Optimizing Industrial Energy and Waste Heat Recovery Training Course



21 - 25 Dec 2026

Lisbon

4500 € (Per Person)

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Course Introduction / Overview:

In an era defined by escalating energy costs and stringent environmental regulations, mastering industrial energy efficiency is no longer an option but a critical necessity for sustainable and profitable operations. This comprehensive training course is meticulously designed to transform how organizations approach energy consumption, focusing on the immense, often-overlooked potential of waste heat recovery. Participants will delve into the core principles of thermodynamics and energy management, moving from fundamental concepts to advanced, actionable strategies. The curriculum is deeply influenced by the pioneering work in process integration by academics like B. Linnhoff, whose methodologies, detailed in works such as "User Guide on Process Integration for the Efficient Use of Energy," have revolutionized industrial process design. BIG BEN Training Center provides a unique learning platform where theoretical knowledge is seamlessly integrated with practical application. This course will equip professionals with the skills to conduct detailed energy audits, identify significant heat recovery opportunities, and implement cutting-edge technologies to convert waste into value, thereby reducing operational costs and advancing corporate sustainability goals and industrial decarbonization efforts.

Target Audience / This training course is suitable for:

- Energy Managers and Engineers.
- Plant and Facility Managers.
- Process and Chemical Engineers.
- Maintenance and Operations Supervisors.
- Sustainability and Environmental Officers.
- Project Engineers and Managers.
- Corporate Energy Planners.
- Technical Consultants in the energy sector.
- Research and Development Professionals.

Target Sectors and Industries:

- Heavy Manufacturing and Industrial Production.
- Oil and Gas Refining and Petrochemicals.
- Power Generation and Utilities.
- Chemical and Pharmaceutical Processing.
- Food and Beverage Manufacturing.
- Pulp and Paper Industry.
- Cement and Glass Manufacturing.
- Metals and Mining Operations.
- Governmental bodies and regulatory agencies.

Target Organizations Departments:

- Operations and Production.
- Engineering and Technical Services.
- Maintenance and Reliability.
- Health, Safety, and Environment (HSE).
- Sustainability and Corporate Social Responsibility (CSR).
- Facility Management and Plant Utilities.
- Project Management.
- Research and Development (R&D).
- Finance and Procurement.

Course Offerings:

By the end of this course, the participants will have able to:

- Conduct comprehensive industrial energy audits to identify conservation opportunities.
- Analyze and characterize various sources of industrial waste heat.
- Apply the fundamental principles of thermodynamics to energy systems.
- Evaluate and select appropriate waste heat recovery technologies.
- Utilize Pinch Analysis for optimal process heat integration.
- Design and optimize heat exchanger networks for maximum efficiency.
- Implement an Energy Management System (EnMS) based on ISO 50001 standards.
- Develop key energy performance indicators (EnPIs) to track progress.
- Perform financial analysis and calculate the return on investment for energy projects.
- Create a strategic plan for industrial decarbonization and sustainable manufacturing.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to be immersive, interactive, and highly practical, ensuring that participants can immediately apply their learning in real-world industrial settings. We move beyond traditional lectures by incorporating a dynamic blend of teaching techniques. The course is built around detailed case studies of successful energy conservation and waste heat recovery projects from various industries, allowing participants to analyze challenges and solutions. A significant portion of the training is dedicated to hands-on workshops and group exercises where attendees will work collaboratively on simulated energy audit and system design problems. These sessions foster teamwork and critical thinking. Interactive discussions, expert-led Q&A sessions, and practical demonstrations of energy modeling concepts provide a rich, engaging learning environment. Our approach emphasizes not just the 'what' and 'why' but the 'how', providing actionable strategies and fostering the confidence needed to champion and implement effective energy-saving initiatives within any organization.

Course Agenda (Course Units):

Unit One: Fundamentals of Industrial Energy Management

- Introduction to industrial energy systems and consumption patterns.
- Core principles of thermodynamics and heat transfer.
- Understanding energy units, conversions, and Sankey diagrams.
- The role and methodology of industrial energy audits.
- Identifying and quantifying energy losses in industrial processes.
- Introduction to energy conservation measures and best practices.
- Legal frameworks and global standards for energy efficiency.

Unit Two: Waste Heat Characterization and Recovery Technologies

- Identifying and classifying sources of low, medium, and high-grade waste heat.
- Techniques for measuring waste heat flow and temperature.
- Principles and applications of heat exchangers (shell and tube, plate, etc.).
- Exploring heat pump technology for upgrading low-grade heat.
- Introduction to Waste Heat to Power (WHP) generation systems.
- Organic Rankine Cycle (ORC) principles and applications.
- Thermoelectric generators and other emerging recovery technologies.

Unit Three: Advanced Process Integration using Pinch Analysis

- Introduction to the principles of process integration.
- Constructing process temperature-enthalpy diagrams (Composite Curves).
- Identifying the Process Pinch and minimum energy targets.
- The Golden Rules of Pinch Technology for process design.
- Designing maximum energy recovery (MER) heat exchanger networks (HENs).
- Integrating utility systems (steam, cooling water) efficiently.
- Software tools and practical workshops on Pinch Analysis.

Unit Four: Implementing an ISO 50001 Energy Management System (EnMS)

- Overview of the ISO 50001 standard and its structure.
- Developing an effective energy policy and management plan.
- Establishing an energy baseline and setting realistic targets.
- Defining and tracking Energy Performance Indicators (EnPIs).
- Monitoring, measurement, and analysis of energy performance.
- The role of management review and continuous improvement.
- Integrating EnMS with existing quality and environmental management systems.

Unit Five: Financial Evaluation and Project Management of Energy Initiatives

- Economic analysis techniques for energy efficiency projects.
- Calculating Simple Payback Period, ROI, and Net Present Value (NPV).
- Understanding Life Cycle Cost Analysis (LCCA).
- Securing funding and building a business case for energy projects.
- Key stages of managing an energy project from conception to commissioning.
- Risk assessment and mitigation strategies for energy projects.
- Case study workshop on developing and presenting a complete energy project proposal.

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

As industries move towards decarbonization, how might the principles of waste heat recovery be integrated with emerging technologies like green hydrogen production and carbon capture to create truly circular energy systems?

What unique qualities does this course offer compared to other courses?

This training course distinguishes itself by offering a holistic and deeply practical perspective that bridges the critical gap between engineering theory and financial reality. While many courses focus narrowly on specific technologies, our curriculum integrates three core pillars of modern energy management: fundamental conservation techniques, advanced waste heat recovery systems, and systematic process integration methodologies like Pinch Analysis. This unique combination ensures participants do not just learn about individual solutions but understand how to architect a comprehensive, plant-wide energy strategy. Furthermore, the course places significant emphasis on the implementation and management aspects, including a deep dive into the ISO 50001 standard and robust financial evaluation techniques. Participants leave not only with technical knowledge but also with the project management and business case development skills necessary to champion, justify, and successfully execute energy-saving initiatives. The focus on real-world case studies and interactive problem-solving workshops ensures that the learning is actionable, empowering attendees to deliver tangible cost savings and sustainability improvements for their organizations.