TRAINING TITLE

INTRODUCTION TO GAS TURBINE AND COMPRESSOR CONTROL

Training Duration

5 days

Training Venue and Dates

Ref. No. ME133	**Introduction to Gas Turbine and Compressor Control**	**5**	**5-9 May 2025**	**$5,500**	**DUBAI, UAE**

In any of the 4 or 5-star hotels. The exact venue will be informed later.

Training Fees

- **$5,500 per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Lunch**

Training Certificate

Define Management Consultants Certificate of course completion will be issued to all attendees.

TRAINING DESCRIPTION

The Introduction to Gas Turbine and Compressor Control course is designed to provide participants with fundamental knowledge and hands-on experience in the operation, control, and maintenance of gas turbines and compressors used in power generation, oil and gas, and industrial applications. Gas turbines and compressors are critical components in various energy systems, and understanding their control systems is essential for efficient operation, optimization, and troubleshooting. This course focuses on the control principles, operational strategies, and safety measures associated with gas turbines and compressors, including understanding the key control loops, performance monitoring, and fault diagnostics. The course will also cover the integration of these machines into broader power and industrial systems, as well as the role of control systems in optimizing their performance and minimizing downtime.

TRAINING OBJECTIVES

By end of course participants will be able to understand

- Understand Gas Turbine and Compressor Fundamentals: Learn the basic principles of gas turbine and compressor operation, including thermodynamics, cycle efficiency, and mechanical components.
- Identify Control Loops: Gain knowledge of the key control loops used in gas turbines and compressors, including speed control, fuel control, and load regulation.

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- Understand Control System Architecture: Familiarize with the architecture of control systems used in gas turbines and compressors, including DCS (Distributed Control Systems) and PLC-based control systems.
- Monitor and Analyze Performance: Learn how to monitor performance metrics (e.g., fuel consumption, pressure, temperature) and optimize the performance of gas turbines and compressors.
- Troubleshoot and Diagnose Issues: Gain practical skills in identifying common problems in gas turbine and compressor operations and applying corrective actions to improve performance.
- Apply Safety Protocols: Understand the safety measures and operational best practices required to ensure safe and reliable operation of gas turbines and compressors.
- Understand Integration with Other Systems: Learn how gas turbines and compressors are integrated into power plants, oil and gas facilities, and industrial applications.

WHO SHOULD ATTEND?

- Gas turbine and compressor operators
- Control system engineers and technicians
- Maintenance engineers and technicians
- Instrumentation and automation engineers
- Process engineers and energy managers
- Plant supervisors and managers
- Safety officers and environmental engineers
- Technical support and troubleshooting staff

COURSE PROGRAM

Day 1: Introduction to Gas Turbine and Compressor Fundamentals

- **Overview of Gas Turbines and Compressors**
  - Basic thermodynamics and principles of operation
  - Types of gas turbines and compressors: industrial, aero-derivative, and centrifugal
  - Main components of gas turbines: compressor, combustion chamber, turbine, and exhaust
  - Main components of compressors: impellers, blades, diffusers, and casing
  - The role of gas turbines and compressors in power generation, oil & gas, and industrial processes
- **Key Performance Indicators (KPIs) for Gas Turbines and Compressors**
  - Efficiency, pressure ratios, fuel consumption, and power output
  - Load regulation and speed control
  - Monitoring operating parameters: temperature, pressure, vibration, and flow rate

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- **Understanding the Gas Turbine and Compressor Cycles**
  - The Brayton cycle and its impact on gas turbine efficiency
  - The compression and expansion process in compressors

Day 2: Control Principles for Gas Turbines and Compressors

- **Control Loop Basics**
  - Introduction to control loops: open loop vs. closed loop control
  - Key control loops for gas turbines: speed control, fuel control, temperature regulation, and load regulation
  - Key control loops for compressors: pressure, temperature, and flow control
  - Proportional-Integral-Derivative (PID) control: tuning parameters for optimal performance
- **Control Systems in Gas Turbines and Compressors**
  - Overview of control systems: Distributed Control Systems (DCS) and Programmable Logic Controllers (PLC)
  - Control system architecture and signal flow in gas turbine and compressor systems
  - Control panel overview: HMI (Human-Machine Interface) and SCADA (Supervisory Control and Data Acquisition)
- **Startup and Shutdown Procedures**
  - The control sequence for safe and efficient startup of gas turbines and compressors
  - Shutdown protocols: safe stopping, emergency shutdown, and load rejection
  - Integration of gas turbines and compressors with other plant systems during startup and shutdown

Day 3: Performance Monitoring and Optimization

- **Key Parameters to Monitor**
  - Monitoring turbine and compressor performance: temperature, pressure, speed, vibration, and flow
  - Using sensors and transmitters to measure key parameters
  - Interpreting performance data: what the numbers tell you about system health
- **Troubleshooting Performance Issues**
  - Identifying causes of underperformance: fuel quality, load mismatch, mechanical wear, etc.
  - Strategies to optimize fuel efficiency and reduce emissions
  - Case studies: resolving common performance issues in gas turbines and compressors
- **Optimization Techniques**
  - Load optimization: balancing turbine and compressor loads

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- Fuel optimization strategies: reducing specific fuel consumption (SFC)
- Advanced performance optimization using control algorithms and adaptive control techniques

Day 4: Troubleshooting and Diagnostics

- **Common Gas Turbine and Compressor Failures**
  - Mechanical issues: bearing failure, blade damage, vibration, and misalignment
  - Control system failures: sensor malfunctions, software errors, and communication issues
  - Performance degradation: causes and remedies
- **Diagnostic Tools and Techniques**
  - Vibration analysis and its use in detecting mechanical issues
  - Temperature and pressure analysis to identify system abnormalities
  - Using fault codes and diagnostics from DCS/PLC systems
  - Preventive and predictive maintenance techniques

Day 5: Safety and Integration with Other Systems

- **Safety Protocols for Gas Turbines and Compressors**
  - Operational safety measures: fire prevention, explosion hazards, and handling toxic gases
  - Protecting the system from over-speed, over-temperature, and under-pressure conditions
  - Emergency shutdown systems (ESD) and safety interlocks
- **Safety and Risk Management**
  - Risk assessment and management techniques for gas turbines and compressors
  - Safety procedures and best practices for operators and maintenance staff
  - Regulatory standards and industry codes (e.g., NFPA, IEC, OSHA)
- **Integration with Power and Industrial Systems**
  - How gas turbines and compressors are integrated into power plants, oil and gas facilities, and industrial applications
  - Managing grid connection and synchronization with power systems
  - Coordination with other plant equipment (e.g., boilers, generators, cooling systems)
- **Future Trends and Developments in Gas Turbine and Compressor Control**
  - Emerging technologies in turbine and compressor control systems (e.g., digital twins, AI-based diagnostics)
  - Industry trends: higher efficiency, lower emissions, and smart grid integration
  - The impact of renewable energy integration on gas turbine and compressor operations

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NOTE:

Pre-& Post Tests will be conducted.

Case Studies, Group Exercises, Group Discussions, Last Day reviews, and assessments will be carried out.

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