

Course No. 1569

Energy Efficiency in Process Industries Training Course

ENERGY MANAGEMENT & SUSTAINABILITY
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The Energy Efficiency in Process Industries Training Course provides an advanced and practical framework for improving energy performance across energy-intensive industrial processes. The course focuses on identifying energy consumption drivers, reducing avoidable losses, optimizing process equipment and utilities, improving operating conditions, and integrating energy efficiency into daily operational and management practices. It is designed to support measurable improvements in energy performance while maintaining production, safety, quality, and reliability requirements.

Process industries such as oil and gas, petrochemicals, refining, chemicals, power generation, metals, minerals, cement, and other energy-intensive operations rely on complex combinations of thermal, electrical, mechanical, and utility systems. Energy efficiency in these environments requires a system-wide understanding of how process conditions, equipment performance, heat transfer, combustion, steam, electricity, compressed air, cooling, pumping, and production rates interact. The course provides a structured approach for identifying where energy is consumed and where efficiency improvements can deliver operational and financial value.

The program covers energy performance assessment, energy balances, process optimization, heat integration, steam and condensate systems, combustion, furnaces, boilers, heat exchangers, pumps, compressors, motors, electrical systems, cooling systems, compressed air, and waste heat recovery. Participants will examine how changes in operating parameters, equipment condition, maintenance practices, process integration, and control strategies can influence energy consumption and overall process efficiency.

Particular emphasis is placed on identifying practical improvement opportunities rather than focusing only on theoretical energy-saving concepts. Participants will learn how to establish energy baselines, develop energy performance indicators, identify energy losses, prioritize improvement projects, evaluate technical and economic feasibility, and monitor results. The course also addresses energy management systems, operational discipline, maintenance integration, process monitoring, benchmarking, and continuous improvement.

Through industrial case studies, energy balance exercises, process efficiency assessments, equipment performance analysis, heat recovery studies, utility optimization, and improvement planning workshops, the Energy Efficiency in Process Industries Training Course develops practical

capabilities that can be applied across complex industrial environments. The course is suitable for government entities, ministries, oil and gas organizations, petrochemical companies, manufacturing facilities, utilities, large corporations, engineers, energy managers, operations leaders, maintenance specialists, and senior decision makers.

Objectives

- Analyze the major principles of energy efficiency and their application to energy-intensive process industries during the course.
- Develop process-level energy balances to identify energy inputs, useful outputs, and major sources of energy loss.
- Evaluate the energy performance of process equipment and utility systems and identify operating inefficiencies.
- Apply process optimization techniques to reduce energy consumption without compromising production, quality, safety, or reliability.
- Assess the performance of boilers, furnaces, heat exchangers, steam systems, pumps, compressors, motors, and cooling systems.
- Design practical strategies for reducing thermal, electrical, mechanical, and utility energy losses.
- Evaluate waste heat recovery and heat integration opportunities within industrial processes.
- Apply energy performance indicators, monitoring methods, and benchmarking techniques to track efficiency improvements.
- Analyze the technical, financial, and operational feasibility of energy efficiency improvement projects.
- Develop prioritized energy efficiency initiatives based on savings potential, implementation risk, investment requirements, and operational impact.
- Strengthen coordination between process engineering, operations, maintenance, utilities, energy management, and finance.
- Align industrial energy efficiency strategies with cost management, sustainability, operational resilience, and long-term business objectives.

Who Should Attend

This course is designed for professionals working in process engineering, energy management, operations, maintenance, utilities, mechanical engineering, electrical engineering, reliability, and industrial performance. It is particularly relevant to Energy Managers, Process Engineers, Energy Engineers, Mechanical Engineers, Utilities Managers, Plant Managers, Operations Managers, Maintenance Managers, Reliability Engineers, Energy Analysts, and technical specialists responsible for improving energy performance in industrial facilities.

The program is also suitable for Engineering Directors, Operations Directors, Plant Managers, Technical Managers, Energy Performance Leaders, Sustainability Managers, Maintenance Directors, and senior decision makers responsible for energy costs, process efficiency, asset performance, and capital improvement programs. Professionals working in government entities, ministries, oil and gas companies, refineries, petrochemical facilities, chemical plants, power and utilities organizations, manufacturing operations, mining, metals, cement, and other energy-intensive industries can benefit from the course.

The course is particularly valuable for professionals involved in energy audits, process optimization, heat integration, steam systems, combustion, rotating equipment, electrical efficiency, waste heat recovery, equipment maintenance, energy monitoring, and efficiency improvement projects. It also provides useful knowledge for finance, procurement, project management, and sustainability professionals involved in evaluating or supporting industrial energy efficiency investments.

