QUEST
Professional Center

PROFESSIONAL TRAINING COURSE

Course No. 1567

Thermal Energy Management & Optimization Training Course

ENERGY MANAGEMENT & SUSTAINABILITY
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION
5 Days

DELIVERY
Classroom

LOCATION
Munich, Germany

DATES
28 Dec 2026 – 1 Jan 2027

Scheduled Event Details

CITY	Munich, Germany
DATE	28 Dec 2026 – 1 Jan 2027
DELIVERY TYPE	Classroom
COURSE FEE	€6,000

Course Overview

The Thermal Energy Management & Optimization Training Course provides an advanced and practical framework for understanding, managing, monitoring, and optimizing thermal energy systems across industrial, commercial, utility, and process environments. The course focuses on improving thermal efficiency, reducing avoidable energy losses, strengthening operational performance, and supporting informed energy management decisions through systematic analysis of heat generation, transfer, recovery, utilization, and losses.

Thermal energy represents a significant component of energy consumption in many facilities, particularly where boilers, furnaces, steam systems, heat exchangers, process heaters, turbines, refrigeration systems, or high-temperature production processes are involved. Effective thermal energy management therefore requires more than monitoring fuel or electricity consumption. It requires understanding energy balances, heat transfer mechanisms, equipment performance, operating conditions, insulation quality, combustion efficiency, waste heat, and process integration.

The program develops practical capabilities in thermal energy assessment, energy balance analysis, heat-loss identification, boiler and furnace efficiency, steam system performance, heat exchanger optimization, insulation, combustion control, waste heat recovery, thermal storage, and process heat integration. Participants will learn how to identify the technical and operational factors affecting thermal performance and determine where energy losses occur and where efficiency improvements can generate measurable operational value.

A strong emphasis is placed on optimization rather than isolated energy-saving actions. Participants will examine how operating parameters, maintenance practices, equipment selection, process conditions, control strategies, and production requirements interact to influence thermal efficiency. The course also addresses the economic evaluation of thermal improvement projects, energy performance indicators, monitoring approaches, and the integration of thermal optimization with

broader energy management and sustainability objectives.

Through practical energy balance exercises, equipment performance assessments, heat-loss analysis, efficiency calculations, case studies, optimization workshops, and improvement planning activities, the Thermal Energy Management & Optimization Training Course develops practical capabilities that can be applied across industrial facilities, utilities, oil and gas operations, manufacturing plants, power and process industries, commercial facilities, and large corporations. The program is suitable for engineers, energy managers, maintenance professionals, operations managers, technical specialists, and senior decision makers responsible for energy performance and operational efficiency.

Objectives

- Analyze the principles of thermal energy management and their role in improving industrial and organizational energy performance during the course.
- Develop thermal energy balance models to identify major sources of energy input, useful output, and heat loss.
- Evaluate the efficiency and operating performance of boilers, furnaces, process heaters, heat exchangers, and steam systems.
- Apply heat-transfer and energy-efficiency principles to identify opportunities for reducing thermal losses.
- Assess combustion efficiency, flue-gas losses, excess air, temperature profiles, and operating conditions.
- Design practical approaches for improving insulation, heat recovery, steam distribution, and thermal system performance.
- Evaluate waste heat recovery opportunities and determine their technical and operational suitability.
- Apply energy performance indicators and monitoring techniques to measure thermal efficiency and identify performance deterioration.
- Analyze the economic and operational feasibility of thermal energy improvement projects.
- Develop optimization strategies that balance energy efficiency, production requirements, reliability, maintenance, and safety.
- Strengthen the integration of thermal energy management with maintenance, operations, process engineering, and sustainability programs.

- Align thermal energy optimization initiatives with organizational energy objectives, cost management, environmental performance, and long-term operational resilience.

Who Should Attend

This course is designed for professionals working in energy management, thermal engineering, mechanical engineering, process engineering, utilities, maintenance, operations, production, and industrial energy efficiency. It is particularly relevant to Energy Managers, Thermal Engineers, Mechanical Engineers, Process Engineers, Utilities Managers, Maintenance Managers, Plant Engineers, Operations Managers, Reliability Professionals, Energy Analysts, and specialists responsible for monitoring and improving thermal systems.

The program is also suitable for Engineering Directors, Operations Directors, Plant Managers, Maintenance Directors, Energy Performance Leaders, Technical Managers, Sustainability Managers, and senior decision makers responsible for energy costs, operational efficiency, equipment performance, and capital improvement programs. Professionals working in government entities, ministries, public sector organizations, oil and gas companies, petrochemical facilities, power and utilities organizations, manufacturing plants, industrial corporations, and large commercial facilities can benefit from the frameworks covered in the course.

