

Course No. 1565

Industrial Cooling Water Systems Training Course

UTILITIES & PLANT ENGINEERING
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The Industrial Cooling Water Systems Training Course provides a comprehensive professional framework for understanding, operating, monitoring, maintaining, troubleshooting, and optimizing industrial cooling water systems. The course is designed for professionals responsible for cooling utilities and heat-rejection systems across oil and gas, petrochemical, refining, power generation, manufacturing, industrial utilities, and large-scale facilities. It combines engineering principles with practical operating and maintenance considerations to help organizations improve system reliability, thermal performance, water management, and operational continuity.

Industrial cooling water systems are essential to maintaining stable operating conditions for heat exchangers, condensers, compressors, pumps, process equipment, and other critical assets. Ineffective cooling water management can contribute to elevated equipment temperatures, reduced heat-transfer efficiency, corrosion, scaling, fouling, biological growth, restricted flow, increased water consumption, and premature equipment deterioration. Understanding the relationship between water quality, hydraulic performance, heat transfer, and equipment condition is therefore essential for reliable industrial operations.

The course examines the complete cooling water cycle, including cooling towers, circulating water pumps, heat exchangers, piping networks, valves, tanks, instrumentation, control systems, makeup water, blowdown, evaporation, and water treatment processes. Participants will explore the operational parameters that influence system performance, including flow rates, temperature differentials, pressure losses, water chemistry, concentration levels, heat loads, and cooling tower performance.

A strong practical focus is placed on cooling water quality management and troubleshooting. Participants will learn how to recognize the operational impact of corrosion, scaling, fouling, suspended solids, biological growth, poor water distribution, inadequate flow, and ineffective treatment. The course also develops practical approaches for diagnosing abnormal temperatures, pressure losses, hydraulic restrictions, poor heat transfer, equipment deterioration, and recurring cooling system problems.

Through technical discussions, case studies, practical exercises, and workplace-oriented scenarios, the Industrial Cooling Water Systems Training Course enables engineers, operators, maintenance professionals, supervisors, and managers to make more informed technical decisions. The program

supports organizations in improving cooling system reliability, optimizing water and energy use, strengthening preventive maintenance practices, and establishing more effective approaches to cooling water system performance and asset management.

Objectives

- Analyze the configuration, operating principles, and major components of industrial cooling water systems within the course timeframe.
- Develop the ability to evaluate cooling water temperatures, flow rates, pressure differentials, and key performance indicators using operational data.
- Evaluate the operating condition and performance of cooling towers, pumps, heat exchangers, piping networks, valves, tanks, and water treatment equipment.
- Apply heat-transfer and fluid-flow principles to understand the relationship between cooling water performance and equipment operating conditions.
- Assess the effects of water quality, chemical concentration, evaporation, blowdown, and makeup water on overall system performance.
- Identify the causes and operational consequences of corrosion, scaling, fouling, suspended solids, and biological growth.
- Apply structured troubleshooting methods to investigate high cooling water temperatures, inadequate flow, pressure losses, and reduced heat-transfer performance.
- Improve the ability to monitor cooling water quality and operating conditions and determine appropriate corrective actions.
- Design practical inspection and maintenance practices for critical cooling water system equipment.
- Implement approaches for improving hydraulic balance, water management, thermal performance, and operational stability.
- Assess operating and maintenance data to identify recurring problems, reliability risks, and opportunities for performance improvement.
- Develop a practical improvement plan for industrial cooling water operation, maintenance, water treatment, and reliability.

Who Should Attend

The course is designed for engineers, operators, technicians, and maintenance professionals responsible for the operation, inspection, maintenance, monitoring, and optimization of industrial cooling water systems. It is particularly relevant to mechanical engineers, process engineers, utilities engineers, maintenance engineers, reliability engineers, facilities engineers, energy professionals, water treatment specialists, and technical personnel working with industrial cooling systems.

The program is also suitable for cooling water operators, utility operators, mechanical supervisors, maintenance supervisors, utilities managers, maintenance managers, engineering managers, operations managers, reliability managers, and facilities managers. It is especially applicable to professionals working in oil and gas, petrochemical, refining, power generation, manufacturing, industrial utilities, and large process facilities where cooling water systems are critical to production and equipment reliability.

The course will also benefit project engineers, asset managers, technical coordinators, plant managers, and decision makers involved in cooling system design, equipment selection, water treatment strategies, maintenance planning, energy and water efficiency, reliability improvement, and asset performance management. It is particularly valuable for professionals responsible for coordinating operations, maintenance, engineering, water treatment, and utilities activities.

