

A 2-Day Technical Seminar on

Insulation Co-ordination & Surge Arrester Application

by
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What you will learn?

- Understand basic insulation coordination principles
- Understand the causes and characteristics of overvoltages
- Learn how to effectively protect substation equipment, transmission lines and cables from overvoltages
- Apply metal oxide surge arresters correctly in substations and on transmission circuits

Introduction

Metal oxide surge arresters have been in use since the early 1980s and have evolved into very reliable devices applied in substations and on transmission lines. Standards have been developed by both the IEC and IEEE but generally tend to lag behind new application and, to further add to the situation, different approaches have been taken by the two standards bodies.

Metal oxide surge arresters are highly non-linear resistive devices that continuously conduct current and therefore react immediately to all overvoltages. This contrasts with the older silicon carbide gapped arresters which react only after sparkover in the gaps. The application of metal oxide surge arresters is best understood by first considering the basic principles of insulation coordination of the power system and its designed withstand capability. The next consideration is the overvoltages that will be imposed on the system from power frequency temporary overvoltages to switching and lightning surge overvoltages. The role of the arrester is to limit the overvoltages in order to provide a protective margin below the withstand capability of the system. While power systems are dimensioned by lightning and switching surges, suitable metal oxide surge arresters ratings are actually determined from temporary overvoltages.

What will you learn from this seminar?

The protection of power systems and associated equipment against overvoltages is fundamental to reliable operation and the prevention of unnecessary outages and disturbances. This comprehensive seminar will provide an in-depth understanding of basic insulation coordination principles and the correct application of metal oxide surge arresters as follows:

- Basic principles of insulation coordination according to IEC standards
- Review of statistical methods applied to insulation coordination
- Power system overvoltages: origins and characteristics
- Insulation types and strengths: internal, external, self and non-self restoring, air, oil and gas
- Rated insulation withstand: where do rated withstand voltages come from?
- Characteristics of metal oxide surge arresters
- Metal oxide arresters applied in substations and on transmission lines and cables

Case studies from real applications will be presented and discussed. **The seminar is hands-on, so bring your case study examples and your calculator!**

About the Course Leader

Dr. David Peelo

PhD, P.Eng, C Eng, FIEE



An independent consultant, worked at British Columbia Hydro for 28 years, rising to the position of specialist engineer, switchgear and switching. He also worked for ASEA (now ABB) in Ludvika, for seven years before joining BC Hydro in Vancouver, Canada. In 2004, the Eindhoven University of Technology awarded him a PhD degree for original research on current interruption using air-break disconnect switches.

He is active in leadership roles in IEEE, CIGRE and IEC. He chaired the IEEE Switchgear Committee Working Group that wrote the first application guide for shunt reactor switching (IEEE C37.015) and represented the IEEE on the IEC Task force that prepared the IEC TR 1233 Inductive Load Switching. He is the Canadian Member of CIGRE Study Committee A3 High Voltage Equipment and chairs the SC A3 Tutorial Advisory Group and is the Convener of IEC Maintenance Team 32 that wrote the recently published standard IEC 62271-110 Inductive Load Switching. He is also a member of the currently active CIGRE Working Group A3.11 Application Guide for IEC 60694 and 62271-100 for which he has contributed chapters on shunt reactor switching, parallel switching, impulse voltage withstand test procedures and the application of current limiting reactors.

He has published over 50 technical papers relating to metal oxide surge arresters and switching. He has presented tutorials and courses on metal oxide arrester application and switching in a number of countries including Austria, Japan, Germany, Singapore, Sweden, France and Bosnia & Herzegovina.

As an international and independent consultant, he has clients in various countries such as Australia, Canada, the US, South Korea, Malta and France. The clients include ElectraNet, AREVA, BC Transmission Corporation, BC Hydro T&D, BC Hydro Generation, Hyundai Heavy Industries, Enemalta Corporation, CEA Technologies Inc and Puget Sound Energy.

CPD Recognition

This training program is especially designed to meet the Continuing Professional Development (CPD) needs of participants. A Certificate of Attendance will be awarded at the end of the program. This serves as evidence of your personal and professional commitment to your career.

Course Outline

DAY 1

1. Basic Definitions and Principles of Insulation Coordination

- Purpose of insulation coordination
- Basic definitions
- Insulation coordination procedures

2. Statistics for Insulation Coordination : Review of Concepts used in Insulation Coordination

- Probability distributions
- Statistical sampling plans

3. Power System Overvoltages

- Temporary overvoltages
- Slow front overvoltages
- Fast front overvoltages
- Very fast front overvoltages

4. Insulation Types and Strengths

- Internal and external insulation
- Self and non-self restoring insulation
- Air
- Liquids and gases

DAY 2

5. Rated Insulation Withstand Voltages

- Rated withstand voltage determination
- Test sequences
- Test correction factors
- Altitude correction factors
- Pollution

6. Metal Oxide Surge Arresters

- Rated voltage and energy considerations
- Protective and related characteristics
- Selection procedures

7. Application of Metal Oxide Surge Arresters in Substations and on Transmission Lines and Cables

- Substations
- Transmission lines and cables



Who Should Attend?

This two-day seminar is specially intended for managers, engineers and others involved in substation design, transmission line design, surge arrester application, or specification, installation, or testing of medium or high voltage substation or transmission equipment.

Those who should attend this seminar include :

- ◇ Substation and transmission line design manager, engineers and technicians
- ◇ System studies and planning engineers
- ◇ Specification and procurement engineers or personnel
- ◇ Protection and control engineers
- ◇ Utility, plant and consulting engineers
- ◇ involved with transmission or substation equipment operation, specification, installation or testing

Students should be familiar with the basic relationships in electric power systems and the role of transformers, circuit breakers, and other switching devices. The seminar does not require previous experience with the application of surge protective devices.



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