

Course No. 1529

Refrigeration Systems Design & Maintenance Training Course

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

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The Refrigeration Systems Design & Maintenance Training Course provides a comprehensive professional program focused on the engineering principles, system design considerations, operation, maintenance, troubleshooting, and performance optimization of modern refrigeration systems. The course develops a practical understanding of refrigeration cycles, major equipment, system configurations, refrigerants, heat transfer, controls, and maintenance strategies required for reliable and efficient refrigeration performance.

Refrigeration systems are essential across commercial, industrial, food processing, cold storage, pharmaceutical, healthcare, hospitality, logistics, manufacturing, and energy-intensive facilities. Effective refrigeration system design and maintenance directly influence temperature control, product and process integrity, equipment reliability, energy consumption, operational continuity, and asset lifecycle performance. A structured approach to refrigeration engineering therefore supports both technical performance and broader organizational objectives.

This Refrigeration Systems Design & Maintenance Training Course examines the complete refrigeration system, including compressors, condensers, evaporators, expansion devices, receivers, filters, pumps, fans, piping, insulation, controls, and safety devices. Participants will explore how these components interact under different operating conditions and how design decisions influence capacity, efficiency, reliability, and maintainability.

The course places strong emphasis on practical troubleshooting and maintenance. Participants will learn how to interpret operating parameters, identify abnormal conditions, investigate common refrigeration failures, assess system performance, and establish preventive and predictive maintenance practices. The program also addresses refrigerant management, heat exchanger performance, pressure and temperature control, system commissioning, and energy efficiency.

By connecting refrigeration design with operation, maintenance, troubleshooting, and energy management, the course enables engineers, technicians, supervisors, and facility professionals to make better technical decisions throughout the lifecycle of refrigeration assets. The approach is suitable for organizations seeking to improve system reliability, reduce avoidable failures, optimize energy use, and maintain stable refrigeration performance.

Objectives

- Analyze the refrigeration cycle and identify the function and interaction of major refrigeration system components during the training program.
- Evaluate refrigeration system configurations and determine their suitability for different commercial and industrial applications.
- Apply refrigeration design principles to assess cooling capacity, operating conditions, heat transfer requirements, and equipment selection.
- Evaluate compressor, condenser, evaporator, and expansion device performance using relevant temperature, pressure, and flow parameters.
- Analyze refrigerant circuits and assess the effects of refrigerant charge, pressure, temperature, and flow on system performance.
- Apply systematic troubleshooting techniques to identify mechanical, electrical, control, and refrigerant-related faults.
- Develop preventive maintenance strategies for major refrigeration equipment based on operating conditions and equipment criticality.
- Assess refrigeration system efficiency and identify practical opportunities for reducing unnecessary energy consumption.
- Evaluate piping, insulation, airflow, heat transfer, and control conditions that influence refrigeration performance.
- Strengthen commissioning and operational procedures to support reliable refrigeration system performance.
- Assess common failure modes and develop appropriate corrective actions based on root cause analysis.
- Develop an integrated refrigeration maintenance and performance improvement plan applicable to a real workplace environment.

Who Should Attend

The Refrigeration Systems Design & Maintenance Training Course is designed for professionals responsible for the design, installation, commissioning, operation, maintenance, inspection, and performance management of refrigeration systems. It is particularly suitable for mechanical engineers, refrigeration engineers, HVAC engineers, facilities engineers, maintenance engineers, energy engineers, project engineers, commissioning engineers, and technical specialists working with commercial and industrial refrigeration equipment.

The course is also relevant to maintenance managers, facility managers, engineering managers, operations managers, technical supervisors, refrigeration technicians, HVAC technicians, maintenance supervisors, building services professionals, consultants, contractors, and project management teams. It is particularly valuable for professionals working in cold storage facilities, food processing plants, pharmaceutical facilities, hospitals, hotels, supermarkets, logistics centers, manufacturing facilities, industrial plants, government facilities, and other organizations where reliable temperature control is operationally critical.

