



Training Program:

Gas Turbines Operations, Maintenance & Inspection

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Introduction:

This course will provide technical information for those people who maintain the gas turbine engines. The goal of each training program is to build confidence based on knowledge and understanding. Engine System Familiarization and Maintenance Procedures are key focal points of each program. This course offers a firm understanding of the basic operations of all types of gas turbines. The objective of this course is to give participants an understanding of basic gas turbine operations and construction as well as a fundamental knowledge of proper operation, control and protection of the turbine and its accessory systems. The course does not include any discussions of generators.

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:

- Basic gas turbine operating cycle, Operating parameters and control
- Overview of gas turbine major components and equipment arrangements

- Fundamentals of gas turbine control and protection: start-up, speed, load, shutdown and temperature
- Protection features of the various turbine support systems such as the lubricating oil, hydraulic, variable inlet guide vanes, starting means and fuels
- Operating factors and considerations that affect maintenance intervals
- Engine nomenclature & functions, Engine systems operation
- Gas turbine principles and theory, Troubleshooting techniques through class discussions
- Maintenance and preventative maintenance, Inspection technique

Course Outline

- An overview of gas turbine
- Gas turbine cycle
- Performance
- Design consideration
- Major components
- Environmental effect
- Theoretical and actual cycle analysis
- Brayton cycle
- Combined cycle
- Compressor and turbine performance characteristics
- Performance characteristic
- Aerothermal equations

- Performance and mechanical standards
- Major variables for gas turbine application
- Rotor dynamics
- Major Components
- Centrifugal compressors
- Components
- Performance
- Surge
- Process
- Axial flow compressors
- Blade and cascade
- Airfoil theory
- Compressor stall
- Performance characteristics
- Radial- inflow turbines
- Description theory
- Performance of a radial –inflow turbine
- Axial- flow turbines
- Turbine geometry
- Impulse turbine
- Reaction turbine
- Turbine blade cooling
- Cooled turbine Aerodynamic

- Turbine looses
- Combustors
- Combustion terms
- Combustion chamber design
- Fuel atomization and ignition
- Typical combustor arrangement
- Air pollution problems
- Materials
- Fuel technology and fuel systems
- Materials
- General metallurgical behaviours in gas turbine
- Gas turbine material
- Compressor blades
- Forging and non-destructive Testing
- Coating, Fuels
- Fuel specifications
- Fuel properties
- Fuel treatments
- Heavy fuel
- Cleaning of turbine components
- Fuel economic
- Heat tracing of piping system
- Storage of liquids

- Auxiliary components and Accessories
- Bearings
- Bearing design principles
- Tilting pad journal bearing
- Bearing materials
- Bearing and shaft instabilities
- Thrust bearing
- Thrust bearing power loss
- Seals
- Noncontact seals
- Mechanical face seals
- Mechanical seal selection and application
- Seal systems
- Associated oil system
- Dry gas seals
- Gears
- Gear types
- Factors affecting gear design
- Installation and initial operation
- Installation, operation and maintenance
- Lubrication
- Basic oil system
- Lubrication selection

- Oil sampling and testing
- Contamination and filter selection
- Cleaning and flushing
- Lubrication management
- Spectrum analysis
- Vibration sensors
- Vibration measurements
- Vibration analysis
- Balancing
- Rotor imbalance
- Balancing procedures
- Application of balancing techniques
- Balancing machine
- Coupling and alignment
- Gear coupling
- Metal diaphragm coupling
- Metal disc coupling
- Shaft misalignment and correction
- Control system and instrumentation
- Control system
- Condition monitoring system
- Implementation of condition monitoring
- Life cycle cost

- Temperature measurements
- Pressure measurements
- Vibration measurements
- Failure diagnostics
- Mechanical problem diagnostics
- Maintenance techniques
- Philosophy of maintenance
- Training of personnel
- Tools and shop equipment
- Machine cleaning
- Hot section maintenance
- Compressor maintenance
- Bearing maintenance
- Coupling maintenance
- Repair and rehabilitation of turbo machinery
- Foundation
- Typical problem encountered in gas turbine