Gas Turbine Performance Optimization and Troubleshooting Training Course



18 - 22 Oct 2026

Doha

5500 € (Per Person)

Ref: #ERE9675_224122

Course Introduction / Overview:

This comprehensive training course provides an in-depth exploration of gas turbine technology, focusing on the critical areas of performance optimization and systematic troubleshooting. In an era where operational efficiency and reliability are paramount, mastering the intricacies of gas turbine performance is essential for minimizing costs and maximizing output. This program is designed to equip participants with the knowledge and skills to analyze performance data, identify sources of degradation, and implement effective optimization strategies. Drawing upon foundational principles outlined by experts like Meherwan P. Boyce in his seminal "Gas Turbine Engineering Handbook", the course bridges the gap between thermodynamic theory and real-world application. Participants will learn to diagnose complex operational issues, from compressor fouling to combustion instabilities, using a structured, analytical approach. BIG BEN Training Center has developed this curriculum to empower professionals to not only solve existing problems but also to proactively enhance turbine efficiency, extend component life, and ensure the safe and reliable operation of these critical assets. This course is the definitive guide for any professional seeking to achieve peak performance from their gas turbine systems.

Target Audience / This training course is suitable for:

- Operations Engineers and Managers.
- Maintenance Engineers and Technicians.
- Plant and Facility Managers.
- Performance and Efficiency Engineers.
- Control Room Operators.
- Inspection and Reliability Engineers.
- Technical Support Staff.
- Project Engineers involved with gas turbines.

Target Sectors and Industries:

- Power Generation and Utility Companies.
- Oil and Gas Production and Refining.
- Petrochemical and Chemical Processing Plants.
- Aerospace and Aviation Maintenance.
- Industrial Manufacturing Facilities.
- Marine Propulsion and Offshore Platforms.
- Governmental agencies and public sector utilities.

Target Organizations Departments:

- Operations and Production.
- Maintenance and Reliability.
- Engineering and Technical Services.
- Asset Management and Integrity.
- Health, Safety, and Environment (HSE).
- Plant Management and Site Operations.
- Process and Control Engineering.

Course Offerings:

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

- Analyze the fundamental thermodynamic principles governing gas turbine operation.
- Identify key performance parameters and establish baseline performance metrics.
- Evaluate the impact of ambient conditions and degradation on turbine efficiency.
- Implement effective strategies for compressor washing and performance recovery.
- Diagnose common operational problems using systematic troubleshooting techniques.
- Interpret performance data to predict potential failures and plan maintenance.
- Optimize combustion systems for improved efficiency and emissions control.
- Troubleshoot gas turbine control systems and auxiliary equipment effectively.
- Conduct a root cause analysis for complex gas turbine failures.
- Develop long-term strategies for performance enhancement and life assessment.

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 application. This course moves beyond traditional lectures by integrating a balanced mix of interactive presentations, detailed case studies drawn from real-world industrial scenarios, and collaborative group workshops. Participants will actively engage in problem-solving sessions where they can apply learned troubleshooting techniques to simulated operational issues. The curriculum emphasizes a hands-on approach, encouraging open discussions and knowledge sharing among peers and the instructor. Expert facilitators guide participants through complex topics like performance degradation analysis and root cause analysis, ensuring a deep understanding of the subject matter. Through a combination of theoretical instruction, practical exercises, and continuous feedback, the program ensures that attendees not only grasp the concepts but also gain the confidence to apply them directly to their operational challenges upon returning to their workplace. This immersive learning experience is structured to build tangible skills for immediate impact.

Course Agenda (Course Units):

Unit One: Gas Turbine Fundamentals and Operational Principles

- Introduction to gas turbine technology and applications.
- The Brayton cycle and its thermodynamic principles.
- Detailed review of major components: compressor, combustor, and turbine.
- Understanding gas turbine performance curves and maps.
- Key operational parameters and their significance.
- Auxiliary systems overview: fuel, lubrication, and cooling.
- Safety considerations in gas turbine operation and maintenance.

Unit Two: Performance Monitoring and Degradation Analysis

- Establishing baseline performance and key performance indicators (KPIs).
- Factors affecting gas turbine performance: ambient conditions and load.
- Understanding recoverable and non-recoverable degradation.
- Techniques for compressor fouling detection and analysis.
- Methods for online and offline compressor washing.
- Turbine section degradation: erosion, corrosion, and damage.
- Analyzing operational data for performance trend monitoring.

Unit Three: Strategies for Performance Optimization and Enhancement

- Techniques for improving gas turbine heat rate and output.
- Combustion system tuning for efficiency and emissions control.
- The role of Turbine Inlet Temperature (TIT) in performance.
- Advanced optimization strategies: inlet air cooling and filtration.
- Upgrades and retrofits for performance enhancement.
- Optimizing part-load and transient operation performance.
- Integrating performance monitoring with asset management strategies.

Unit Four: Systematic Troubleshooting of Core Turbine Systems

- Developing a logical and structured troubleshooting methodology.
- Diagnosing common compressor section problems and failures.
- Troubleshooting combustion system issues: flameout and instabilities.
- Identifying and addressing turbine section faults and damage.
- Analyzing and resolving high vibration and rotor dynamic issues.
- Troubleshooting startup, shutdown, and load change sequences.
- Utilizing operational data and alarms for fault diagnosis.

Unit Five: Advanced Diagnostics, Auxiliary Systems, and Case Studies

- Advanced diagnostic tools: vibration analysis and borescope inspection.
- Troubleshooting fuel and lubrication system malfunctions.
- Diagnosing issues within the gas turbine control and instrumentation systems.
- Conducting effective Root Cause Analysis (RCA) for major failures.
- Review of real-world case studies on performance and failure incidents.
- Developing proactive maintenance strategies based on performance data.
- Final review, open forum, and course assessment.

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 advanced performance optimization and predictive maintenance extend the economic viability and strategic importance of existing gas turbine fleets?

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

This course distinguishes itself by offering a holistic and integrated perspective on gas turbine management, moving beyond siloed instruction on either performance or troubleshooting. Its core strength lies in teaching participants how to intrinsically link performance data with maintenance and reliability outcomes. Unlike programs that focus merely on identifying problems, this curriculum emphasizes a deep dive into root cause analysis, equipping professionals with the analytical framework to prevent recurrence rather than just fixing symptoms. The content is meticulously structured to build a strong theoretical foundation based on established engineering principles before transitioning into advanced, practical application. We explore not just the "what" but the "why" behind performance degradation and system failures. Furthermore, the course integrates discussions on advanced operational strategies and the economic impact of efficiency, providing a managerial perspective that is often absent in purely technical training. The use of diverse, real-world case studies ensures that the troubleshooting and optimization techniques discussed are not just theoretical but are proven and applicable in complex industrial environments.