in the paper show the suitability of the proposed relay design.

3152.3 Relay Systems

Protection Requirements for Flexible AC Transmission Systems. M. Adamiaik and R. Patterson, CIGRE, Paris, Aug 30-Sep 5, 1992, Paper No. 34-206. The paper presents the protection requirements and proposed protection approaches for a power system where Flexible AC Transmission Systems (FACTS) are implemented. The adaptive techniques, response times and control interfaces of a typical FACTS protection system are discussed. Testing and evaluation of the FACTS protection systems is reviewed.

Power System Protection in HVDC Environments. F. Andersson and L. Juhl, ABB Review, 1992, p 27-32. This paper explores the problems that may arise in ac line protection when large HVDC systems are connected to relatively weaker ac systems and provides some solutions to these problems.

Protecting NYSEG's Six-Phase Transmission Line. A. Apostolov and W. George, IEEE Computer Applications in Power, Vol. 5, No. 4, 1992, p 33-6. The paper discusses the protection requirements of the NYSEG's six-phase transmission line. The protection system chosen includes current differential, directional comparison and distance protection. Test setup to determine the suitability of the chosen protection system is described in the paper.

Current Differential and Phase Comparison Relaying Schemes. J.F. Calero and W.A. Elmore, 46th Annual Georgia Tech Protective Relaying Conference, Apr 29-May 1, 1992. This paper clarifies the
difference between current differential and phase comparison relaying schemes, and points out advantages and disadvantages of these schemes as contrasted with distance schemes. Also discussed are the significant influences that power system parameters have upon their satisfactory operation.


Relaying at the Speed of Light: Pilot Relaying on Optical Channels, J.D. Huddleston III, 46th Annual Georgia Tech Protective Relaying Conference, Apr 29-May 1, 1992. This paper relates one utility's experience with various pilot relaying systems that use fiber optic channels.

Protection Considerations for Pull Splice 500 KV Substation, J.W. Mower, 46th Annual Georgia Tech Protective Relaying Conference, Apr 29-May 1, 1992. Technical advancements in switchgear and relaying have increased opportunities for new protective relay applications. This paper describes how one utility took advantage of these advancements while designing the relaying for a new 500/230-KV GIS substation.


Thailand's First two 500-kV Substations Successfully Commissioned, W. Rochanaphiphatkom, B. Frentzen and H. Kaiser, ABB Review, 1992, p 3-10. This paper describes the switchgear and protection equipment designed and commissioned at the first two 500-kv substations in Thailand. Redundant pilot schemes, one employing microwave and the other with fiber are described.

Distance Relay Element Design, E.O. Schweitzer III and J. Roberta, 19th Annual Western Protective Relay Conference, Oct 20-22, 1992. This paper presents the design of a basic distance and directional element. Emphasis is placed on relating the new digital and numerical methods to the established electromechanical and static-analog methods of designing relay elements.


3153 RELAY INPUT SOURCES

Relay Potential Grounding Problems on Texas Utilities Electric System, D.F. Faulk, 45th Annual Texas A&M Protective Relay Conference, Apr 13-15, 1992. This paper discusses two separate cases that occurred when two or more grounds existed on a PT or CCVT secondary circuit for relaying. The improper operations resulting from this arrangement are also discussed.


Calculation of the Transient Performance of Protective Current Transformers Including Core Hysteresis, D. O'Kelly, IEE Proceedings-C, Vol. 139, No. 5, 1992, p 455-60. A digital simulation technique, which represents both hysteresis and eddy current action in the core steel, is used to compute current wave shapes and flux excursions for a wide range of fault current parameters. The paper also examines the production of residual core flux and its effect on secondary-current output.
Improper Grounding Effects on Cross-Polarized and Self-Polarized Relays. M.B. Saacke, 45th Annual Texas A&M Protective Relay Conference, Apr 13-15, 1992. This paper discusses the impact that grounding practices have on the ability of a relay to properly determine the fault location. Several examples are presented for phase to ground faults on cross-polarized and self-polarized relays.

Filtering for Protective Relays. E.O. Schweitzer III and D. Hou, 19th Annual Western Protective Relay Conference, Oct 20-22, 1992. This paper identifies filtering requirements or criteria for different relays. Discussion is limited to the applications requiring precise measurements of system-frequency component of the signal, such as distance relays.


Current Transformer Concepts. S.E. Zocholl, 46th Annual Georgia Tech Protective Relaying Conference, Apr 29-May 1, 1992. This paper reviews the accuracy ratings of C and K bushing type cts and their implications in relay application. A computer simulation is also introduced and used to analyze specific ct applications in transformer and generator differential relays.

