Process Equipment Sizing, Selection, and Maintenance Training Course



01 - 05 Nov 2026

Manama

4400 € (Per Person)

Ref: #ACE8603_252481

Course Introduction / Overview:

The strategic sizing, selection, and maintenance of process equipment form the bedrock of operational excellence and plant profitability. In any industrial facility, the performance of pumps, compressors, heat exchangers, and vessels directly impacts efficiency, safety, and the bottom line. This comprehensive training course is meticulously designed to provide a holistic understanding of the entire equipment lifecycle, from initial design calculations to long-term reliability strategies. Drawing upon foundational principles articulated by industry experts like John M. Campbell in his seminal work "Gas Conditioning and Processing," the program bridges the critical gap between theoretical engineering and practical application. Participants will delve into systematic methodologies for equipment sizing, learn to conduct rigorous technical and commercial evaluations for selection, and master modern maintenance philosophies such as Reliability-Centered Maintenance (RCM). BIG BEN Training Center has developed this course to empower professionals with the skills to make informed decisions that optimize asset performance, minimize lifecycle costs, and ensure regulatory compliance, thereby driving sustainable success for their organizations.

Target Audience / This training course is suitable for:

- Process Engineers.
- Mechanical and Maintenance Engineers.
- Reliability and Integrity Engineers.
- Project and Plant Engineers.
- Operations and Production Supervisors.
- Technical Managers.
- Procurement and Purchasing Professionals.
- Inspection and Quality Control Personnel.
- Junior engineers entering the process industries.

Target Sectors and Industries:

- Oil and Gas Production and Refining.
- Petrochemical and Chemical Manufacturing.
- Power Generation and Utilities.
- Pharmaceuticals and Biotechnology.
- Food and Beverage Processing.
- Water and Wastewater Treatment.
- Heavy Manufacturing and Mining.
- Governmental bodies and regulatory agencies.

Target Organizations Departments:

- Engineering and Design.
- Maintenance and Reliability.
- Plant Operations and Production.
- Project Management.
- Procurement and Supply Chain.
- Health, Safety, and Environment (HSE).
- Asset Management and Integrity.
- Technical Services.

Course Offerings:

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

- Apply fundamental engineering principles to accurately size various types of process equipment.
- Develop detailed equipment specification sheets for procurement.
- Evaluate vendor proposals based on technical compliance and lifecycle cost analysis.
- Select the most appropriate equipment for specific process applications.
- Implement preventive and predictive maintenance strategies to enhance equipment reliability.
- Conduct Root Cause Failure Analysis (RCFA) to prevent recurring equipment issues.
- Optimize maintenance schedules and spare parts management for critical assets.
- Understand the role of key industry codes and standards like API and ASME.
- Integrate modern condition monitoring techniques into maintenance programs.

Course Methodology:

The training methodology employed by BIG BEN Training Center is designed for maximum knowledge retention and practical application. This immersive program moves beyond traditional lectures to foster a dynamic and interactive learning environment. Participants will engage in hands-on workshops focused on real-world equipment sizing calculations and problem-solving. The course heavily utilizes industry-specific case studies, allowing attendees to analyze equipment selection successes and failures from various sectors. Collaborative group exercises will challenge teams to develop maintenance strategies for hypothetical plant scenarios, encouraging peer-to-peer learning and the exchange of diverse perspectives. Interactive sessions, facilitated by an experienced instructor, will include Q&A segments, open discussions on operational challenges, and practical demonstrations of analytical techniques. Continuous feedback is provided throughout the course to ensure participants are mastering the concepts and can confidently apply their new skills to their professional roles upon completion.

Course Agenda (Course Units):

Unit One Fundamentals of Process Equipment and Engineering Principles

- Introduction to process flow diagrams (PFDs) and piping and instrumentation diagrams (P&IDs).
- Key process variables and their impact on equipment design.
- Overview of major process equipment categories and their functions.
- Understanding key industry standards (API, ASME, TEMA).
- Principles of fluid mechanics and thermodynamics in equipment design.
- Material selection criteria based on process conditions and corrosion.
- The link between process design, equipment selection, and plant safety.

Unit Two Sizing Methodologies for Core Process Equipment

- Centrifugal and positive displacement pump sizing and calculations.
- Compressor sizing, performance curves, and selection criteria.
- Shell and tube heat exchanger thermal and mechanical design principles.
- Sizing of pressure vessels, drums, and storage tanks.
- Control valve sizing and characteristics (Cv calculations).
- Piping sizing for single-phase and two-phase flow.
- Pressure relief device sizing and selection according to API standards.

Unit Three Equipment Selection, Procurement, and Installation

- Developing comprehensive equipment data sheets and specifications.
- The procurement cycle for process equipment.
- Technical bid evaluation and vendor qualification processes.
- Lifecycle Cost Analysis (LCCA) for equipment selection.
- Understanding vendor documentation and drawings.
- Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT).
- Best practices for equipment installation, commissioning, and startup.

Unit Four Modern Maintenance Strategies and Philosophies

- Evolution from reactive to proactive maintenance.
- Developing a robust Preventive Maintenance (PM) program.
- Principles and implementation of Predictive Maintenance (PdM).
- Introduction to Reliability-Centered Maintenance (RCM) methodology.
- Understanding Total Productive Maintenance (TPM) concepts.
- Failure Modes and Effects Analysis (FMEA) for risk assessment.
- Integrating maintenance planning with operational goals.

Unit Five Advanced Reliability, Troubleshooting, and Optimization

- Introduction to condition monitoring techniques (vibration analysis, thermography, oil analysis).
- Root Cause Failure Analysis (RCFA) tools and techniques.
- Troubleshooting common problems in pumps, compressors, and heat exchangers.
- Spare parts management and inventory optimization strategies.
- Managing maintenance during plant turnarounds and shutdowns.
- The role of IIoT and digitalization in modern maintenance.
- Developing a continuous improvement culture for asset management.

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:

In an era of rapid technological advancement and IIoT, how does the traditional trade-off between initial capital cost (CAPEX) and long-term operational cost (OPEX) evolve in equipment selection?

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

This course distinguishes itself by offering a uniquely integrated perspective on the entire asset lifecycle, a crucial approach often fragmented in other training programs. While many courses focus narrowly on either design calculations or maintenance tactics, this program meticulously connects the dots between the two. It demonstrates how decisions made during the initial sizing and selection phase have profound, long-term consequences on equipment reliability, maintainability, and overall operational expenditure. The curriculum is built not just on theoretical formulas but on a strategic decision-making framework, emphasizing the "why" behind the "how." Participants learn not only to perform sizing calculations but also to critically assess competing vendor technologies through the lens of lifecycle cost analysis and reliability engineering. By blending the disciplines of process design, mechanical engineering, and asset management, the course provides a holistic, 360-degree view that empowers professionals to move beyond siloed thinking and make choices that optimize performance and profitability from commissioning to decommissioning.