Gas Turbine Operation, Maintenance and Troubleshooting Training Course



23 - 27 Nov 2026

Cape town

4600 € (Per Person)

Ref: #INM5185_277535

Course Introduction / Overview:

This comprehensive training course provides an in-depth exploration of gas turbine technology, from fundamental principles to advanced operational, maintenance, and troubleshooting strategies. In today's demanding industrial landscape, the reliability and efficiency of gas turbines are paramount for sectors like power generation and oil and gas. This program is meticulously designed to equip participants with the essential knowledge and practical skills required to ensure optimal performance and longevity of these critical assets. Drawing upon established engineering principles, such as those detailed by Meherwan P. Boyce in his seminal work, the "Gas Turbine Engineering Handbook," the course bridges theoretical understanding with real-world application. Participants will delve into the intricacies of the Brayton cycle, component functions, auxiliary systems, and sophisticated control mechanisms. BIG BEN Training Center has structured this curriculum to empower professionals to confidently manage the entire lifecycle of gas turbines, enhancing operational safety, minimizing downtime, and driving organizational excellence through superior asset management and diagnostic capabilities. This is not just a theoretical overview; it is a practical journey into the heart of turbomachinery.

Target Audience / This training course is suitable for:

- Operations Engineers and Supervisors.
- Maintenance Engineers and Technicians.
- Mechanical and Electrical Engineers.
- Plant Operators and Control Room Personnel.
- Rotating Equipment Specialists.
- Reliability and Condition Monitoring Engineers.
- Technical Managers and Project Engineers.
- Inspection and NDT Personnel.

Target Sectors and Industries:

- Power Generation and Utilities.
- Oil and Gas Production and Refining.
- Petrochemical and Chemical Processing.
- Manufacturing and Industrial Plants.
- Marine Propulsion and Offshore Platforms.
- Aerospace and Aviation Maintenance.
- Governmental bodies and regulatory agencies overseeing energy infrastructure.

Target Organizations Departments:

- Operations and Production.
- Maintenance and Reliability.
- Engineering and Technical Services.
- Asset Management and Integrity.
- Plant Management and Supervision.
- Health, Safety, and Environment (HSE).
- Project and Commissioning Teams.

Course Offerings:

By the end of this course, the participants will have able to:

- Analyze the fundamental principles and thermodynamic cycles of gas turbines.
- Identify the function and interaction of all major gas turbine components and auxiliary systems.
- Execute standard operating procedures for safe start-up, steady-state operation, and shutdown.
- Implement proactive and predictive maintenance strategies to enhance equipment reliability.
- Diagnose common operational problems and apply systematic troubleshooting techniques.
- Interpret performance data to optimize turbine efficiency and output.
- Understand the critical role of control, instrumentation, and protection systems.
- Apply best practices for borescope inspections and condition monitoring.
- Develop effective maintenance plans and outage management strategies.
- Conduct a root cause analysis for common gas turbine failures.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to foster a dynamic and engaging learning environment that maximizes knowledge retention and practical skill development. This course moves beyond traditional lecture-based instruction by integrating a blended learning approach. Sessions are highly interactive, featuring expert-led presentations, detailed case studies of real-world turbine failures, and collaborative group discussions where participants can share experiences and solve complex problems together. We emphasize a hands-on perspective through high-quality visual aids, schematic diagrams, and simulated troubleshooting scenarios that challenge participants to apply their learning in a controlled setting. The curriculum encourages active participation through Q&A sessions, practical exercises, and workshops focused on maintenance planning and fault diagnosis. Our instructors provide continuous feedback and facilitate a learning process where theoretical concepts are consistently linked to their practical applications in the field, ensuring that attendees leave with not only the "what" and "why" but also the "how" of effective gas turbine management.

Course Agenda (Course Units):

Unit One: Fundamentals of Gas Turbine Technology

- Introduction to Gas Turbine Theory and the Brayton Cycle.
- Classification and Application of Industrial Gas Turbines.
- Detailed Study of Major Components: Compressor Section.
- Detailed Study of Major Components: Combustion Section.
- Detailed Study of Major Components: Turbine Section.
- Understanding Gas Turbine Auxiliary Systems: Lube Oil, Fuel, and Cooling.
- Materials and Coatings Used in Gas Turbine Construction.

Unit Two: Gas Turbine Operation and Performance Monitoring

- Standard Procedures for Turbine Start-up, Synchronization, and Loading.
- Normal Operation and Steady-State Performance Monitoring.
- Controlled and Emergency Shutdown Procedures.
- Key Performance Indicators (KPIs) for Gas Turbines.
- Factors Affecting Turbine Performance, Efficiency, and Degradation.
- Basics of Gas Turbine Emissions and Control Technologies.
- Interpreting Operational Data and Control System Displays.

Unit Three: Maintenance Strategies and Inspection Techniques

- Introduction to Maintenance Philosophies: Preventive, Predictive, and Corrective.
- Developing a Comprehensive Gas Turbine Maintenance Plan.
- Borescope Inspection: Techniques, Tools, and Findings Interpretation.
- Hot Gas Path Inspection and Component Life Assessment.
- Compressor and Turbine Blade Cleaning and Maintenance.
- Alignment and Balancing Procedures for Turbomachinery.
- Planning and Management of Minor and Major Overhauls.

Unit Four: Troubleshooting and Fault Diagnosis

- A Systematic Approach to Gas Turbine Troubleshooting.
- Diagnosing Common Compressor and Turbine Section Faults.
- Troubleshooting Combustion System Issues: Flameouts and Instability.
- Analyzing and Resolving High Vibration and Bearing Problems.
- Investigating Lube Oil System Malfunctions.
- Troubleshooting Control and Instrumentation System Failures.
- Root Cause Analysis (RCA) Techniques for Turbine Incidents.

Unit Five: Advanced Diagnostics, Safety, and Lifecycle Management

- Advanced Vibration Analysis and Condition Monitoring Techniques.
- Lube Oil Analysis and Interpretation for Predictive Maintenance.
- Gas Turbine Protection Systems: Overspeed, Overtemperature, and Fire Protection.
- Hazard Identification and Safe Work Practices in Turbine Environments.
- Managing Spare Parts Inventory and Logistics.
- Strategies for Gas Turbine Upgrades, Retrofits, and Life Extension.
- Future Trends in Gas Turbine Technology and Maintenance.

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

Considering the rise of renewable energy sources, how can the operational flexibility and maintenance strategies of gas turbines be adapted to support a more dynamic and intermittent power grid?

What unique qualities does this course offer compared to other courses?

This training course distinguishes itself by offering a holistic and integrated perspective on gas turbine management, moving beyond siloed instruction on individual topics. While many programs focus separately on either operations or maintenance, this curriculum is built on the principle that operational excellence and maintenance reliability are intrinsically linked. We delve deep into the cause-and-effect relationships between operating decisions and their long-term impact on component health and maintenance requirements. The course emphasizes a diagnostic mindset, teaching participants not just to follow procedures but to critically analyze performance data and system behavior to preemptively identify issues. Our use of detailed, real-world case studies of turbine failures provides an unparalleled learning experience, allowing participants to dissect complex incidents and understand the chain of events leading to a fault. The content is structured to build a comprehensive skill set, from understanding the fundamental thermodynamics to mastering advanced troubleshooting and lifecycle management strategies, ensuring participants are equipped to enhance asset value and operational integrity in any industrial setting.