ICTD

المركز العالمي للتدريب والتطوير

International Centre For Training & Development

ADVANCED CIRCUIT BREAKERS

Operation Maintenance

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Course Introduction:

Circuit breakers play an important role in the safe distribution of electrical power. The equipment needs to be operated, maintained and installed in a safe manner securing continuity of supply to consumers.

This following are important aspects of the circuit breakers:

- Electric power systems are designed to be as fault free as possible through appropriate network design, equipment design, proper installation and on-going maintenance.
- The Circuit breaker and its associated fault detection equipment, protective relaying, is an extremely important device, through its role of clearing short-circuit currents, disconnecting faulty elements from the power network, and thus maintaining the overall integrity of the power network
- If faults are not controlled they can cause unnecessary loss of electricity service with all of its many ramifications.
- The circuit breaker selection and arc extinction methods are of great importance
- Minimizing downtime by proper and systematic maintenance program

The seminar focuses mainly on the operation and maintenance of circuit breakers, with reference to auxiliary equipment's incorporated for its reliable and safe operation.

Course Objectives:

Delegates will gain a detailed appreciation of the following:

- The importance of preventive maintenance check and servicing of the various types of circuit breakers
- Implementation of safe systems of work and operations
- Co-ordination of maintenance activities and maintaining system safety
- To be able to understand the component functionalities of the gas and vacuum circuit breakers
- Methods of arc extinction for MV HV circuit breakers
- Routine inspections and the functions of the micro-processor component in the circuit breakers

Organizational Impact

The seminar will allow delegates to interact and gain shared experiences of others along with:

- An understanding for the need for routine inspection and maintenance
- Using selected videos and case studies to illustrate the material being discussed
- An emphasis to ensure material is appropriate to the organizations being represented with regards to the types of circuit breakers and switchgears are installed in their premises
- An awareness and understanding of the course objectives

- Safe working practices being stressed and risk management analysis are applied when the need arises

Personal Impact

On successful completion of this seminar delegate will be able to understand:

- The construction, the arc extinguishing principles of different types of circuit breakers currently in use and the relevance to operations and maintenance
- The micro-processor operation and impact on the fault clearing and tripping process
- Expand their knowledge on circuit breaker standards and the relevance to specifications and procurement
- Circuit breakers and switchgear maintenance requirements and techniques.
- The use of partial discharge and thermography techniques when dealing with condition monitoring

Who Should Attend?

It is suitable for those Electrical Professionals, HSE personnel, Technicians and Supervisors. Professionals responsible for the operation and maintenance of distribution equipment, who will benefit from sharing experiences in the planning, organization, and implementation of maintenance activities.

Course Outline:

Day 1 - Introduction - reasons for faults - and classification of faults

- Distinction between load and fault current
- Sources of short-circuit current
- Introduction to fault calculations
- Balanced and unbalanced faults

Overview of Power System Protection

- Measurement – voltage and current transformers
- Protective device characteristics
- Types of protection systems
- The role and importance of the circuit breaker in power systems

Exercises and Case Studies

Day 2 - General principles of arc extinction

Overview of types of circuit breaker

- Air-Break
- Vacuum
- Gas

- Other related switching devices
- The single-line diagram
- Substation layouts

Air-break

- Principles of arc extinction
- D.C. circuit breaking
- A.C. circuit breaking
- Contacts and arc initiation
- Arc chutes
- Performance characteristics
- General construction Principles

Exercises and Case Studies

Day 3 - Vacuum

- History – The early years
- The vacuum arc – An overview
- Current interruption in vacuum
- Methods of keeping the arc diffuse
- Current chopping – general implications
- Vacuum interrupters in series
- Design of vacuum switchgear
- Maintenance and testing requirements

Exercises and Case Studies

Day 4 - SF6 Gas

- Properties of SF6
- Principles of arc extinction
- Features of construction
- Mechanism principles
- Insulation principles
- Gas leak problems
- Specific supervision requirements
- Circuit power factor considerations
- Maintenance and testing requirements

Exercises and Case Studies

Day 5 - International Standards

- Importance and relevance to specifications
- ANSI and IEEE

- IEC and IEE
- Circuit breakers and power system
- Circuit breaker failure and the effects on power system operation
- Circuit breaker inspection, testing and maintenance program
- The Principles of modern substation control systems
- Power circuit breaker maintenance

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionaires
- Group Work
- Discussion
- Presentation

Course Certificate:

International Center for Training & Development (**ICTD**) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Fees:

To be advised as per course locations. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session