Learning Outcomes

- Explain the refrigeration cycle and the thermodynamic principles governing refrigeration system operation.
- Identify the functions and operating characteristics of compressors, condensers, evaporators, expansion devices, receivers, and associated components.
- Evaluate refrigeration system capacity and operating performance using relevant field measurements.
- Interpret temperature and pressure readings to identify abnormal refrigeration conditions.
- Assess compressor performance and recognize common mechanical and operational problems.
- Evaluate condenser and evaporator performance and identify factors affecting heat transfer efficiency.
- Diagnose refrigerant-related problems, including incorrect charge, restrictions, leakage, and abnormal operating pressures.
- Apply structured troubleshooting methods to mechanical, electrical, control, and refrigeration system faults.
- Develop preventive maintenance schedules for critical refrigeration equipment and components.
- Evaluate energy efficiency opportunities related to compressors, condensers, evaporators, fans, pumps, controls, and operating practices.
- Assess system commissioning and operational requirements to support reliable long-term performance.
- Prepare a practical maintenance and performance improvement plan for a refrigeration system or refrigeration facility.

Course Outline

DAY 01

Refrigeration Fundamentals & System Configuration

- Fundamentals of refrigeration and heat transfer
- Refrigeration cycle and thermodynamic principles
- Major refrigeration system components and their functions
- Compressor types and operating characteristics
- Condensers, evaporators, expansion devices, receivers, and refrigerant circuits
- Direct expansion and other refrigeration system configurations
- Commercial and industrial refrigeration applications
- Refrigeration system capacity and operating conditions

PRACTICAL APPLICATION

Analyze a refrigeration system schematic and identify the function of each major component

DAY 02

Refrigeration System Design & Equipment Selection

- Refrigeration load estimation and cooling capacity requirements
- Heat gain through walls, roofs, doors, products, lighting, and equipment
- Equipment selection based on capacity and operating conditions
- Compressor selection and performance considerations
- Condenser selection and heat rejection requirements
- Evaporator selection and heat transfer considerations
- Expansion device selection and refrigerant flow control
- Refrigeration piping design and pressure drop considerations
- Pipe sizing, insulation, drainage, and installation requirements

PRACTICAL APPLICATION

Develop a preliminary equipment selection and refrigeration system design for a representative application

DAY 03

Refrigeration Operation, Controls & Commissioning

- Refrigeration system start-up and shutdown procedures
- Operating pressures and temperatures
- Superheat and subcooling principles
- Refrigerant charging and system operating conditions
- Pressure controls and temperature controls
- Thermostatic and electronic expansion control
- Refrigeration control systems and monitoring
- Electrical components and motor protection
- Commissioning procedures and performance verification
- Operating documentation and baseline performance assessment

PRACTICAL APPLICATION

Review refrigeration operating data and determine whether the system is operating within appropriate conditions

DAY 04

Refrigeration Maintenance & Troubleshooting

- Preventive and predictive maintenance principles for refrigeration systems
- Compressor inspection, servicing, and performance monitoring
- Condenser cleaning and heat rejection performance
- Evaporator maintenance and airflow management
- Expansion device inspection and troubleshooting
- Refrigerant leakage detection and refrigerant circuit integrity
- Diagnosis of high and low suction pressure conditions
- Diagnosis of high condensing pressure and poor heat rejection
- Electrical and control system troubleshooting
- Common refrigeration failures and root cause analysis
- Maintenance planning based on equipment criticality and operating conditions

DAY 04 — CONTINUED

PRACTICAL APPLICATION

Diagnose a series of refrigeration faults and develop corrective maintenance actions

DAY 05

Energy Efficiency, Reliability & Refrigeration Performance Optimization

- Refrigeration system energy consumption and efficiency indicators
- Compressor efficiency and capacity control strategies
- Optimization of condensing and evaporating temperatures
- Improving condenser and evaporator heat transfer
- Fan and pump energy optimization
- Insulation, air infiltration, and thermal load management
- Refrigeration system controls and automated monitoring
- Preventing short cycling and inefficient operating conditions
- Reliability-centered maintenance principles for refrigeration assets
- Lifecycle performance and maintenance cost considerations
- Development of refrigeration system performance indicators

FINAL WORKSHOP

Prepare an integrated action plan for improving refrigeration system reliability, maintenance, energy efficiency, and operational performance

Register or Request More Information

Course page: <https://quest-training.com/courses/refrigeration-systems-design-maintenance-training-course>

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