

EM-110 Switchgears & Transformers: Maintenance and Servicing – 3 days

Purpose

We are specialized in providing customized technical training for “Maintenance and Servicing of Electrical Switchgears & Transformer based on client's individual requirements. Courses are designed to comply with current legislative, regulatory standards, directives and guidelines. Training Courses meet the needs of the operator dealing with Energy Efficient Management.

Objectives

1. Describe the fundamentals of operating switchgear and circuit breakers
2. Select appropriate type and rating of circuit breakers and switchgear
3. Understand the operation of switchgear components (CTs, VTs, relays and cable terminations)
4. Describe the principles of operation of power transformers
5. Identify and apply the different transformer types
6. Set up simple transformer protection schemes
7. Detail power transformer testing procedures
8. Manage power transformer breakdowns to minimize disruption
9. Detail safe working procedures in switch rooms, indoor and outdoor substations
10. Draw up simple operational policies for safety rules
11. Detail practical maintenance strategies for switchgear and transformers



Who Should Attend

- Facilities Maintenance and Services Engineers
- Facilities Maintenance and Services Supervisors
- All Facilities Services Technicians
- All Maintenance and Services Staffs

Content

MODULE 1: INTRODUCTION TO SWITCHGEAR AND TRANSFORMERS

- Single line diagrams
- Circuit breaker utilization
- Types of MV switchgear - ring main units and load breaking/fault making switches

MODULE 2: APPLICATION OF SWITCHGEAR

- Principles of current interruption
- Plain break circuit breakers
- Bulk and small oil volume circuit breakers
- Operating mechanisms
- Air break and air blast switchgear, SF6 and vacuum
- Switchgear in association with dis-connectors
- Fixed and withdraw-able designs
- Switchgear standards
- Factors affecting switchgear selection

MODULE 3: SPECIFICATION OF SWITCHGEAR

- Switchgear ratings - highest system and impulse withstand voltages, load and short circuit currents
- Simple and complex protection systems
- Switchgear ancillaries, measurement CTs, VTs and relays
- Cable terminations
- Indoor and outdoor operation
- Substation and switch room layouts and design

MODULE 4: SAFETY POLICIES

- General safety precautions and the use of personal protective equipment
- Principles of safety rules
- Principles of personal authorization
- Operative training for safe operation of switchgear
- Isolation in a circuit breaker context
- Safety documentation
- Operational and safety locking, caution and danger notices
- Work safety in a substation environment
- Safety interlocks
- Substation alarms
- Individual study tasks and presentation - safety policies in my company and how they might be improved

MODULE 5: DIAGNOSTICS, TESTING AND MAINTENANCE

- Switchgear inspection methodologies
- Partial discharge measurement and survey
- Timing tests
- Thermovision
- Mechanisms of deterioration
- Principles of circuit breaker maintenance
- Maintaining oil circuit breakers
- Contact maintenance and contact wipe
- Maintaining vacuum circuit breakers
- Maintaining SF6 circuit breakers
- Switchgear defects and defect control Systems

MODULE 6: TRANSFORMERS' MAIN FUNCTIONS AND CLASSIFICATION

- Construction (shell type and core type)
- Classification and type in relation to insulation, windings, core, cooling systems, voltage level, sizing, tank and breathing action
- Transformer parts

POWER TRANSFORMERS AND SAFETY

- How to install, operate and work with high voltage power transformers safely
- Earthing of HV transformers

MODULE 7: TRANSFORMER THEORY

- Electrical values and their definition in a power transformer - voltage, current, number of turns, impedance and their interrelation

OPERATION OF POWER TRANSFORMERS IN A POWER SYSTEM

- Thermal performance, loading, paralleling, tap-changing, connections and vector groups
- Surge protection
- Protective relaying (differential, over-current and earth fault)
- Buchholz relay and pressure relief relay
- Thermal devices and instruments (oil temperature alarm and trip, winding temperature alarm and trip)

MODULE 8: OIL QUALITY

- Oil contents: water, acidity and dissolved gas
- Oil tests: dielectric breakdown, moisture, resistivity, interfacial tension, specific gravity, power factor and furan analysis

MODULE 12: POWER TRANSFORMER ELECTRICAL TESTS

- AC Tests:
 - Power factor tests (insulation, oil, and bushings); Single phase excitation current test; Transformer turns ratio test
- DC Tests:
 - Insulation resistance test; Dielectric absorption test; Polarisation index test; Step voltage test; Hi-pot test

PREVENTATIVE MAINTENANCE ON POWER TRANSFORMERS

- Techniques to improve life expectancy

PRACTICAL

Trainer:

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