



Training Program:

Advanced Power Generation Overview

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Introduction:

This course depicts the factors to be considered within the area of power generation. It will begin with an overview of generator design and function. Load requirements and calculations including load sharing, shedding and switching will be examined. Power factor calculations and power factor correction techniques will be presented. The techniques and equipment available for monitoring generators will be covered in depth to ensure delegates are made aware of what is available on the modern market and the most appropriate utilization of these systems. The maintenance and protection schemes that are utilized for generation and their applications will be examined. The importance of the roles and responsibilities of personnel working on electrical systems and the safety procedures involved are also explored.

The course covers generator theory, operation, protection and application, and troubleshooting. Different excitation systems, prime movers and generator earthing systems generator voltage and frequency control are included. In addition condition monitoring and maintenance are explained.

Who Should Attend?

Electrical Engineers, Power Generation Engineers, Mechanical Maintenance Personnel, Power System Protection Engineers, Gas turbine newcomers and more experienced persons who desire an overview of the many available gas turbine technologies, Process Control Engineers & Personnel, Electrical and Instrumentation Technicians & Design Engineers, Maintenance Technicians & Supervisors, Plant Operators & Technicians, Oil & Gas Industry Personnel

Course Objectives:

By the end of this course delegates will be able to:

- The fundamentals and basics of generators
- The different prime movers used for generators
- Controlling frequency and voltage, the earthing system for generators
- The different protection needed for generators
- Condition monitoring, data collection and routine maintenance for generators
- The factors with regard to load calculation, acceptance, rejection, shedding and sharing
- Synchronization methods and conditions
- Power factor calculations and power factor correction
- Voltage drop and short circuit calculations
- Data collection techniques employed in major power generation equipment

Course Outline

Principles of A.C. Generation

- Principles of alternating and rotating
- Magnetic fields
- Peak
- RMS and mean values
- Vectors

- Faraday's Law of Electromagnetic Induction
- A.C. generators
- 3-Phase A.C. Generators
- Star and delta connections
- Drawing of star- and delta-connected apparatus

Generator Construction and Excitation

- General
- Rotor construction
- Insulation
- Cooling
- Excitation and voltage control
- Insulated bearings
- Generator excitation and voltage control

Prime Movers

- Turbines
- Diesel generator sets
- Generators Earthing
- Introduction
- Equipment earthing
- System earthing
- Classification of supply

- Installation system earthing
- Earthing via neutral earthing compensator
- Distribution transformers
- Zig zag transformers
- Evaluation of earthing methods

Generator Voltage and Frequency Control

- Reactive power and voltage control
- Voltage control of generator loading at synchronizing
- Frequency control of generators loading at synchronizing

Generator Operation

- Synchronising of generators
- Load shedding
- Power factor

Generator Protection

- Generator connections and overview of typical protection
- Stator phase-fault protection for all size generators
- Phase protection for small generators that do not use differentials
- Phase-fault backup protection (51v) or (21)
- Stator ground-fault protection ground -fault protection for single medium or small WYE
- Ground -fault protection for very small, solidly grounded generators

- Generator off-line protection
- Reduced or lost excitation protection (40)
- Generator protection for system disturbances and operational hazards
- Cogeneration and non-utility “distributed” generation protection
- Generator operation under contingency conditions
- Shaft current
- Typical generator protection schemes of various ratings

Condition Monitoring and Data Collection

- Introduction
- Approaches based on mathematical models
- Reliability Centered Maintenance (RCM)
- Condition Based Maintenance (CBM)
- Partial discharge
- Insulation resistance monitoring
- DC HI-POT TEST
- Maximum allowable test voltage
- Measuring insulation degradation
- Capacitive charging current
- Resistive leakage current
- Energy dissipated
- Insulation power factor
- Insulation power factor standards

- Power factor test sets
- Outage for scheduled maintenance

Generator Maintenance

- Preventative maintenance
- Trouble shooting
- General procedure
- Generator does not produce voltage
- Generator produce low voltage
- Generator produce high voltage
- Generator voltage fluctuating
- Fault analysis for generator control circuit

Accreditation:

BTS attendance certificate will be issued to all attendees completing a minimum of 80% of the total course duration.