



Advanced Plant Optimization & Energy Efficiency Course

28 March – 8 April 2027
Cairo (Egypt)



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Advanced Plant Optimization & Energy Efficiency Course is a two-week course for engineers and supervisors who already run or maintain process plants and now need to find, prove and fund deeper savings. It goes past a one-week overview into advanced control, energy auditing, benchmarking and equipment-level tuning. You build a Plant Energy Optimization Roadmap for your own site. Mercury Training Center runs this two-week edition of the subject.

About This Course

Many plants run short improvement drives that fade within months because savings were never measured, equipment limits were ignored or the business case was weak. To follow the course you should already work on operations, maintenance or energy tasks in a plant. You practice on audit data, control cases and equipment calculations, then apply them to your site.

Who It Is For

- People who run daily plant operations and set operating targets
- People who maintain rotating and static equipment and plan its reliability
- People who lead site energy management and report savings
- People who design and deliver improvement projects on existing units
- People who link plant performance with environmental and sustainability goals

This course is not for readers who want a short introduction to plant efficiency, who are better served by a one-week overview course, or for designers of new plants, who are better served by a process design course.

Competencies You Will Build

- Integrity-led optimization: raises throughput or efficiency only inside safe operating windows.
- Heat and control tuning: uses pinch targets and advanced control to cut energy and variability.
- Energy auditing: runs audits, sets baselines and benchmarks units against each other.
- Equipment efficiency: improves steam, cooling, motor, pump and heater performance one system at a time.
- Reliability analytics: applies RCM and condition data to keep efficient equipment in service.
- Investment justification: turns savings into lifecycle cost and ROI cases leaders can approve.

What You Will Be Able to Do

By the end of the course you will be able to:

- From a heat exchanger network, set a pinch target and list the exchanges that close the gap.
- Given a site's metered energy data, build a baseline and energy performance indicators for each area.
- Using thermal imaging results and audit checklists, rank conservation measures by payback.
- From pump, motor and fan duty data, size drives and identify where variable frequency drives fit.
- Given a critical equipment list, choose RCM tasks and condition monitoring for each item.
- Using lifecycle cost and ROI figures, present an optimization case to plant leadership.

Course Content

Day 1: Optimization Foundations and Asset Integrity

- Scope and Value of Plant Optimization Versus a New Build
- Asset Integrity and Reliability Elements Behind Sustained Gains
- Operating Windows to Protect Mechanical Integrity
- Management of Change for Operating Adjustments
- Cost-Benefit Screening of Improvement Ideas

Day 2: Process Control and Heat Integration

- Control System Architectures and Key Process Variables
- Process Models and Advanced Control to Reduce Variability
- Heat Integration and Pinch Analysis for Savings Targets
- Heat Exchanger Network Optimization
- Simulation to Predict Behavior and Stabilize Throughput

Day 3: Energy Management Systems

- Energy Baselines and Usage Profiles by Plant Area
- Energy Performance Indicators and Benchmarking Between Units
- ISO 50001 Energy Management System Structure
- Site Energy Plan: Targets and High-Energy System Priorities
- Incentives, Barriers and Savings Reporting to Stakeholders

Day 4: Energy Auditing and Conservation Measures

- Walk-Through and Detailed Energy Audit Methods
- Thermal Imaging and Fiber Optic Sensors in Audit Work
- Low-Cost Measures and Equipment Operating Checklists
- Variable Frequency Drives for Pumps and Fans
- Savings and ROI Estimates for Audit Recommendations

Day 5: Steam, Boilers and Heat Recovery

- Steam Generation and Distribution Loss Review
- Boiler and Turbine Operating Conditions
- Heat Recovery From Flue Gas and Hot Process Streams
- Process Heater Tuning and Combustion Control
- Pressure Regulation and Balance in Steam Headers

Day 6: Cooling, Motors, Pumps and Chemicals

- Cooling Water System Efficiency
- Motor and Drive Upgrades for Lower Consumption
- Pumping System Losses and Throttling Reduction
- Chemical Usage Reduction in Treatment Systems
- Equipment Sizing Matched to Actual Process Duty

Day 7: Reliability-Centered Maintenance and Predictive Analytics

- RCM Selection of Critical Systems
- Condition-Based Maintenance Planning
- Failure Mode Analysis on Energy-Intensive Equipment
- Predictive Models From Sensor Data and Machine Learning
- Digital Twins and Real-Time Monitoring for Failure Prevention

Day 8: Digital Plant and Sustainability

- Smart Sensors and Real-Time Analytics for Operating Decisions
- Industry 4.0 Practices: Digitized Inspection and Automated Reporting
- Technology Readiness and Cybersecurity for Plant Systems
- Emissions and Carbon Footprint Reduction Through Operating Changes
- Energy Data in Sustainability and ESG Reporting

Day 9: Economics and the People Side

- Lifecycle Cost Analysis of Plant Improvements
- ROI, Financial Modeling and Investment Risk Comparison
- Optimization Budgets and Executive Business Cases
- Change Management, Human Error and Continuous Improvement Culture
- Role Design, Training and Communication Plans for Rollout

Day 10: Optimization Practice and Your Roadmap

- Exercise: Pinch Targeting on a Heat Exchanger Network Case
- Exercise: Ranking Audit Findings by Payback
- Exercise: RCM and Condition Monitoring Plan for a Critical Pump Train
- Exercise: Business Case Review With Plant Leadership
- Completing Your Plant Energy Optimization Roadmap

Case Studies and Exercises

The following are suggested activities.

- Case study: A refinery crude preheat train has lost heat recovery over time; you decide which exchangers to clean, add or rearrange.
- Case study: A petrochemical site's steam system vents at low load; you produce a header balancing and heat recovery plan.
- Exercise: A power generation station's cooling water pumps run throttled; you produce a drive and sizing proposal with payback.
- Exercise: A chemical plant needs to justify condition monitoring on compressors; you produce an RCM task list and ROI case.

What You Take Back

The Plant Energy Optimization Roadmap is a staged plan you build across the two weeks around your own site. In your first month back, use it to set the energy baseline, launch the first audit and put the highest-payback measure in front of leadership.

- An energy baseline with performance indicators by area
- A ranked list of conservation and equipment measures with payback
- A reliability plan for the equipment the savings depend on
- A lifecycle cost and ROI case for the first projects

Quick Answers FAQ

What should I know before an advanced plant optimization and energy efficiency course?

You should already work in plant operations, maintenance or energy management and read process flow diagrams and equipment data sheets. Basic spreadsheet skills help with the audit and ROI calculations.

How does a two-week advanced plant optimization course differ from a one-week energy conservation course?

The two-week course adds advanced control, pinch analysis, energy auditing, benchmarking and equipment-level tuning to the one-week syllabus. The one-week course suits readers who need an overview of integrity, reliability and conservation opportunities.

What does an energy management system based on ISO 50001 require in a plant?

ISO 50001 requires an energy policy, a baseline, energy performance indicators, objectives with action plans, and regular monitoring and review. In a plant, it ties metering, operating targets and improvement projects into one managed cycle.

What do I take back from an advanced plant optimization and energy efficiency course?

You take back the Plant Energy Optimization Roadmap, built on your own site. It holds an energy baseline, ranked measures, a reliability plan and an ROI case for the first projects.

For Your Manager

After the course, the team member will be able to set an energy baseline, run audits, apply pinch and control methods, tune major utility systems and justify projects with lifecycle cost and ROI. They return with a Plant Energy Optimization Roadmap built on the site's own data, first used to choose and fund the next round of improvement projects.