



SUSTAINABLE CHEMICAL PROCESS AND ENERGY EFFICIENCY TRAINING COURSE

28 DEC 2026 - 01 JAN 2027

KUALA LUMPUR

5200 € (PER PERSON)

REF: #ACE8743_254880



COURSE INTRODUCTION / OVERVIEW:

The global chemical industry is at a critical juncture, facing immense pressure to reduce its environmental footprint while maintaining economic competitiveness. This course provides a comprehensive framework for integrating energy efficiency and sustainability into the core of chemical manufacturing operations. Moving beyond theoretical concepts, this program delves into practical strategies and cutting-edge technologies that drive both ecological responsibility and operational excellence. We will explore the foundational principles laid out by pioneers like Paul Anastas in his seminal work, "Green Chemistry: Theory and Practice," to re-imagine chemical processes from the ground up. Participants will learn to identify energy wastage, implement process intensification techniques, and evaluate the entire life cycle of their products to minimize environmental impact. At BIG BEN Training Center, we have designed this curriculum to empower professionals with the skills to lead the transition towards a greener, more efficient, and profitable chemical industry, ensuring long-term viability in a world increasingly focused on sustainability. This course is an essential investment for any organization committed to sustainable development and resource optimization.

TARGET AUDIENCE / THIS TRAINING COURSE IS SUITABLE FOR:

- Chemical Engineers.
- Process Engineers.
- Plant and Operations Managers.
- Environmental, Health, and Safety (EHS) Specialists.
- Research and Development Scientists and Chemists.
- Corporate Sustainability Officers.
- Energy Managers and Auditors.
- Project and Design Engineers.
- Regulatory Affairs Professionals.
- Supply Chain and Procurement Managers.

TARGET SECTORS AND INDUSTRIES:

- Bulk and Specialty Chemical Manufacturing.
- Pharmaceutical and Biopharmaceutical Industries.
- Petrochemicals and Refining.
- Agrochemicals and Fertilizers Production.
- Polymers and Plastics Manufacturing.

- Paints, Coatings, and Adhesives Industries.
- Food and Beverage Processing.
- Governmental Environmental and Regulatory Agencies.
- Pulp and Paper Industry.



TARGET ORGANIZATIONS DEPARTMENTS:

- Operations and Production.
- Engineering and Technical Services.
- Environment, Health, and Safety (EHS).
- Research and Development (R&D).
- Process Design and Development.
- Corporate Sustainability and Social Responsibility.
- Energy Management.
- Quality Assurance and Control.
- Supply Chain and Logistics.
- Capital Project Management.

COURSE OFFERINGS:

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

- Apply the twelve principles of green chemistry to process design and optimization.
- Conduct a comprehensive energy audit within a chemical manufacturing facility.
- Identify and evaluate opportunities for waste heat recovery and process heat integration.
- Analyze and implement process intensification technologies for improved efficiency.
- Perform a streamlined Life Cycle Assessment (LCA) to quantify environmental impacts.
- Develop strategies for reducing a facility's carbon and water footprint.
- Integrate circular economy concepts into waste management and product design.
- Evaluate the economic feasibility of sustainability and energy efficiency projects.
- Formulate a strategic roadmap for achieving corporate sustainability goals.
- Navigate key environmental regulations and standards relevant to the chemical industry.

COURSE METHODOLOGY:

The training methodology at BIG BEN Training Center is designed to be highly interactive, engaging, and practical, ensuring that participants can immediately apply their learning in a real-world context. We move beyond traditional lectures by incorporating a dynamic blend of expert-led presentations, in-depth case studies from the global chemical industry, and collaborative group workshops. Participants will work in teams to solve complex problems, such as designing a more sustainable process or conducting a mock energy audit, fostering critical thinking and teamwork. Interactive sessions, facilitated discussions, and Q&A panels with an industry expert provide a platform for sharing experiences and gaining diverse perspectives. The course emphasizes a hands-on approach, utilizing simulation exercises

and practical tools for process analysis and environmental impact assessment. Continuous feedback is provided throughout the training to reinforce key concepts and ensure a deep understanding of the material. This immersive learning environment guarantees that attendees leave not just with knowledge, but with the confidence and skills to implement effective energy efficiency and sustainability initiatives within their organizations.



