

Training Title

TAMCO HIGH VOLTAGE SWITCHGEARS

Training Duration

5 days

Training Venue and Dates

REF					
EE140	TAMCO High Voltage Switchgears	5	16 - 20 June, 2019	\$4,250	Dubai, UAE

In any of the 5 star hotels. The exact venue will be informed once finalized.

Training Fees

- 4,250 US\$ per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Buffet Lunch.

Training Certificate

Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.

TRAINING DESCRIPTION

Switchgears play an important role in a power system network in maintaining the continuity of power supply and power quality to the industrial and commercial consumers. The high voltage switchgears comprises of switching equipment (LV and HV circuit breakers, Fuses, Auto-reclosers, Automatic sectionalizer, Isolator switches ,Load switches ,Relays , Current transformers and Voltage transformers. A properly planned and designed switchgear is essential for the reliable operation of power system network.

This course covers all aspects of Low, high and medium voltage TAMCO switchgear design and maintenance including regulatory and environmental requirements, general design considerations, application of switching and power equipment, safe grounding design, protection/control, automation and maintenance considerations

TRAINING OBJECTIVES

This course introduces the basis of understanding the theory of high voltage switchgear covering LV/MV/HV circuit breakers and the equipment included in the switch gears. It also introduces the practice and testing of switchgear & by the end of this course the trainee should be able to:

- Demonstrate the components of different voltage switchgear
- Demonstrate the maintenance, testing procedures used for different voltage switchgear
- Understand the operations & types of TAMCO switchgears

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- Develop management & implementation of safe work system
- Apply the safety precautions of P.M. on switchgear
- The transient phenomena in power systems
- Understand the arc phenomena and circuit interruption
- Know the different types of circuit breakers and industrial switchgears
- Be able to select the proper specifications of CB and switchgears
- Know the maintenance procedures
- Be able to do all tests on circuit breakers.
- Be able to detect circuit breakers troubleshooting.
- Know the methods of system earthing and protection requirements.
Be able to control circuit breakers with associated relaying systems.
- Know the circuit breakers protection and its coordination

WHO SHOULD ATTEND?

Managers, Engineers and Technicians, responsible for the design, installation, testing and operation of electrical substations and power stations, who require to refresh their knowledge and skills in working with circuit breakers at low and medium voltage level. Technicians and engineers who are responsible for maintaining, testing and troubleshooting of HV/MV/LV switchgear

TRAINING METHODOLOGY:

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions, and motivate everybody find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

Very useful Course Materials will be given.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Group Work& Practical Exercises
- 20% Videos& General Discussions

WORKSHOP KEY TOPICS

- Basic Concepts of Power Systems (Generation, Transmission and Distribution of Power)
- Breaking of AC current
- Introduction on Switchgears
- High voltage switchgear

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- Low & medium voltage switchgear
- Testing, Troubleshooting Principles and Commissioning Guide Of Electrical Equipment
- Condition Monitoring For Electrical Switchgears
- Switchgear testing.
- Typical example of Maintenance of M.V SF6 breaker and switchgear assembly.
- Typical example of Maintenance of M.V vacuum breaker and switchgear assembly
- Functions of Circuit Breakers
- TAMCO Circuit Breaker Components
- Design Features of TAMCO Circuit Breakers
- Description of some reputed make Circuit Breakers
- Installation and Commissioning of Circuit Breakers
- Testing of Circuit Breakers
- Analysis of Circuit Breakers Performance
- General Maintenance of Circuit Breakers
- Application of CBM on Circuit Breakers
- Circuit Breakers Rule in Protection and Protection Coordination

DAILY OUTLINE

1. Introduction

- Electrical engineering basic concepts
- Three phase review and per unit
- Voltage levels
- One line and three line diagram
- Generation system layout
- Transmission system layout
- Substation system layout
- Distribution system layout

2. Industrial Switchgears

- TAMCO switchgears
- Fuses
- Auto-reclosers
- Automatic sectionalizer
- TAMCO Circuit Breakers
- Isolator switches
- Load switches
- Relays
- Current transformers
- Voltage transformers

