1. Experimental Investigations to Aid Interpretation of Frequency Response Analysis Measurements for Diagnosing Transformers

M. Prameela, G. Radhakrishna Murthy and Pradeep M. Nirgude

Frequency Response Analysis (FRA) is an emerging diagnostic tool to assess the mechanical integrity of the transformer. Proper guidelines on using FRA data for declaring the integrity of transformer windings or indicating the extent of displacement/deformations are not yet available. Interpretations of the Sweep Frequency Response Analysis (SFRA) data for diagnosing the condition of the transformer windings are not yet clear. Experimental investigations were carried out on a model transformer to obtain SFRA data for various simulated conditions like axial and radial displacements, winding displacements and deformation, core faults etc for different test configurations. The paper presents the results of these investigations and analyse them to form the guidelines in interpreting the SFRA data for various test conditions to detect various type of faults. It is observed from the analysis of results that, SFRA with different test configurations need to be applied to detect the type of fault and faulty phase winding. The information presented in the paper, from the simulated faults on transformers with SFRA measurements, will be useful in the interpretation of FRA results to assess and diagnose the condition of transformer windings and core.

2. Simulated Annealing Based Optimal Solution Methodology under Deregulation Power System Environment

Lokanatha Dhall Samanta, Jitendra Kumar Das and Bibhu Prasad Panigrahi

In economic load dispatch solution procedure, the fuel cost characteristics of a thermal generator is usually approximated by (i) a quadratic function (ii) piecewise quadratic function, (iii) a polynomial function with order higher than two. When functions in (ii) and (iii) are adopted the economic load dispatch problem may have several optimum solutions with one being the global optimum solution. To find the global or near global optimum solution, the new algorithm based on Genetic Algorithm (GA) or Simulated Annealing (SA) etc., for solving the economic dispatch problem are needed.

In this paper the generation dispatch methodologies under deregulation power system environment have been developed. The classical economic dispatch algorithm relies on the convexity of cost function. However, in deregulated power market, the market strategies make the sellers’ bidden cost function concave causing
classical economic algorithm inapplicable. Here a special type of algorithm is developed based on deregulation strategy and also a heuristic algorithm is proposed which combines with the powerful searching mechanism of simulated annealing with mathematical foundation on global optimization.

3. Challenges and Developments in Numerical Distance Protection

Venkatesh C. and K. Shanti Swarup

This paper discusses some of the major issues in third generation numerical distance protections which are being faced by utilities and the solutions made available for these issues by relay manufacturers. Each discussion are accompanied with simulation results obtained using matlab and simulink. In addition to this some of the key issues which still need further research are also addressed.

4. Suppression of High Frequency Disturbances in Low Voltage Circuits Caused by Vacuum Circuit Breaker Operation in Medium Voltage Indoor Substation

Chetankumar V. Patel, Varsha A. Shah and Khirad Dhabhar

In a high or medium voltage substation, the operation of circuit breakers can induce high frequency over voltages in low voltage circuits known as an electromagnetic interference (EMI). The radiated and/or conducted EMI can be the cause of damage or malfunction of low voltage electronic equipment. This paper is focused on the effects of electromagnetic interference (EMI) produced due to switching of medium vacuum circuit breakers (MV CB) on the functioning of Numerical relays and measuring devices which are in the vicinity of 6.6kV Vacuum circuit breaker and remedy for reduction of effects of EMI. In this paper a unique and cost effective solution has been suggested and implemented to bring down the EMI effects by installation of ferrite core on control cable bunch and effective galvanized iron(GI) sheet shielding between source (MV CB) and victim(numerical relay & meter).

5. Failure Of Short Circuit Generators - A Case Study by CPRI Bhopal

Arun Kumar Datta, M. A. Ansari, N. R. Mondal and B. V. Raghavaiah

Switchgear Testing & Development Station prevalently known as STDS was established in 1965 at Bhopal by government of India as one of the unit of Central Power Research Institute. The predominant objective of setting up this institute was to cater the short circuit testing needs of various LT/HT power equipments in switchgear, controlgear and transformer field. Over the years the unit has expanded and received all the national/international accreditations, further became the member of Short Circuit Testing Liaison (STL). Today CPRI’s short circuit laboratories
of generator based and direct on line based are one of the leading laboratories in south east Asia. 
Year 2006-07 was a test time for CPRI, Bhopal when both the short circuit generators have developed technical snag, resulting in interruption of short circuit testing. It was a challenge for CPRI as well as for the service provider to take repair work as so many technical intricacies were involved including the reverse engineering process. Nation realized the importance of CPRI during the shutdown period. This paper discusses about the occurrence of failure, its detailed diagnosis, root cause analysis and the action taken thereafter. Short circuit generator is different from conventional one in many aspects. Repairing experiences of these generators, along with the re-commissioning process are also shared herewith.