3154 ROTATING MACHINERY PROTECTION


Focus on Motor Controllers. B. Brickhouse and W. Hoffman, Electric Light and Power, Vol. 70, No. 2, 1992, p 23-5. Microprocessor based relays provide standard motor protection with the added advantage of fine-tuning for each particular motor or application.

3155 OTHER PROTECTION


3155.1 Transformer and Reactor Protection

Advances in the Design of Differential Protection for Power Transformers. A.T. Giulianite and G.K. Clough, 45th Annual Texas A&M Protective Relay Conference, Apr 13-15, 1992. Discussed in this paper are the basic concepts of transformer differential protection including some of the potential drawbacks of using harmonic restraint. Modern electronics allows techniques to be used to overcome some of these problems and a relay designed with this in mind is presented.

Protection of the East Garden City 345KV Phase Angle Regulating Transformers. M.A. Ibrahim and F. Stacom, 46th Annual Georgia Tech Protective Relaying Conference, Apr 29-May 1, 1992. This paper discusses the various aspects of protection and control of a 345KV phase angle regulating transformer.

Improved Operation of Differential Protection of Power Transformers for Internal Faults. P. Liu, D. Chen, Y. Guo, O.P. Malik and G.S. Hope, IEEE Trans. on Power Delivery, Vol. 7, No. 4, 1992, p 1912-9. This paper studies the possibility of the 2nd harmonic restraint relays not operating for faults in transformers. The operation of three algorithms are analyzed for a large number of faults and magnetizing inrush. Modified schemes to improve operation are presented.


Design, Implementation, and Testing of a Microprocessor-Based High Speed Relay for Detecting Transformer Winding Faults. T.S. Sidhu, M.S. Sachdev, H.C. Wood and M. Nagpal, IEEE Trans. on Power Delivery, Vol. 7, No. 1, 1992, p 108-17. Instead of relying on the presence of harmonics to identify magnetizing inrush, the described relay uses a non-linear model of the transformer to determine the state of its health. The winding resistance and reactance plus turns ratio are required input data.

On-line Identification of Magnetizing Inrush and Internal Faults in Three Phase Transformers. T.S. Sidhu and M.S. Sachdev, IEEE Trans. on Power Delivery, Vol. 7, No. 4, 1992, p 1885-91. In this paper we use a digital algorithm that does not rely on the presence of harmonic components in the difference current to identify magnetizing inrush. It uses a transformer model whose outputs are identical to the transformer during normal operation and magnetizing inrush but not during a fault.

3155.2 Capacitor Bank and Static Var Protection

Effect of Geomagnetically-Induced Currents on Static Var Compensator Protection Systems. H. Bilodeau, S.R. Chano and J.P. Chayer, Trans. CEA E&O Div., Vol. 31, 1992, Paper No. 92-SP-178. The paper describes the effect of harmonically distorted waveforms on static var compensator (SVC) protective relays. Test results obtained from a simulator study and showing the behavior of protective relays are given. Potential protection problems due to geomagnetically induced currents are identified.

Capacitor Control Using a Programmable Controller. G.D. Brophy, Jr., 46th Annual Georgia Tech Protective Relaying Conference, Apr 29-May 1, 1992. This paper presents one utility's experience with using programmable controllers to provide the control function.
for transmission capacitor banks.

Protection and Control of MOV Protected Series Capacitor Banks, F.P. Plumptre, Trans. CEA E&O Div., Vol. 31, 1992, Paper No. 92-SP-146. The application of protection and control equipment to MOV protected capacitor banks is discussed. A brief review of the B.C. Hydro’s experience in planning and operating nine series capacitor banks on their system is also included in the paper.

3155.3 Other Protection

Grounding Transformer Applications and Associated Protection Schemes, E.R. Detjen and K.R. Shah, IEEE Trans. on Industry Applications, Vol. 28, No. 4, 1992, p 788-96. The paper reviews the state of the art of grounding transformers and then discusses two case studies illustrating improperly applied grounding transformers and/or associated ground-fault protection schemes. The paper stresses that a single grounding transformer is not adequate for use with a multibus configuration. A protection scheme for use on a multibus arrangement is also presented.

Microcomputer Based Expert System for Control, Protection and Management of 500 kV AC Air Blast Circuit Breakers, J. Estergalyos, J.H. Burke, E.O. Schwetzer and L.S. Anderson, CIGRE, Paris, Aug 30-Sep 5, 1992, Paper No. 34-207. The paper describes the operation and logic design of a microcomputer based expert system for control, protection and management of 500 kV air blast circuit breakers. The software logic of the expert system can be modified to protect any type of circuit breaker.