Learning Outcomes

- Explain the principles of energy efficiency and energy management within process industries.
- Prepare and interpret process and facility energy balances to identify major energy losses.
- Analyze energy consumption patterns and determine the principal operational and process drivers.
- Evaluate the efficiency of boilers, furnaces, heat exchangers, steam systems, pumps, compressors, motors, and cooling systems.
- Identify thermal, electrical, mechanical, and utility energy losses and determine appropriate corrective measures.
- Apply process optimization techniques to reduce energy consumption while maintaining production and operational requirements.

- Evaluate heat integration and waste heat recovery opportunities within industrial processes.
- Apply energy performance indicators, benchmarks, and monitoring techniques to measure improvement.
- Assess the technical and economic feasibility of energy efficiency projects and calculate their potential value.
- Develop prioritized energy improvement plans based on energy savings, cost, risk, reliability, and implementation considerations.
- Prepare management reports presenting energy performance, opportunities, risks, and recommended actions.
- Develop an integrated industrial energy efficiency strategy aligned with operational performance, sustainability, and long-term organizational objectives.

Course Outline

DAY 01

Energy Efficiency Fundamentals and Industrial Energy Assessment

- Principles of energy efficiency in process industries
- Energy consumption drivers in energy-intensive operations
- Process and facility energy balances
- Energy baselines and identification of significant energy users
- Thermal, electrical, mechanical, and utility energy flows
- Energy measurement, instrumentation, monitoring, and data quality
- Energy performance indicators and benchmarking
- Identifying energy losses and inefficient operating conditions

PRACTICAL APPLICATION

Develop an energy balance for a representative process facility and identify the major energy-consuming systems and improvement opportunities

DAY 02

Process Optimization, Steam Systems and Thermal Efficiency

- Process optimization and energy-efficient operating conditions
- Boiler efficiency and combustion optimization
- Furnace and process heater performance
- Steam generation, distribution, and utilization
- Steam traps, condensate recovery, and pressure management
- Heat exchanger performance and heat-transfer efficiency
- Fouling, scaling, temperature approaches, and pressure-drop considerations
- Insulation and reduction of thermal losses

PRACTICAL APPLICATION

Evaluate a process heating and steam system and develop recommendations for reducing thermal energy consumption and improving operating efficiency

DAY 03

Electrical and Mechanical Energy Efficiency in Process Plants

- Electrical energy consumption in process industries
- Electric motor efficiency and motor loading
- Variable-speed control and efficient motor operation
- Pump efficiency, system curves, and flow optimization
- Compressor efficiency and compressed air management
- Transformer and electrical distribution losses
- Cooling systems, fans, and auxiliary equipment efficiency
- Maintenance practices and their relationship with energy performance

PRACTICAL APPLICATION

Conduct an energy performance assessment of rotating and electrical equipment and identify high-priority efficiency improvement opportunities

DAY 04

Heat Integration, Waste Heat Recovery and Energy Optimization Projects

- Principles of process heat integration
- Identification of waste heat sources
- Waste heat recovery technologies and applications
- Heat recovery from flue gases, exhaust streams, and process effluents
- Thermal integration between process units
- Energy cascading and improved heat utilization
- Technical constraints, operating risks, and reliability considerations
- Economic evaluation of energy efficiency and heat recovery projects

PRACTICAL APPLICATION

Develop a waste heat recovery and heat integration proposal and assess its technical feasibility, expected energy impact, and economic value

DAY 05

Energy Performance Management, Continuous Improvement and Strategic Implementation

- Establishing energy management objectives and performance targets
- Monitoring, verification, and measurement of energy improvements
- Benchmarking plant and process energy performance
- Integrating energy efficiency with operations, maintenance, and asset management
- Prioritizing energy efficiency projects and investment decisions
- Developing energy performance dashboards and management reports
- Organizational governance, accountability, and energy performance ownership
- Continuous improvement and operational energy discipline
- Linking energy efficiency with sustainability, cost management, and business resilience

DAY 05 — CONTINUED

FINAL WORKSHOP

Develop and present an integrated Energy Efficiency in Process Industries improvement strategy covering energy balances, significant energy users, process optimization, thermal and electrical efficiency, heat integration, waste heat recovery, performance indicators, economic evaluation, governance, and implementation priorities

Register or Request More Information

Course page: <https://quest-training.com/courses/energy-efficiency-in-process-industries-training-course>

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