

Course No. 1534

HVAC Energy Efficiency & Optimization Training Course

**HVAC, REFRIGERATION & BUILDING SERVICES
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS**

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The HVAC Energy Efficiency & Optimization Training Course is a specialized professional program designed to develop the technical and managerial capabilities required to improve energy performance, operational efficiency, and reliability across modern heating, ventilation, and air conditioning systems. The course focuses on practical methods for evaluating HVAC energy consumption, identifying operational losses, assessing equipment performance, and implementing optimization strategies that support efficient and sustainable facility operations.

The program examines the relationship between HVAC system design, equipment selection, operating conditions, control strategies, maintenance practices, and overall energy consumption. Participants explore the factors that influence HVAC efficiency, including thermal loads, supply and return temperatures, airflow and water flow rates, equipment loading, operating schedules, control settings, and equipment condition. This approach enables organizations to move from conventional operation toward data-driven energy and performance management.

The course provides detailed coverage of the performance of major HVAC equipment, including chillers, pumps, fans, cooling towers, air handling units, heat exchangers, and other air and water distribution components. Participants learn how to interpret operating measurements and performance indicators to identify inefficiencies, investigate abnormal conditions, and develop practical improvements without compromising thermal comfort, equipment reliability, or operational continuity.

Particular emphasis is placed on HVAC controls, building automation, energy monitoring, load management, equipment sequencing, operating schedules, and preventive maintenance. Participants also explore how Building Management Systems can support energy analysis and continuous optimization. Through practical exercises and workplace-oriented scenarios, the HVAC Energy Efficiency & Optimization Training Course enables professionals to develop actionable strategies for reducing energy waste, improving equipment performance, and strengthening long-term facility management.

Objectives

- Analyze the principal factors affecting energy consumption in HVAC systems during the course.
- Evaluate the performance of major HVAC equipment using operating measurements and appropriate efficiency indicators.
- Apply thermal load principles to identify opportunities for improving HVAC system operation.
- Analyze energy consumption, temperature, pressure, and flow data to identify sources of operational waste.
- Evaluate HVAC control strategies and automation settings against actual building load requirements.
- Develop practical optimization strategies for chillers, pumps, fans, cooling towers, and air handling systems.
- Apply improved operating schedules, setpoints, and load management techniques to enhance system efficiency.
- Assess the impact of preventive and corrective maintenance on HVAC energy performance and equipment reliability.
- Analyze air and water distribution systems to identify losses and opportunities for performance improvement.
- Use Building Management System data to monitor HVAC performance and energy consumption.
- Design a practical HVAC energy efficiency improvement plan supported by measurable performance indicators.
- Develop continuous improvement practices for maintaining HVAC energy performance and operational reliability.

Who Should Attend

This course is designed for engineers, technical specialists, and professionals responsible for the design, operation, maintenance, optimization, and management of HVAC systems. It is particularly suitable for HVAC engineers, mechanical engineers, refrigeration engineers, energy engineers, facilities engineers, operations and maintenance engineers, HVAC technicians, maintenance supervisors, building automation specialists, and professionals involved in energy performance management.

The program is also highly relevant to facilities managers, engineering managers, maintenance

managers, energy managers, project managers, asset management professionals, sustainability specialists, consultants, commissioning professionals, and technical contractors. It is applicable to professionals responsible for HVAC systems in government buildings, commercial properties, industrial facilities, hospitals, hotels, airports, educational institutions, data centers, and large infrastructure projects.

The course is also suitable for executives, department heads, and decision makers who need to understand the relationship between HVAC performance, energy consumption, operating costs, maintenance effectiveness, and facility reliability. It provides a practical perspective for evaluating improvement opportunities and making informed technical and operational decisions based on equipment performance data and energy efficiency indicators.

Learning Outcomes

- Explain the fundamental principles of energy efficiency in heating, ventilation, and air conditioning systems.
- Identify major sources of energy consumption and operational waste within HVAC installations.
- Analyze the performance of chillers, pumps, fans, cooling towers, and air handling equipment.
- Interpret temperature, pressure, flow, and energy consumption data to evaluate HVAC performance.
- Assess the impact of thermal loads and operating conditions on HVAC energy consumption.
- Identify opportunities to optimize temperature setpoints, equipment schedules, and load management.
- Analyze air and water distribution systems to identify performance losses and inefficiencies.
- Use Building Management System data to monitor equipment performance and detect operating deviations.
- Apply maintenance practices that help preserve HVAC equipment efficiency and reliability.
- Evaluate the impact of HVAC controls and automation on energy consumption and thermal comfort.
- Develop key performance indicators for monitoring HVAC energy and operational performance.
- Prepare a practical energy efficiency improvement plan for an existing HVAC installation.