Realization of End User Controllable Protection Schemes within a Coordinated Substation Control System, K. Sridharan, Trans. CEA E&O Div., Vol. 31, 1992, Paper No. 92-SP-175. The paper describes the hardware and software necessary for realization and implementation of protection schemes which are designed and controlled by protection engineer.


3156 FAULT AND SYSTEM CALCULATIONS

Seen Impedance by Impedance Type Relays During Sequential Disturbances, M.M. Elkhat, IEEE Trans. on Power Delivery, Vol. 7, No. 4, 1992, p 1946-54. The trajectory of impedance seen by impedance relays during sequential disturbances is investigated. The case of simultaneous faults is also studied. The analysis is in the phase coordinate frame of reference which provides machine time variant parameters producing a time variant E.M.F.


Fault Location Techniques for Radial and Loop Transmission Systems Using Digital Fault Recorded Data, A.A. Girgis and C.M. Fallon, IEEE Trans. on Power Delivery, Vol. 7, No. 4, 1992, p 1936-45. This paper shows the conversion of the data to data files and techniques developed to determine fault location. Leads and their effect are discussed. A test case is presented for a loop system; use is made of three phase current & voltage phasors rather than sequence components.


Development of Advanced Transmission Line Fault Location System, Part 2: Algorithm Development and Simulation. D.J. Lawrence, L.Z. Cabeza and L.T. Hochberg, IEEE Trans. on Power Delivery, Vol. 7, No. 4, 1992, p 1972-83. This paper describes the solution techniques, system modeling considerations, and simulation studies performed in developing the fault location system. The impact of various system models, hardware features, and system conditions on fault location accuracy was investigated.


A New Approach for Fault Location Problem on Power Lines. A.M. Ranjbar, A.R. Shiram and A.F. Fathi, IEEE Trans. on Power Delivery, Vol. 7, No. 1, 1992, p 146-51. This paper suggests a new technique based on the distributed model of transmission lines to overcome the problems of other approaches. This method considers the effect of capacitance explicitly and enables greater accuracy.


3157 MAINTENANCE, TESTING, ANALYSIS AND MODELING

Power Simulation: A High Power Amplifier Approach. M.G. Adamiak, G.E. Alexander and J.G. Andrichak, 46th Annual Georgia Tech Protective Relaying Conference, Apr 29-May 1, 1992. New high power amplifier technology provides more versatility and dynamic range to cover the diversity of relay test environments. This paper discusses a model power system that uses this technology and presents some examples of simulations performed.


A Knowledge-Based System for Automatic Evaluation of Disturbance Recordings. L. Cedarblad and P.O. Gjerde, CIGRE, Paris, Aug 30-Sep 5, 1992, Paper No. 34-204. The paper describes a system for the automatic evaluation of disturbance recordings. The system consists of decentralized knowledge-based systems in substations and a central system for a disturbance data base. The report from the analysis consists of fault type, fault current and relay operating time etc.

Modelling Overcurrent Relay Characteristics. S. Chan and R. Maurer, IEEE Computer Applications in Power, Vol. 5, No. 1, 1992, p 41-5. The paper reviews the existing methods of modelling overcurrent relay characteristics and describes a new way of creating and editing time-current characteristics. Computer implementation of the proposed method is also given.


and circuit design to reduce the need for routine maintenance and also to provide for efficient and safe testing. Methods and means for protective equipment design which caters for lifetime management are discussed.

Effect of Voltage Harmonics on the Operation of Solid-State Relays in Industrial Applications. A.A. Gligis, J.W. Nims, J. Jacomino and A. Bishop, IEEE Trans. on Industry Applications, Vol. 28, No. 5, 1992, p 1166-73. The paper presents the results of a study on the effects of voltage and current harmonics on the operation of four types of solid-state relays used in control schemes of many industrial applications. Conclusions and recommendations to reduce the impact of harmonic distortion on these types of relays are reported.


Protective Relaying Performance Reporting, IEEE Committee Report, IEEE Trans. on Power Delivery, Vol. 7, No. 4, 1992, p 1892-9. The paper introduces a computer data base program to organize the relay failure data gathering process, allowing consistent and clearly defined categorization of the data so that interpretation or statistical analysis is easily derived. Potential uses of the data are discussed.


Detailed Analysis of the Performance of Protective Devices in View of a More Effective Protection System. P. Lienart and F. Wellems, CIGRE, Paris, Aug 30-Sep 5, 1992, Paper No. 34-101. The paper describes the philosophy and methods used to obtain a high performance protective system for the Belgian high voltage network. The philosophy involves examining the performance of protective devices in the network and in the laboratory during approval tests.