The course is particularly valuable for professionals involved in boiler and furnace operations, steam systems, process heating, heat exchanger performance, waste heat recovery, combustion management, energy audits, equipment optimization, maintenance planning, and capital energy projects. It also provides value for finance, procurement, sustainability, and project professionals who need to understand the technical and economic implications of thermal energy optimization initiatives.

Learning Outcomes

- Explain the principles of thermal energy management, thermal efficiency, and energy optimization in industrial systems.
- Prepare and interpret thermal energy balances for processes, equipment, and facilities.
- Evaluate boiler, furnace, process heater, heat exchanger, and steam system performance.
- Identify major sources of heat loss and determine their operational and financial implications.
- Assess combustion performance using key operating and efficiency indicators.

- Evaluate insulation systems and identify opportunities to reduce heat loss from equipment, piping, and process systems.
- Analyze waste heat sources and determine technically appropriate recovery opportunities.
- Apply thermal performance indicators to monitor energy efficiency and identify deterioration or abnormal performance.
- Evaluate the technical and economic feasibility of thermal efficiency improvement projects.
- Develop practical optimization strategies that consider production requirements, reliability, maintenance, safety, and energy consumption.
- Prepare management reports and improvement recommendations based on thermal performance analysis.
- Develop a practical thermal energy optimization plan aligned with organizational energy management and sustainability objectives.

Course Outline

DAY 01

Thermal Energy Management Principles and Energy Performance Assessment

- Fundamentals of thermal energy management and energy efficiency
- Forms of thermal energy and major industrial sources and uses
- Energy balances and thermal system boundaries
- Heat transfer principles and thermal losses
- Thermal efficiency and energy utilization indicators
- Identifying energy-intensive processes and equipment
- Heat-loss pathways and sources of avoidable energy consumption
- Thermal energy measurement, instrumentation, and performance data

PRACTICAL APPLICATION

Develop a thermal energy balance for a representative industrial process and identify major energy losses and improvement opportunities

DAY 02

Boilers, Furnaces, Process Heating and Combustion Optimization

- Boiler operating principles and efficiency assessment
- Boiler efficiency losses and performance indicators
- Combustion fundamentals and fuel-air relationships
- Excess air, combustion control, and flue-gas analysis
- Furnace and process heater performance
- Temperature management and operating condition optimization
- Heat losses through flue gases, surfaces, and incomplete combustion
- Burner performance and maintenance considerations

PRACTICAL APPLICATION

Evaluate boiler or furnace performance and develop an optimization plan based on combustion efficiency, operating conditions, and identified thermal losses

DAY 03

Steam Systems, Heat Exchangers, Insulation and Thermal Distribution

- Steam generation, distribution, and utilization
- Steam traps, condensate recovery, and distribution losses
- Steam pressure management and system efficiency
- Heat exchanger performance and effectiveness
- Fouling, scaling, pressure drop, and thermal degradation
- Insulation design, inspection, and thermal loss prevention
- Heat transfer optimization across process systems
- Identifying underperforming thermal equipment and operating constraints

PRACTICAL APPLICATION

Analyze a steam and heat-transfer system and identify opportunities to improve thermal efficiency, recover losses, and optimize operating conditions

DAY 04

Waste Heat Recovery, Process Integration and Thermal Optimization

- Identifying industrial waste heat sources
- Waste heat recovery technologies and application considerations
- Heat recovery from flue gases, exhaust streams, and process systems
- Heat exchangers for energy recovery
- Thermal storage concepts and load management
- Heat integration and opportunities for improved process efficiency
- Evaluating energy recovery potential and operating constraints
- Reliability, maintenance, safety, and production considerations in thermal optimization
- Economic evaluation of thermal improvement opportunities

PRACTICAL APPLICATION

Develop a waste heat recovery and thermal optimization proposal for a selected industrial process and evaluate its technical and economic feasibility

DAY 05

Thermal Energy Performance Management, Monitoring and Continuous Improvement

- Thermal energy performance indicators and benchmarking
- Monitoring energy consumption and identifying performance deterioration
- Thermal energy audits and performance diagnostics
- Integrating thermal optimization with maintenance and operations
- Developing energy efficiency improvement initiatives
- Prioritizing projects according to savings potential, risk, feasibility, and operational value
- Management reporting and executive communication of thermal performance
- Building a continuous improvement framework for thermal energy management
- Integrating thermal optimization with sustainability, cost management, and organizational energy strategy

DAY 05 — CONTINUED

FINAL WORKSHOP

Develop and present a comprehensive Thermal Energy Management & Optimization plan covering energy balances, thermal performance, equipment efficiency, heat losses, combustion, steam systems, heat exchangers, waste heat recovery, performance indicators, economic evaluation, governance, and implementation priorities

Register or Request More Information

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