Centrifugal Pump Operation, Maintenance and Troubleshooting Training Course



23 - 27 Nov 2026

Cape town

4600 € (Per Person)

Ref: #INM6158_277439

Course Introduction / Overview:

This comprehensive course provides an in-depth exploration of centrifugal pump technology, from fundamental principles to advanced troubleshooting and reliability strategies. In today's industrial landscape, the efficient and reliable operation of pumping systems is critical to minimizing downtime and maximizing productivity. This program is designed to equip participants with the practical skills and theoretical knowledge necessary to master the entire lifecycle of centrifugal pumps. Drawing upon established principles from authorities like Igor J. Karassik, a key author of the seminal "Pump Handbook", the curriculum delves into pump hydraulics, component functions, and system interactions. Participants will move beyond reactive repairs to embrace a proactive maintenance mindset, learning to identify potential failures before they occur. BIG BEN Training Center has structured this training to provide a holistic understanding, ensuring that every attendee can confidently manage pump operation, implement effective maintenance schedules, and diagnose complex problems with precision. The course integrates real-world case studies and best practices to bridge the gap between theory and on-the-job application, fostering a culture of operational excellence and asset reliability within your organization.

Target Audience / This training course is suitable for:

- Mechanical Engineers and Technicians.
- Maintenance and Reliability Professionals.
- Plant Operators and Process Technicians.
- Maintenance Planners and Schedulers.
- Rotating Equipment Engineers.
- Operations and Maintenance Supervisors.
- Engineering and Technical Managers.
- Service Technicians and Field Engineers.

Target Sectors and Industries:

- Oil and Gas Production and Refining.
- Power Generation and Utilities.
- Water and Wastewater Treatment Facilities.
- Chemical and Petrochemical Processing.
- Pharmaceutical Manufacturing.
- Food and Beverage Production.
- Mining and Mineral Processing.
- Governmental bodies and public sector utilities.
- General Manufacturing and Industrial Plants.

Target Organizations Departments:

- Maintenance and Reliability.
- Plant Operations.
- Engineering and Technical Services.
- Asset Management.
- Production and Manufacturing.
- Facilities Management.
- Health, Safety, and Environment (HSE).
- Project Management.

Course Offerings:

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

- Identify different types of centrifugal pumps and their main components.
- Interpret pump performance curves to optimize operation.
- Implement best practices for pump startup, shutdown, and monitoring.
- Execute precise pump alignment and balancing procedures.
- Develop and manage effective preventive and predictive maintenance programs.
- Diagnose and troubleshoot common pump failures like cavitation and vibration.
- Conduct root cause failure analysis for recurring pump issues.
- Select, install, and maintain mechanical seals and packing systems.
- Apply API standards relevant to centrifugal pump maintenance and repair.
- Enhance pump system energy efficiency and overall reliability.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to be highly interactive and participant-centered, ensuring maximum knowledge retention and practical skill development. We move beyond traditional lectures by incorporating a blended learning approach that includes detailed presentations, dynamic group discussions, and collaborative problem-solving sessions. A significant portion of the course is dedicated to analyzing real-world case studies of pump failures, allowing participants to apply theoretical concepts to tangible industrial scenarios. Interactive workshops will challenge attendees to work in teams to troubleshoot simulated pump problems, fostering critical thinking and communication skills. The instructor will facilitate these activities, providing expert guidance and personalized feedback to each participant. The learning environment encourages open dialogue, where attendees can share their own professional experiences and challenges, creating a rich and collaborative educational experience. This hands-on, practical approach ensures that participants leave the course not just with new knowledge, but with the confidence to apply it directly to their work environment.

Course Agenda (Course Units):

Unit One: Fundamentals of Centrifugal Pumps and Pumping Systems

- Introduction to centrifugal pump theory and classifications.
- Key components and their functions: impellers, volutes, casings, and shafts.
- Understanding basic fluid dynamics and hydraulic principles.
- Reading and interpreting pump technical drawings and P&IDs.
- Pump materials of construction and their applications.
- Introduction to pump drivers: electric motors and engines.
- Fundamentals of pump system design and layout.

Unit Two: Efficient Pump Operation and Performance Monitoring

- Understanding and using pump performance curves.
- Calculating Total Dynamic Head (TDH) and Net Positive Suction Head (NPSH).
- Best practices for pump startup and shutdown procedures.
- Techniques for routine operational monitoring and data logging.
- Identifying and preventing pump cavitation and its effects.
- Managing pump operation in series and parallel configurations.
- Strategies for optimizing pump energy efficiency.

Unit three: Proactive Maintenance and Mechanical Seal Technology

- Developing a comprehensive preventive maintenance (PM) program.
- Lubrication principles and best practices for bearings.
- Precision shaft alignment techniques: dial indicator and laser methods.
- Principles of rotor balancing and its importance.
- Detailed study of mechanical seals: types, selection, and installation.
- Understanding and maintaining gland packing systems.
- Bearing maintenance, inspection, and replacement procedures.

Unit Four: Systematic Troubleshooting and Failure Analysis

- A systematic approach to diagnosing pump problems.
- Troubleshooting common issues: low flow, low pressure, and excessive noise.
- Analyzing and mitigating pump vibration.
- Investigating and resolving seal and bearing failures.
- Conducting Root Cause Failure Analysis (RCFA) for pumps.
- Techniques for non-destructive testing (NDT) in pump inspection.
- Documenting failures and implementing corrective actions.

Unit Five: Advanced Diagnostics, Reliability, and Safety Practices

- Introduction to predictive maintenance (PdM) technologies.
- Fundamentals of vibration analysis for condition monitoring.
- Application of infrared thermography in pump inspection.
- Overview of relevant API standards (e.g., API 610).
- Implementing a reliability-centered maintenance (RCM) strategy.
- Safety procedures for pump maintenance and operation (LOTO).
- Future trends in pump technology, including smart pumps and IIoT.

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 IIoT and predictive analytics, how might the traditional role of a maintenance technician evolve into that of a reliability strategist for pumping systems?

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

This course distinguishes itself by offering a holistic and deeply practical curriculum that transcends basic operational training. While other programs may focus narrowly on either maintenance or operation, this course integrates these disciplines with advanced diagnostics and reliability principles. We emphasize a systematic, problem-solving methodology, teaching participants not just how to fix a pump, but how to conduct a thorough root cause failure analysis to prevent recurrence. The content is grounded in established engineering principles, such as those found in foundational texts, yet it is forward-looking, incorporating modern techniques like vibration analysis, thermography, and the principles of reliability-centered maintenance. The instructional design prioritizes interactive learning through complex, real-world case studies and collaborative troubleshooting exercises, ensuring that participants develop tangible skills. This approach moves beyond theoretical knowledge to build diagnostic intuition and strategic thinking, empowering attendees to become key contributors to their organization's asset management and operational excellence initiatives, thereby maximizing equipment lifespan and minimizing costly downtime.