Industrial HVAC Systems Design, Operation and Maintenance Training Course



25 - 29 Oct 2026

Manama

4400 € (Per Person)

Ref: #INM3214_228886

Course Introduction / Overview:

This comprehensive course provides an in-depth exploration of industrial Heating, Ventilation, and Air Conditioning (HVAC) systems, covering the entire lifecycle from initial design and load calculation to efficient operation and strategic maintenance. Unlike standard commercial systems, industrial HVAC must meet rigorous demands for process control, air quality, and energy efficiency, often in challenging environments. This program, offered by BIG BEN Training Center, is meticulously structured to bridge the gap between theoretical knowledge and practical application. Participants will delve into the core principles of psychrometrics, thermodynamics, and fluid mechanics as they apply to large-scale systems. Drawing upon foundational concepts detailed in authoritative texts like "HVAC Analysis and Design" by Faye C. McQuiston, the curriculum emphasizes real-world problem-solving. The course addresses critical topics such as chiller plant optimization, Building Automation Systems (BAS) integration, and adherence to key industry standards, including those set by ASHRAE. By mastering these complex elements, professionals can ensure system reliability, minimize operational costs, and maintain safe, productive industrial environments. This training is essential for anyone aiming to achieve excellence in managing the complexities of modern industrial HVAC infrastructure.

Target Audience / This training course is suitable for:

- HVAC Engineers and Technicians.
- Facility Managers and Supervisors.
- Maintenance and Operations Personnel.
- Project Managers and Engineers.
- Energy Managers and Consultants.
- Plant and Manufacturing Engineers.
- Building Automation System Specialists.
- Design and Application Engineers.

Target Sectors and Industries:

- Manufacturing and Industrial Plants.
- Pharmaceutical and Biotechnology Facilities.
- Data Centers and Telecommunication Hubs.
- Oil and Gas Refineries and Petrochemical Plants.
- Food and Beverage Processing Industries.
- Hospitals and Large-Scale Healthcare Facilities.
- Government Agencies and Public Sector Buildings.
- Aerospace and Automotive Manufacturing.

Target Organizations Departments:

- Facilities Management and Maintenance.
- Engineering and Technical Services.
- Operations and Production.
- Project Management and Capital Projects.
- Health, Safety, and Environment (HSE).
- Energy Management and Sustainability.
- Quality Assurance and Control.
- Procurement and Asset Management.

Course Offerings:

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

- Analyze and perform industrial heating and cooling load calculations accurately.
- Select appropriate HVAC equipment and components for specific industrial applications.
- Design efficient and effective air distribution and piping systems.
- Develop and implement robust HVAC control strategies using Building Automation Systems (BAS).
- Master the principles of chiller plant operation and optimization for maximum efficiency.
- Create comprehensive preventive and predictive maintenance plans for industrial HVAC systems.
- Troubleshoot common operational problems in chillers, boilers, and air handling units.
- Apply ASHRAE standards to ensure system compliance, safety, and performance.
- Evaluate the lifecycle cost of HVAC systems to make informed investment decisions.
- Implement energy conservation measures to reduce operational expenditures.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to foster a dynamic and engaging learning environment that goes beyond traditional lectures. This course employs a blended approach, combining expert-led presentations with interactive group discussions, allowing participants to share experiences and solve problems collaboratively. A significant portion of the training is dedicated to practical application through real-world case studies of industrial HVAC challenges, from design flaws to operational inefficiencies. Participants will work in teams on hands-on exercises and workshops that simulate system design, troubleshooting scenarios, and maintenance planning. This active learning model is reinforced with detailed video materials, system diagrams, and practical demonstrations. The instructor will facilitate sessions that encourage critical thinking and provide personalized feedback to ensure concepts are not just learned but mastered. This immersive methodology ensures that participants leave with tangible skills and the confidence to apply them directly to their professional roles, improving system performance and operational reliability.

Course Agenda (Course Units):

Unit One: Fundamentals of Industrial HVAC Systems

- Introduction to Industrial HVAC and Its Critical Role.
- Core Principles of Thermodynamics, Heat Transfer, and Fluid Mechanics.
- Understanding the Psychrometric Chart and Air Properties.
- Key Components of Industrial HVAC Systems (Chillers, Boilers, AHUs, Cooling Towers).
- Types of Refrigerants and Refrigeration Cycles.
- Health and Safety Regulations in HVAC Operations.
- Introduction to ASHRAE Standards and Guidelines.

Unit Two: HVAC System Design and Load Calculation

- Industrial Cooling and Heating Load Calculation Methodologies.
- Ventilation Requirements for Industrial and Special-Use Spaces.
- Air Distribution Systems Design: Ductwork Sizing and Layout.
- Piping System Design for Chilled and Hot Water.
- Selection of Chillers, Boilers, and Air Handling Units (AHUs).
- Designing for Energy Efficiency and Sustainability.
- Control System Fundamentals and Component Selection.

Unit Three: System Operation and Energy Management

- Optimizing Chiller and Boiler Plant Operations.
- Advanced Control Strategies for Energy Conservation.
- Building Automation Systems (BAS) and HVAC Integration.
- Variable Air Volume (VAV) System Operation and Control.
- Monitoring and Verifying HVAC System Performance.
- Developing an Effective Energy Management Program.
- Commissioning and Handover of HVAC Systems.

Unit Four: Maintenance and Troubleshooting Strategies

- Developing a Preventive Maintenance (PM) Program for HVAC Equipment.
- Introduction to Predictive Maintenance Technologies (Vibration Analysis, Thermography).
- Troubleshooting Common Problems in Centrifugal and Screw Chillers.
- Diagnosing Issues in Boilers and Steam Systems.
- Solving Air Distribution and Air Quality Problems.
- Maintenance of Cooling Towers and Water Treatment.
- Systematic Fault Diagnosis and Root Cause Analysis Techniques.

Unit Five: Advanced Topics and Modern HVAC Technologies

- HVAC System Retrofitting and Modernization Projects.
- Variable Refrigerant Flow (VRF) Systems in Industrial Settings.
- Geothermal and Other Renewable Energy HVAC Solutions.
- Indoor Air Quality (IAQ) Management and Filtration Technologies.
- Lifecycle Cost Analysis for HVAC Systems.
- The Future of HVAC: IoT, AI, and Smart Systems.
- Final Project: Developing a Comprehensive HVAC Management Plan.

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 rising energy costs and stringent environmental regulations, how can facility managers balance the high initial investment in sustainable HVAC technologies against the long-term operational savings and compliance benefits?

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

This course distinguishes itself by offering a holistic, lifecycle-based perspective specifically tailored to the industrial sector, a focus often overlooked in general HVAC training. While other programs may separate design, operation, and maintenance into distinct subjects, this curriculum integrates them into a unified framework, reflecting how these functions are interconnected in real-world industrial environments. The content moves beyond theoretical principles to emphasize practical, actionable strategies for troubleshooting complex systems, optimizing energy consumption in large-scale facilities, and implementing robust predictive maintenance programs. It heavily references and aligns with critical industry benchmarks, particularly ASHRAE standards, ensuring the skills learned are current, compliant, and directly applicable. Furthermore, the course structure encourages participants to analyze the total cost of ownership, not just the initial capital expenditure, fostering a strategic mindset essential for long-term asset management. The emphasis on case studies drawn from diverse industrial settings from pharmaceutical cleanrooms to heavy manufacturing plants provides unparalleled insight into solving unique and challenging operational problems.