Circuit Breakers and Switchgears Inspection, Maintenance, Design, Repair and Troubleshooting

Energy Milestones Corporation

Advancing Professionals to the next level

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Overview

This program is designed to update participants on the latest developments in circuit breakers and to present some of the more common and updated aspects of low-, medium-, and high-voltage switchgear maintenance.

Course Objectives

This course is designed to enable participants to:

- List the voltage convention classifications used in this course.
- Describe switchgear construction.
- Describe a ground fault relay system.
- Describe the three basic types of low and medium-voltage circuit breaker contacts.
- Describe the moulded case circuit breaker

Course Content

1. General Introduction
   - Electrical engineering basic concepts
   - Three-phase review and per unit
   - Voltage levels
   - One-line and three-line diagrams
   - Generation system layout
   - Transmission system layout
   - Substation system layout
   - Distribution system layout

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Course Content

2. Industrial Switchgears

- Fuses
- Auto-recloses
- Automatic sectionalizer
- Circuit Breakers
- Isolator switches
- Load switches
- Relays
- Current transformer
- Voltage transformers

3. CB Design Specification Based on Short Circuit Current Level

- Per unit system
- Faults on power systems
- Transient phenomena in power system.
- Symmetrical component analysis of three phase network
- Network connection for various fault types
- Current and voltage distribution in system due to a fault
- Effect of system on zero sequence quantities
- Computer programs based short circuit calculation

4. CB Design Specification Based on Arc Phenomena and Circuit Interruption

- Arc phenomena
- Maintenance of the Arc
- Properties of Arc
- Arc Interruption theory
- Circuit Breaker Rating
- Circuit constants and circuit conditions

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Course Content

4. CB Design Specification Based on Arc Phenomena and Circuit Interruption

- Conditions of severity
- Restriking voltage transient
- Class A ultra fast transients
- Class B system transients
- Class C low transients
- Transmission line transient
- Switching transients
- Duties of Switchgear

5. LV Circuit Breakers

- Low voltage molded case current limiting circuit breakers
- Low voltage molded case circuit breakers with high breaking capacity
- Insulated case circuit breakers
- Low voltage air circuit breakers
- Low voltage circuit breakers specification

6. Modern MV and HV Vacuum CB

- Introduction
- Advantages of vacuum interruption
- Vacuum contactors and interrupters
- The vacuum medium
- The vacuum arc
- Vacuum arc stability
- Vacuum break down
- Vacuum switch construction
- Applications of vacuum circuit breakers

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Course Content

7. Modern MV and HV SF6 CB Introduction

- Basic Features of SF6 Breakers
- Dielectric properties of SF6
- Quenching properties of SF6
- Construction of SF6 breaker
- SF6 CB types
- Puffer type SF6 breakers
- Double Pressure System
- Single Pressure Puffer Piston System
- Single-Pressure Self Blast System
- Improvement in SF6 Breakers for HV

Targeted Audience

- Electricians
- Electrical supervisors
- Plant electricians
- Operations & maintenance engineers, supervisors & technicians
- Maintenance technicians

Course Methodology

Facilitated by an experienced professional trainer, this training course will be conducted as a highly interactive workshop session. A variety of training methodologies and facilitation techniques will be used before and during the course whenever applicable. These methods are aimed at enhancing individual and group interaction while maximizing learning. Some of these methods are:

- Online Pre-post Test
- Colorful Visual Aids
- Gamification
- Self-Assessment Instruments
- Simulations
- Case Studies
- Videos
- Group Exercises & Discussions
- Role plays
- Indoor & Outdoor games

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