
COURSE DESCRIPTION**INTCV385****HV/MV switchgear (CB, CT/CVT, DS & Surge Arrestor)
O&M (AIS & GIS) – Level 2****The goal**

The goal of the course is to provide the knowledge and develop the skills necessary to identify and interpret test results, perform condition assessments, manage service specifications, qualify service providers and make critical maintenance decisions or recommendations based on analysis and interpretation test results and history.

Learning objectives

Upon completion of this course, participants will be able to:

- Understand switchgear technology.
- Select the proper switchgear as per application and working condition.
- Ensure safe operation of switchgear.
- Do appropriate test & evaluation of test results.
- Do appropriate maintenance.

Participant profile

Personnel from Power Utilities, Power Generation, transmission companies & industries and Consultants responsible for engineering, commissioning, operation and Maintenance of substations

Prerequisites

- Degree or diploma in engineering, basic knowledge of power system.
- This course requires working knowledge of basic electricity. Students must wear safety toe shoes or boots while entering the labs. No shorts or sandals will be allowed.

Topics**Circuit Breakers (HV & MV)**

- Sulphur hexafluoride (SF₆) – Properties, pressures, density switch, moisture, safety & environment regulations, Applicable standards for handling, storage, transportation of SF₆- statutory constraints.

- Effect of operational stress on Switchgears and means of mitigation (over voltage etc).
- Fundamentals of Circuit Breakers - arc extinguishing the arc in SF₆ and Vacuum Circuit Breakers.
- Design & functioning of Circuit Breaker components – Pole construction, operating mechanisms, operating sequences of interrupting chamber, name plate data.
- Control schematics of Circuit Breakers.
- Materials used and MQP.
- Applicable standards, Circuit Breaker selection – various applications.
- Manufacturing – pole assembly, operating mechanism, final assembly and testing.
- Transportation, storage, installation, commissioning – best practices, Care, Testing and evaluating the result.
- Maintenance plan, tools required for maintenance, field quality plan
- Site testing, trouble shooting
- Condition monitoring of circuit breakers.
- New trends - Controlled switching,
- Practical work on circuit breakers and associated operating mechanism, testing demonstration in experience center switchyard and manufacturing unit.

Instrument Transformers (CT/CVT)

- Theory on working of CTs & CVTs.
- Equivalent Circuit, Errors.
- Design parameters, magnetization, and Ferro resonance.
- Applicable standards.
- CT & CVT selection parameters.
- Construction, Name plate data.
- Maintenance plan, tools required for maintenance.
- Practical Demo manufacturing of CT & CVT, testing, Oil sampling, DGA in training center switchyard and manufacturing unit.
- Transportation, storage, installation, commissioning – best practices, Care, Testing and evaluating the result.
- Maintenance plan, tools required for maintenance, field quality plan.
- Site testing, trouble shooting.
- Modern technics of On-line and off-line monitoring devices for Instrument transformers.

Disconnecter

- Product design & operation – current path, support insulator, base frames, linkages, operating mechanism.
- Transportation, storage, installation, commissioning – best practices, Care, testing and evaluating the result.
- Maintenance plan, tools required for maintenance, field quality plan.
- Site testing, trouble shooting.
- Practical demo of various components of Disconnector, operation of Disconnector in experience center switchyard and manufacturing unit.

Surge Arrestor

- Need of overvoltage protection, Handling of overvoltages.
- Surge arrester: Definition, use, features, function.
- Protective characteristic, classification of surge arresters, IEC energy classes.
- Design - polymer housed arresters, Silicone: hydrophobicity.
- Applicable standards.
- Installation, maintenance & troubleshooting.
- Testing and condition monitoring techniques.

Gas Insulated Switchgear (GIS)

- History & Development stages of GIS.
- Comparison of different arc interrupting principles.
- Comparison of AIS V/s GIS, Salient features, Spec. and standards.
- Basic Concepts of GIS System Engineering.
- GIS Components – Circuit Breaker, current transformer, voltage transformer, and disconnector, fast acting earth switch, enclosures and insulators.
- Different Interconnection arrangements.
- Construction, operation of GIS.
- Erection, commissioning, day to day care, operation and maintenance.
- Troubleshooting.
- Site testing & care.
- Spare parts, special tools required during operation and maintenance.

Safety: standards and regulations, safe work procedures, and usage of personal protective equipment.

- Case Studies, Q & A, Open Discussion.
- Assessment and Certification.

Course type

This is an instructor led seminar with practical demonstration at experience center demo room, switchyard and guided tour to manufacturing facilities. The language of the course is English.

Learning methods and tools

Lectures, demonstrations, practical exercises. Laptop or tablet is required to have access to the e-documentation. Please bring your own device.

Duration

The duration of the course is ten days.

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The latest version of the course portfolio, and course schedule can be found on our

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