Advanced Refinery Process Engineering and Optimization Training Course

14 - 18 Dec 2026

Cape town

4600 € (Per Person)

Ref: #OG9596_274656

Course Introduction / Overview:

This comprehensive training course provides an in-depth exploration of modern petroleum refinery operations, focusing on process engineering principles and advanced optimization strategies. In today's competitive market, maximizing yield, improving energy efficiency, and ensuring operational safety are paramount. This program is meticulously designed to equip participants with the skills needed to analyze, troubleshoot, and enhance refinery unit performance. Drawing upon foundational concepts detailed by authorities like James G. Speight in his seminal work, "The Chemistry and Technology of Petroleum," the course bridges theoretical knowledge with practical application. Participants will delve into the intricacies of crude oil distillation, catalytic conversion processes, and product quality enhancement. BIG BEN Training Center has developed this curriculum to address the real-world challenges faced by refinery professionals, integrating process simulation, advanced process control, and economic evaluation techniques. The course moves beyond simple operational descriptions to empower engineers and specialists to make data-driven decisions that directly impact refinery profitability and sustainability.

Target Audience / This training course is suitable for:

- Process Engineers.
- Refinery Operations Personnel.
- Chemical Engineers.
- Plant Managers and Supervisors.
- Project Engineers.
- Research and Development Scientists.
- Technical Service Engineers.
- Process Control and Instrumentation Engineers.
- Energy Coordinators and Managers.
- Safety and Environmental Engineers.

Target Sectors and Industries:

- Oil and Gas Production and Exploration.
- Petroleum Refining and Petrochemicals.
- Engineering, Procurement, and Construction (EPC) Contractors.
- Technology Licensing and Catalyst Manufacturing Companies.
- Governmental bodies and regulatory agencies overseeing the energy sector.
- Consulting firms specializing in process engineering and energy.

Target Organizations Departments:

- Process Engineering and Technical Services.
- Operations and Production.
- Refinery Planning and Economics.
- Research and Development (R&D).
- Health, Safety, and Environment (HSE).
- Project Management and Engineering.
- Process Control and Automation.
- Maintenance and Reliability.

Course Offerings:

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

- Analyze the complete configuration of a modern petroleum refinery.
- Master the principles of crude oil distillation and atmospheric and vacuum unit optimization.
- Evaluate the performance of key conversion units like FCC, hydrocracking, and coking.
- Implement strategies for hydrotreating and catalytic reforming to meet product specifications.
- Apply advanced process control (APC) concepts to enhance unit stability and profitability.
- Utilize process simulation tools for troubleshooting and process improvement.
- Develop energy conservation and management plans for refinery operations.
- Conduct basic economic evaluations of refinery process modifications.
- Identify and mitigate common operational problems in major refinery units.
- Understand the impact of environmental regulations on refinery process design and operation.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to foster a dynamic and engaging learning environment that emphasizes practical application and knowledge retention. This course moves beyond traditional lectures to incorporate a blended learning approach. Each session combines expert-led instruction with interactive workshops, allowing participants to discuss complex engineering problems and share experiences. A cornerstone of our method is the extensive use of real-world case studies, analyzing both successful optimization projects and significant operational incidents from the global refining industry. This allows participants to learn from tangible examples and apply theoretical concepts to practical scenarios. Group-based problem-solving activities and simulation exercises will challenge attendees to work collaboratively, mirroring the teamwork required in a real refinery setting. Continuous feedback and Q&A sessions are integrated throughout the course to ensure all concepts are clearly understood. This immersive and participatory approach ensures that participants leave not just with new knowledge, but with the confidence to apply it effectively in their own operational environments.

Course Agenda (Course Units):

Unit One: Fundamentals of Petroleum Refining and Crude Oil Characterization

- Introduction to the modern petroleum refinery and its configuration.
- Crude oil composition, properties, and assay analysis.
- The role of crude oil distillation (Atmospheric and Vacuum).
- Optimizing the crude distillation unit for maximum efficiency.
- Refinery products specifications and blending fundamentals.
- Introduction to refinery economics and margin calculation.
- Process flow diagrams (PFDs) and piping and instrumentation diagrams (P&IDs).

Unit Two: Major Refinery Conversion Processes

- Fluid Catalytic Cracking (FCC) unit design, operation, and troubleshooting.
- Hydrocracking processes for maximizing middle distillate production.
- Delayed Coking technology for processing heavy residues.
- Visbreaking and thermal cracking processes.
- Catalytic Reforming for octane number enhancement.
- Isomerization process for gasoline pool improvement.
- Alkylation and Polymerization processes.

Unit Three: Product Treating and Quality Enhancement

- Hydrotreating processes for sulfur, nitrogen, and metal removal.
- Sweetening processes for mercaptan removal (Merox).
- Solvent extraction and deasphalting techniques.
- Lube oil manufacturing processes.
- Hydrogen production and management in the refinery.
- Blending operations for finished products like gasoline, diesel, and jet fuel.
- The role of additives in fuel quality control.

Unit Four: Process Optimization, Control, and Simulation

- Fundamentals of advanced process control (APC) in refineries.
- Application of process simulation software (e.g., Aspen HYSYS) for optimization.
- Energy management and heat integration using Pinch Technology.
- Yield optimization and loss prevention strategies.
- Troubleshooting common operational problems in refinery units.
- Data analytics and digitalization for performance monitoring.
- Economic evaluation of refinery improvement projects.

Unit Five: Safety, Environmental Aspects, and Future Trends

- Process Safety Management (PSM) in refinery operations.
- Hazard and Operability (HAZOP) studies for process units.
- Environmental regulations and emissions control technologies.
- Wastewater treatment in refineries.
- The future of refining: biofuels, renewable diesel, and co-processing.
- Carbon capture, utilization, and storage (CCUS) in refining.
- The role of green hydrogen in decarbonizing refinery operations.

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:

Considering the dual pressures of maximizing profitability and meeting stringent environmental regulations, how can a process engineer balance short-term optimization gains with long-term strategic investments in sustainable refining technologies?

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

This course distinguishes itself by offering a holistic and forward-looking perspective on refinery process engineering. While many programs focus solely on the mechanics of individual units, this training integrates technical principles with their direct economic, safety, and environmental implications. We emphasize the "why" behind the "how," enabling participants to make strategic decisions rather than just executing procedures. The curriculum is uniquely structured to bridge the gap between traditional refining operations and the demands of the energy transition. It dedicates significant time to emerging topics like decarbonization, green hydrogen, and co-processing, equipping engineers with the future-proof skills necessary to navigate the industry's evolution. Furthermore, the course's reliance on practical case studies and simulation-based problem-solving ensures that learning is not purely academic. Participants will grapple with complex, real-world scenarios, fostering critical thinking and collaborative skills that are immediately transferable to their roles, ultimately driving tangible improvements in refinery performance and sustainability.