

# LV/MV/HV (REF:OTSLMH001)

## Course Introduction:

This training program provides the basic skills required to safely operate, inspection, design, repair and troubleshooting of switchgears and circuit breakers. Classroom presentations, video clips, and case study. Sample circuit breakers wiring diagrams are used for maintenance, trouble shooting, repairs and Proper methods for performing the insulation resistance tests, dielectric and vacuum integrity tests, and contact resistance tests are demonstrated. Additional equipment typically on low, medium and high voltage switchgear such as protective relays and metering devices is discussed. Adding to LOTO procedures and safety requirements. Demonstrate the basics of inspection, design, repair and troubleshooting of various types of switchgears.

## Course Objectives

By the end of this course, trainee will be able to:

- Demonstrate the components and design requirements of LV/MV/HV Voltage Switchgear.
- Demonstrate the various types of LV/MV/HV Voltage Switchgear.
- Demonstrate the maintenance, repair and testing procedures used for LV/MV/HV Switchgear.
- Apply the safety precautions of P.M. on various types of Switchgear.
- Carry out short circuit calculations and switchgear assessment.
- Demonstrate inspection, design, repair and troubleshooting of various types of switchgears.

## Who Should Attend?

This course is intended for Electrical Technicians, Supervisors, Junior & Senior Electrical Engineers, who work in operation, planning, maintenance, protection, control and analysis of Utilities & Industrial Electrical substations with various types of switchgears.

## Course Outline:

### Day 1

#### Types of LV/MV/LV, Parts, Mechanisms and Operation

- Types of Switchgears
- Parts of switchgears (charging spring motor, closing coil, trip coil, and anti-pump relay operation, etc).
- Circuit breaker mechanisms
- Safe practices for circuit breaker operations
- Circuit breakers, auto reclosers, disconnectors and sectionalisers operations
- Earth switches construction and applications
- Switchgear symbols on single-line diagrams and wiring diagrams.
- Substation switchgear layouts

### Day 2

#### Sulphur HexaFlouride (SF6) and Vacuum Circuit Breakers

- Compression principles
- SF6 hazards and test equipment.
- Dead and Live tank circuit breakers.
- Operation mechanisms of circuit breakers.
- Vacuum interrupters operation and maintenance.
- Automated circuit breaker monitoring.

### Day 3

#### Switchgears Maintenance

- Common potential breaker failure causes.
- Typical internal breaker problems.
- Fault clearing process.
- Common potential breaker failure causes .
- Importance of adequate maintenance.
- Frequency of Maintenance
- Maintenance procedures for switchgears (ACB-VCB – OCB) .
- Maintenance of SF6 gas circuit breakers.
- Elements of preventive maintenance.
- Lubrication considerations.
- Breaker timing analysis.



## Day 4

### Switchgears Testing

- Common tests and inspections
- Routine maintenance tests
- Insulation resistance tests
- Contact resistance tests
- Tripping time tests
- Mechanical operation tests
- Dielectric and vacuum integrity tests.
- Infrared Testing
- Visual inspection of breaker

## Day 5

### Switchgears Assessment, Protection and Working Safely

- Introduction to types of relay.
- Relay selection, basic concepts and characteristics.
- protection modes.
- Introduction to safety in LV/MV/HV Substations (LOTO).
- Switchgear numbering and nomenclature.
- Switchgear mechanical and electrical interlocking.
- Medium voltage circuit breaker assessment.