Learning Outcomes

- Explain the operating principles and complete water cycle of industrial cooling water systems.
- Identify the functions and operating requirements of cooling towers, pumps, heat exchangers, piping, valves, tanks, and water treatment equipment.
- Evaluate cooling water temperatures, flow rates, pressure differentials, and other key operating indicators.
- Analyze the relationship between water quality, heat transfer, hydraulic performance, and equipment reliability.
- Assess the causes and operational impact of corrosion, scaling, fouling, suspended solids, and biological growth.
- Evaluate makeup water, evaporation, blowdown, concentration levels, and overall cooling water balance.

- Diagnose inadequate flow, excessive pressure loss, elevated cooling water temperatures, and reduced heat-transfer performance.
- Apply practical methods for monitoring cooling water quality and identifying appropriate corrective measures.
- Develop preventive and condition-based maintenance activities for critical cooling water system equipment.
- Analyze operational and water-quality data to identify recurring problems and performance improvement opportunities.
- Recommend practical measures to improve water and energy efficiency while maintaining reliable cooling performance.
- Prepare an actionable plan for improving the operation, maintenance, reliability, and performance of an industrial cooling water system.

Course Outline

DAY 01

Industrial Cooling Water Systems Fundamentals

- Role and importance of cooling water systems in industrial and process facilities
- Types and configurations of industrial cooling water systems
- Cooling water circulation and the complete operating cycle
- Major system components and their operating functions
- Cooling towers, circulating water pumps, heat exchangers, piping, valves, and tanks
- Instrumentation and control requirements for cooling water systems
- Cooling water temperature, flow, pressure, and basic performance indicators
- Cooling water system hydraulic balance and operating requirements

PRACTICAL APPLICATION

Analyze a typical industrial cooling water system and identify major components, flow paths, and monitoring points

DAY 02

Heat Transfer, Hydraulic Performance, and Cooling Equipment

- Fundamentals of heat transfer in cooling water systems
- Heat loads and factors influencing cooling requirements
- Circulating water pumps and principles of flow and pressure
- Pressure losses, system resistance, and hydraulic restrictions
- Heat exchangers and factors affecting heat-transfer efficiency
- Cooling towers and their role in heat rejection
- Supply and return cooling water temperature control
- Monitoring equipment performance and operating trends

PRACTICAL APPLICATION

Evaluate the performance of a cooling water pump, heat exchanger, and cooling tower using operational data

DAY 03

Cooling Water Quality and Treatment

- Importance of cooling water quality for equipment protection and system performance
- Physical and chemical characteristics of industrial cooling water
- Corrosion mechanisms and their impact on piping, heat exchangers, and equipment
- Scaling and deposits and their effect on heat transfer and flow
- Fouling, suspended solids, contamination, and biological growth
- Principles of industrial cooling water treatment
- Makeup water, evaporation, blowdown, and concentration management
- Monitoring key cooling water quality parameters

PRACTICAL APPLICATION

Analyze a cooling water quality problem and determine likely causes and corrective actions

DAY 04

Operation, Maintenance, and Troubleshooting

- Operating procedures and monitoring practices for cooling water systems
- Routine inspection of pumps, cooling towers, heat exchangers, piping, and valves
- Preventive maintenance and condition-based maintenance strategies
- Troubleshooting elevated cooling water temperatures
- Diagnosing inadequate flow, excessive pressure loss, and hydraulic restrictions
- Identifying causes of reduced heat-exchanger performance
- Troubleshooting corrosion, scaling, fouling, and biological growth
- Root-cause analysis of recurring cooling water system failures

PRACTICAL APPLICATION

Diagnose an integrated cooling water system problem and develop corrective actions

DAY 05

Performance Optimization, Water Efficiency, and Reliability

- Evaluating overall industrial cooling water system performance
- Monitoring and managing water consumption and avoidable losses
- Optimizing makeup water, blowdown, evaporation, and concentration levels
- Improving cooling tower, pump, and heat exchanger performance
- Improving hydraulic balance and cooling water distribution
- Using operational and water-quality data for technical decision-making
- Developing performance indicators for cooling water systems
- Strengthening maintenance strategies and equipment reliability
- Identifying opportunities to improve water and energy efficiency

FINAL WORKSHOP

Conduct a comprehensive performance assessment of an industrial cooling water system

- Final implementation exercise: Develop an action plan to improve cooling water quality, system performance, equipment reliability, water efficiency, and operational effectiveness



Register or Request More Information

Course page: <https://quest-training.com/courses/industrial-cooling-water-systems-training-course>

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