Performance of Distance Relay MHO Elements on MOV-Protected Series-Compensated Transmission Lines. R.J. Martella, IEEE Trans. on Power Delivery, Vol. 7, No. 3, 1992, p 1167-78. Both the MOV and the air gap, when conducting, change the line impedance as seen by the distance relays. This paper discusses the findings of a study on the effect to direct under-reach/permissive overreach protection schemes with 65% line impedance compensation.


Differential Relay Transient Testing Program Using EMTP Simulations. G.D. Rockefeller, F. Lawhead, T. Wilkerson, J. Biggs, 46th Annual Georgia Tech Protective Relaying Conference, Apr 29-May 1, 1992. A critical step in the verification of a relay design is transient testing. This paper discusses the procedure that was initiated by one utility on their transformer and generator differential relays.


Testing of Series-Compensated Line Protection System With Telecommunications. A. Sauve, M. Le-Quang and A. Lavallee, Trans. CEA E&O Div., Vol. 31, 1992, Paper No. 92-SP-158. The paper describes the test setup and tests conducted to check the
performance of a current-differential protection system for protecting series-compensated lines. The test results, conclusions drawn from them and future testing are also discussed.


Experience of Protection Equipment Maintenance - A Case Study. B. Svensson, G. Mathiasson, S. Holst and S. Lindahl, CIGRE, Paris, Aug 30-Sep 5, 1992, Paper No. 34-105. The paper describes the experience of Sydkraft, a Swedish electric power company, in maintenance of protection equipment. The experience from maintenance and operation of protective equipment is used for analysing their reliability and for formulating future maintenance policy.

Development of Fault Characterization Equipment (F-CAREC) for Power Transmission Lines. K. Tsuji, H. Yanagida, H. Sasaki and S. Abe, IEEE Trans. on Power Delivery, Vol. 7, No. 1, 1992, p 133-8. This paper presents fault characterization equipment which detects fault resistances in a time sequence, and fault location. The objective is to offer improved functions to estimate the causes of system faults.

3158 STABILITY, OUT OF STEP, RESTORATION


A Generation Shedding Scheme for the Jim Bridger Steam-Electric Plant. C.E. Charman and J.W. Littman, 19th Annual Western Protective Relay Conference, Oct 20-22, 1992. Discussed is a scheme used to shed quickly a block of generation on the loss of critical transmission ties. The benefits of such a scheme are higher generation and transfer levels without loss of system stability.


Undervoltage Load Shedding as an Ultimate Application for Voltage Collar. H.M. Shah and J.R. Cowan, 46th Annual Georgia Tech Protective Relay Conference, Apr 29-May 1, 1992. Voltage instability has caused considerable concern among utilities and the power industry. This paper presents an undervoltage load shedding scheme designed to prevent a total area blackout from a voltage collapse in a specific area.

Recloming Practices. F. Soudi and E.A. Taylor, 19th Annual Western Protective Relay Conference, Oct 20-22, 1992. The reclosing philosophies of PG&E are discussed. The continued use of the latest technology and the use of existing SCADA software allow utilities to develop a more intelligent means of reclosing for meeting the demands of quality service to the customer.


Islanding Problems for Non-Utility Generation. C.L. Wagner, 45th Annual Texas A&M Protective Relay Conference, Apr 13-15, 1992. The interconnection of non-utility generation to the utility transmission and distribution circuits has added a new complication to the design of the utility systems. This paper discusses some of these concerns.

3159 SURGE PHENOMENA

Tightening Surge Testing Procedures - Problems and Solutions. R.P. Heller, 45th Annual Texas A&M Protective Relay Conference, Apr 13-15, 1992. New standards have been put in place recently that change the way equipment is designed and tested. This paper reviews surge standards and provides a comparison of one to another. The problem of which standard to apply is examined and solutions are offered.

Impact of Electromagnetic Compatibility Requirements on the Design and Maintenance of Protection and Control Equipment. E.P. Walker, Trans. CEA E&O Div., Vol. 31, 1992, Paper No. 92-SP-177. The paper describes the generation of electromagnetic disturbances in the protection relay environment and discusses ways to overcome the effects of these disturbances with regard to protection system in its operational environment. A resume of the international standard's position with regard to electromagnetic compatibility as related to protection systems is also included.

LIST OF PERIODICALS

IEEE Transactions, Journal and Conference Papers
IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331
ABB Review
ABB Marketin Services Ltd., P.O. Box 58, Baden, CH-5401, SWITZERLAND