

# GULF INSTITUTE



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# Electrical Distribution Equipment Operation & Maintenance

## INTRODUCTION

- This Electrical Distribution Equipment Operation and Maintenance training seminar will take a closer look at the equipment installed in and electrical installation. Safety, security and reliability are the main attributes of all electrical equipment installed. It has to be well designed, installed and commissioned. A well-planned maintenance regime is essential to ensure safe operations and trouble-free electrical operations.
- Competent workforce and sophisticated testing, measuring and diagnostic instruments are important to avoid system downtime. Distribution equipment plays an important role in the safe distribution of electrical power. Arc flash hazards analysis is vital to ensure that the equipment needs to be operated in a safe manner securing continuity of supply to consumers.
- This training course focuses mainly on the operation and maintenance of distribution equipment like transformers, circuit breakers, protection relays and cables concerning auxiliary equipment necessary for its operation. This also includes new technologies incorporated in the transformers and circuit breakers.

### This training seminar will highlight:

- The importance and significance of maintenance
- Understand the functions and purposes of choosing the correct test instruments
- The severity of arc flashes and mitigation methods
- Safe operations of circuit breakers and transformers
- Principles of the electrical protection system

## OBJECTIVES

### At the end of this training seminar, participants will learn to:

- The need and management for maintenance
- Management and implementation of safe systems of work
- Co-ordination of maintenance activities and maintaining system safety
- Switchgear maintenance - transformer maintenance
- Cable installation and rating; condition monitoring using non-intrusive technology
- Routine inspections, properties of insulating oils

## TRAINING METHODOLOGY

- This Electrical Engineering course will ensure participants understanding and importance of primary electrical distribution equipment and maintenance. The goals of each participant are discussed to ensure their needs are fulfilled as far as possible. Questions are encouraged throughout, particularly at the daily wrap up sessions. This provides opportunities for participants to discuss specific issues and, if possible, find appropriate solutions. Case studies are employed to highlight particular points and appropriate video material used to illustrate particular conditions.

## ORGANISATIONAL IMPACT

Upon completion of this training course, the organizational impact would be:

- An understanding of the need for routine inspection
- Using selected videos and case studies to illustrate the material being discussed
- An emphasis on ensuring material is appropriate to the organisations being represented
- An awareness and understanding of the course objectives
- Safe working practices being stressed and
- Risk reduction methods investigated

## PERSONAL IMPACT

- The need for a routine inspection, adequate maintenance of equipment and accurate record-keeping
- Methods of maintenance management, using safe systems of work
- How to co-ordinate maintenance activities for best utilisation of time and resources, while ensuring safety is not compromised
- Switchgear maintenance requirements and techniques - properties of insulating oils and their analysis
- Transformer maintenance requirements and techniques - cable installation and fault finding techniques
- The use of non-intrusive condition monitoring methods

## WHO SHOULD ATTEND?

This training course is suitable to a wide range of professionals but will greatly benefit:

- Electrical Professionals
- Electrical Engineers
- Technicians
- Professionals responsible for the operation and maintenance of distribution equipment, who will benefit from sharing experiences in the planning, organisation, and implementation of maintenance activities

## Course Outline

### Introduction, Electric Hazards and Safety

- Goals and Discussion
- The Smart Grid Architecture
- Maintenance of Electrical Equipment
- Managing Maintenance
- Safety Culture
- Safety Integrity Level (SIL)
- Electrical Safety Rules
- Electrical Hazards and Emergencies

### Power Network Fundamentals and Systems Protection

- Power Network Fundamentals
- Faults and Protection
- Fault Levels for transformer
- Types of the Protection Relay
- Numerical Relays
- Arc Flash Mitigation
- Importance of Earthing
- Network Earthing

### Power and Distribution Transformers Operations and Maintenance

- Transformer Characteristics
- Transformer Cooling and Protection
- On-load Tap Changer Operation
- Transformer Site Testing
- Transformer Maintenance
- Dry Transformer
- Gas Insulated Transformer (GIT)
- Ester base Oil for New Power and Distribution Transformers

### Circuit breakers, Switchgear and Condition Monitoring

- Circuit Breaker Ratings and Operation
- Circuit Breaker Examples
- Switchgear Maintenance
- Alternatives to SF6 Gas
- HV Vacuum Circuit Breakers
- Hybrid Outdoor Circuit Breakers

## Gas-insulated Switchgear Common Voltage Cables Faults and Locating Methods

- Overview of Gas-insulated Switchgears
- Power Cables Construction and Characteristics
- Common Underground Cable Faults
- Cable Fault Locating
- Heat Shrink and Cold Shrink Cable Terminations and Joints
- LV Wiring and Cabling Systems
- Wrap-up Session

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