6. Literature Review on Frequency Regulation in Traditional Power Systems Restructured Systems and Smart Grid

Devika Jay and K.S. Swarup

A literature survey on the main control strategies used for load frequency control in electrical power systems is presented. This includes traditional as well as restructured power systems. As load becomes more and more unpredictable and also as supply becomes distributed the frequency control strategies for the emerging Smart grid must include demand-side management also. A survey on demand response and Active load control is also discussed.

7. Establishment of Baseline data in Power Distribution of Electric Utilities in Karnataka under R-APDRP


This paper presents the field experience of authors during the establishment of base line data for designated Project Areas under R-APDRP Programme. This paper also brought out sample base line parameters estimation. It also emphasizes problems in the field during collecting data and attempt to overcome the problems. The paper also emphasizes findings on ESCOM by focusing project Area and Aggregate Technical and Commercial loss (AT&C).

8. Battery separator grade PVC resin for possible insulation applications

P.V.Reddy

An emulsion grade resin has been checked for the purpose of battery grade separator properties along with suspension grade PVC resin for insulation purpose. The study suggest that when battery separator resin CP172 SG added to K6701, the
elongation property decreases with increase in its content i.e., the material attains rigidity suggesting that CP172SG is not a good absorbent of plasticizer. It has been confirmed that the particle sizes of these 2 resins are not the same and a just physical mixing need not be a homogeneous mixture and this could affect the properties of the compounded material intended to use for HT cable. The samples CP 172 SG and K6701 both may be used for LT PVC cable sheathing and CP 172 SG cannot be used in XLPE (cross linked polyethylene) LT cables. However, only sample K 6701 can be used for insulation.

9. Technology development of Flame Retardant Low smoke material for wire and cables for sheathing applications

P.V. Reddy

An Attempt was made to Develop technology for Low Smoke Flame Retardant Cable and Compound with elimination of toxic chemicals in the formulation. The Extrusion trials using twin screw extruder and cable coating with single screw extruder was successful. The results of the evaluation of the cable and compound suggest that the composition seems to be satisfactory. However, large scale production could not be taken due to the actual techno-economic viability of the commercialization. This study paved the way for DSIR sponsored project for commercial exploitation under PATSER scheme.


Rajashekar P. Mandi and Udaykumar R. Yaragatti

This paper describes the auxiliary power consumption in Indian coal fired thermal power plants. The factors influencing the auxiliary power are discussed in details. Increase in auxiliary power due to lower plant load factor and causes for lower PLF are enumerated. The effect of poor coal quality and their effect on auxiliary power are discussed. The effect of operational optimization, adoption of new energy efficient technologies, design deficiencies, etc., are discussed in details along with remedial measures to reduce the auxiliary power. The energy conservation measures reduce the auxiliary power of 210 MW power plant from 11.59 % to 8.50 % with a payback period of 1 to 5 years.

11. Load flow study of a radial distribution network

Tejas Vyas and Ranjit Roy

The paper presents the simple method for finding the load flow solution of a radial distribution network using the Kirchoff’s current and Kirchoff’s voltage law. The method is tested on four test cases: 16-node, 33-node, 69-node and 117-
node network. Comparing to the existing methods, the memory space requirement is very small and time required for the CPU execution is also lower. Result shows that the proposed method is very efficient and competitive with the existing methods.

12. Premature Failure and Remedial measure for Prototype Testing of UHV Transmission Line Towers: an Overview

J. C. Mohanta and D. Revanna

The need for adopting bulk power transmission system with all possible ways to make support structures economical and also to reduce the right of way (ROW) requirements has arisen in view of accelerated growth of electrical network. This bulk power transmission has become compelling due to separation of power sources to the areas requiring the power are at longer ranges, namely inter- state & inter regional. In this direction, 400kV D/C & M/C system with quadruple conductor configuration, 800kV/1200kV AC system & ± 500kV/800kV HVDC systems are now adopted in India. Recently, CPRI has successfully tested the self-supporting type of 765 kV and 800 kV AC and HVDC towers for POWERGRID. The prototype testing and the premature failure of these towers in particular and some of special towers in general are described in this paper.