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Arc Phenomena and Circuit Interruption and CB Specifications

- Arc phenomena
- Maintenance of the Arc
- Properties of Arc
- Arc Interruption theory
- Circuit Breaker Rating
- Circuit constants and circuit conditions
- Conditions of severity
- Restriking voltage transient
- Switching transients
- Duties of Switchgear

3. *Condition Monitoring and Testing Guide Of Electrical Equipment*

- Approaches Based On Mathematical Models
 - Reliability Centered Maintenance (RCM)
 - Condition Based Maintenance (CBM)
 - Partial Discharge
- Insulation Resistance Monitoring
 - Insulation resistance test (IR)
 - Megger test
 - Polarization index test
 - Dc hi-pot test
 - Measuring insulation degradation
 - Insulation power factor
 - On line measuring partial discharge activity for insulation
- On-Line Monitoring Of Transformers
 - Local Indications
 - Thermography
 - PDA - Partial Discharge Analysis
 - Insulating Oil Properties And Tests
 - Test for Dielectric Strength
 - Water Content in Oil
 - Acidity Test (Neutralization Number)
 - Oxidation Inhibitor

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- Interfacial Tension Test (IFT)
 - Oil Colour
 - Oil Power Factor Test
 - Insulating Oil Dissolved Gas Analysis (DGA)
- Understanding cable thermal behavior after installation
 - Optical cable Temperature Monitoring
4. 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
5. Modern HV Vacuum CB
- Introduction
 - Advantages of vacuum interruption
 - Vacuum contactors and interrupters
 - TAMCO Vacuum Circuit Breakers
 - The vacuum medium
 - The vacuum arc
 - Vacuum arc stability
 - Vacuum break down
 - Vacuum switch construction
 - Applications of vacuum circuit breakers
6. 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
7. Other Type of Circuit Breakers
- a) Air Circuit Breakers
- Method of increasing arc resistance

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- Plan break type
- Magnetic blow out type
- Arc splitter type
- Application
- Construction and operation
- Blast air CB

b) Oil Circuit Breakers

- Arc rupture under oil
- Advantages of oil
- Disadvantages of oil
- Plan break oil circuit breakers
- Arc control circuit oil breakers
- Minimum oil circuit breakers
- Construction and operation

8. Circuit Breaker Inspection, Maintenance and Services

- Inspection
- General inspection technical procedure
- Daily inspection of circuit breakers
- Monthly inspection of circuit breakers
- Annual inspection of circuit breakers
- Disassembly
- Cleaning
- Tightening
- Lubrication
- Equipments used in testing
- Testing procedure
- Direct testing
- Contact resistance test.
- Insulation resistance test
- Test report
- Indirect testing

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9. Circuit Breakers Control, Protection and Protection Coordination

- Switchgears control devices and wiring
- Switchgears protection devices and wiring
- Circuit Breakers and Protection coordination

10. CB Troubleshooting

- Low insulation Resistance (below 2000 Mega-ohms) between a) Phase terminal

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and earthed frame, with breaker closed b) Phase terminals of a pole.

- Resistance between Terminals of Pole contact.
- Unequal contact Wipe and Travel in 3-pole Measured from top surface of interrupter flange and the contact lip by a simple rod with a) breaker open and b) breaker closed
- One of the pole docs not close.
- Breaker operation too Slow During opening timing from trip command to contact separation instant too large

TRAINING OUTCOME

By the end of this course the participants will gain the following;

- The transient phenomena in power systems.
- Understand the arc phenomena and circuit interruption.
- Know the different types of circuit breakers and industrial switchgears.
- Be able to select the proper specifications of CB and switchgears.
- Know the maintenance procedures.
- Be able to do all tests on circuit breakers.
- Be able to detect circuit breakers troubleshooting.
- Know the methods of system earthing and protection requirements.
- Be able to control circuit breakers with associated relaying systems.

NOTE:

Pre & Post Tests will be conducted

Case Studies, Group Exercises, Group Discussions, Last Day Review & Assessments will be carried out.

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