Course Outline

DAY 01

HVAC Energy Efficiency Fundamentals and Performance Analysis

- Fundamentals of energy efficiency in heating, ventilation, and air conditioning systems
- Relationship between thermal loads and HVAC energy consumption
- Major HVAC components and their energy consumption characteristics
- HVAC equipment efficiency indicators and performance parameters
- Operating factors affecting HVAC system efficiency
- Impact of temperature, humidity, airflow, and water flow on performance
- Relationship between HVAC design, operation, maintenance, and energy efficiency
- Identification of common sources of energy waste
- Fundamentals of energy measurement and operational data collection
- Key performance indicators for HVAC systems

PRACTICAL APPLICATION

Analyze a representative HVAC system and identify major energy consumption and loss points

DAY 02

Optimization of Cooling Equipment and Distribution Systems

- Evaluation of chiller performance and central cooling systems
- Compressor and heat exchanger performance analysis
- Optimization of chilled water pumps and distribution systems
- Fan efficiency and air distribution optimization
- Cooling tower performance and energy efficiency
- Analysis of chilled water supply and return temperatures
- Impact of fouling, scaling, and heat transfer deterioration on equipment efficiency
- Optimization of airflow and water flow rates
- Variable-load operation and equipment efficiency

DAY 02 — CONTINUED

- Equipment sequencing and load-based operation
- Identification of improvement opportunities in existing HVAC equipment

PRACTICAL APPLICATION

Analyze equipment operating data and develop recommendations for improving system efficiency

DAY 03

HVAC Controls, Automation, Load Management, and Energy Monitoring

- Fundamentals of HVAC control strategies
- Temperature setpoints and operating parameters
- Occupancy-based scheduling and equipment operation
- Demand-based HVAC control
- Variable-speed control for fans and pumps
- Chiller sequencing and multiple-equipment operation
- Load management and equipment staging
- Role of Building Management Systems in HVAC energy efficiency
- Energy monitoring through building automation systems
- Analysis of alarms, trends, and operating data
- Using real-time and historical data to identify optimization opportunities

PRACTICAL APPLICATION

Develop an HVAC control and operating strategy designed to improve energy performance in a central cooling system

DAY 04

Maintenance, Performance Diagnostics, and Operational Optimization

- Relationship between HVAC maintenance and energy efficiency
- Preventive maintenance requirements for HVAC and refrigeration equipment
- Condition-based maintenance principles
- Inspection and cleaning of filters, coils, and heat exchangers
- Impact of refrigerant leakage and improper charge on system efficiency
- Inspection of fans, motors, belts, pumps, and associated components
- Diagnosis of reduced cooling performance and excessive energy consumption
- Using operating measurements for performance troubleshooting
- Identification of root causes of inefficient HVAC operation
- Optimization of operating and maintenance procedures
- Performance verification following maintenance and corrective work

PRACTICAL APPLICATION

Investigate a simulated HVAC performance problem and develop a corrective improvement plan

DAY 05

Advanced HVAC Optimization and Energy Performance Management

- Advanced strategies for improving HVAC energy efficiency
- Analysis of building energy consumption patterns
- Optimization of HVAC operation according to actual building loads
- Demand management and reduction of unnecessary operating hours
- Integration of HVAC systems with energy management practices
- Using Building Management Systems for continuous performance optimization
- Development and monitoring of HVAC energy performance indicators
- Establishing energy efficiency improvement plans and performance targets
- Evaluation of operational and technical energy-saving measures

DAY 05 — CONTINUED

- Integration of energy efficiency with facility management and maintenance strategies
- Continuous improvement and long-term HVAC performance management

FINAL WORKSHOP

Develop an integrated HVAC energy efficiency and optimization plan for an existing facility and establish measurable performance indicators

Register or Request More Information

Course page: <https://quest-training.com/courses/hvac-energy-efficiency-optimization-training-course>

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