COURSE AGENDA (COURSE UNITS)

UNIT ONE FOUNDATIONS OF GREEN CHEMISTRY AND INDUSTRIAL SUSTAINABILITY

- Introduction to sustainability in the chemical industry.
- The twelve principles of green chemistry and engineering.
- Global drivers for sustainability: regulations, market demands, and social responsibility.
- Key performance indicators (KPIs) for sustainability and energy efficiency.
- Introduction to industrial energy management systems.
- The role of catalysis in sustainable chemical production.
- Understanding process mass intensity and atom economy.

UNIT TWO ENERGY EFFICIENCY AND MANAGEMENT IN CHEMICAL PLANTS

- Conducting effective energy audits and assessments.
- Fundamentals of thermodynamics and heat transfer in chemical processes.
- Process heat integration and pinch analysis techniques.
- Optimizing utility systems: steam, compressed air, and refrigeration.
- Waste heat recovery technologies and applications.
- Energy-efficient separation processes.
- Implementing an ISO 50001 energy management system.

UNIT THREE SUSTAINABLE PROCESS DESIGN AND INTENSIFICATION

- Principles of inherent safety and sustainable process design.
- Process Intensification (PI): concepts and technologies.
- Application of microreactors and advanced reactor design.
- Use of alternative solvents and reaction media.
- Integration of renewable feedstocks and bio-based chemicals.
- Membrane technology and its role in sustainable separations.
- Case studies in innovative and green process design.

UNIT FOUR ENVIRONMENTAL IMPACT ASSESSMENT AND CIRCULAR ECONOMY

- Life Cycle Assessment (LCA) methodology and application.
- Calculating and reducing the carbon footprint of chemical processes.
- Water footprint analysis and water management strategies.
- Waste minimization, valorization, and industrial symbiosis.
- Principles of the circular economy in the chemical sector.

- Managing hazardous materials and reducing process emissions.
- Environmental risk assessment and management protocols.



UNIT FIVE STRATEGY, ECONOMICS, AND FUTURE OF SUSTAINABLE MANUFACTURING

- Developing a corporate sustainability strategy and goals.
- Economic analysis of green projects: ROI and life cycle costing.
- Integrating sustainability into the supply chain.
- Corporate Social Responsibility (CSR) and stakeholder engagement.
- Emerging technologies: carbon capture, utilization, and storage (CCUS).
- The role of digitalization and Industry 4.0 in sustainable manufacturing.
- Future trends and outlook for the sustainable chemical industry.

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:

How can the chemical industry effectively balance the high initial capital investment required for sustainable technologies with the pressures of short-term profitability and shareholder expectations?

WHAT UNIQUE QUALITIES DOES THIS COURSE OFFER COMPARED TO OTHER COURSES?

This course distinguishes itself by offering a holistic and integrated perspective that bridges the gap between high-level sustainability theory and practical, on-the-ground engineering solutions. Unlike programs that focus narrowly on either energy management or green chemistry, this curriculum synthesizes these critical domains, demonstrating how they are intrinsically linked. We emphasize a systems-thinking approach, teaching participants not just how to optimize an individual unit operation, but how to analyze and improve the entire value chain, from feedstock sourcing to end-of-life product management. The content is deeply rooted in real-world applicability, featuring extensive case studies from diverse chemical sectors that illustrate both successes and failures in implementing sustainable practices. Furthermore, the course moves beyond technical fixes to address the strategic and economic dimensions, equipping participants with the skills to build a compelling business case for sustainability initiatives within their organizations. It provides a forward-looking view, exploring emerging technologies and regulatory trends to ensure that the knowledge gained is not only relevant today but will also empower professionals to lead their companies into a more sustainable and competitive future.