Process Intensification for Energy and Cost Efficiency Training Course

Ref: #ACE8683

Course Introduction / Overview:

This training course gives a comprehensive look into the core principles of process intensification (PI) for enhancing energy and cost efficiency. As industries face rising energy costs and stricter environmental regulations, PI offers a powerful solution for making chemical processes smaller, safer, and more productive. This course gives participants a solid foundation in the fundamental concepts behind PI, including the design of novel reactors, integrated separation systems, and heat exchangers. We explore how to redesign traditional batch processes into more efficient continuous operations, leading to significant savings in energy, raw materials, and capital costs. The curriculum is informed by leading academic research in the field. The book Process Intensification: Engineering for Efficiency, Sustainability, and Safety by Jacob Moulijn, Michiel van der Schaaf, and Anton van den Berg serves as a foundational reference. BIG BEN Training Center is committed to giving a forward-thinking curriculum that equips professionals with the skills needed to innovate and optimize chemical manufacturing processes for the future.

Target Audience / This training course is suitable for:

- Chemical and process engineers.
- R&D scientists.
- Plant managers and operations leaders.
- Project and design engineers.
- Academics and students in chemical engineering.
- Environmental and sustainability professionals.
- Consultants in process optimization.

Target Sectors and Industries:

- Chemical manufacturing.
- Pharmaceuticals.
- Oil and gas.
- Food and beverage.
- Biotechnology.
- Government agencies and research institutes.
- Energy and power generation.

Target Organizations Departments:

- Process design and engineering.
- Research and development.
- Operations and production.
- Sustainability and corporate responsibility.
- Capital projects.
- Energy management.
- Quality assurance.

Course Offerings:

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

- Describe the principles and benefits of process intensification.
- Identify opportunities for PI in existing and new plants.
- Understand the design of intensified reactors and separators.
- Evaluate the use of microreactors and microchannel heat exchangers.
- Apply process integration principles for energy savings.
- Perform a preliminary techno-economic analysis of a PI project.
- Discuss the challenges and safety considerations of PI.
- Compare intensified processes with conventional designs.

Course Methodology:

This training course uses a mix of interactive and practical training methods to give dynamic learning experience. The curriculum combines theoretical lectures with real-world case studies to bridge the gap between academic concepts and practical application. Participants will use hands-on activities, including group workshops and scenario-based exercises, to reinforce their understanding of key topics. We use discussions and Q&A sessions to encourage a collaborative learning environment, where participants can share experiences and insights. The course also includes an in-depth analysis of successful and unsuccessful projects from various industries to highlight best practices and common pitfalls. This approach gives participants the confidence to apply their new knowledge directly to their professional roles. At BIG BEN Training Center, we believe that an engaging and interactive format is key to mastering new skills, so we focus on giving immediate feedback and continuous support throughout the training. The methods are designed to ensure every participant leaf with a clear, practical skill set.

Course Agenda (Course Units):

Unit One: Fundamentals of Process Intensification.

- Introduction to process intensification (PI).
- The key drivers for PI: energy, cost, and safety.
- The PI toolbox: reactors, separators, and heat exchangers.
- Comparing batch vs. continuous processes.
- Case studies of successful PI implementations.

Unit Two: Intensified Reactors and Separators.

- Microreactors and compact reactors.
- Reactive distillation and reactive absorption.
- Intensified separation methods.
- Membrane reactors and hybrid systems.
- Catalyst design for intensified processes.

Unit Three: Process and Heat Integration.

- Pinch analysis for energy integration.
- Designing compact heat exchangers.
- Process flow sheeting for intensified processes.
- Heat and mass transfer enhancement.
- Minimizing utility consumption.

Unit Four: Process and Safety Aspects.

- Control strategies for intensified processes.
- Modeling and simulation of PI systems.
- Safety in design and operation.
- Handling highly exothermic reactions.
- Scale-up challenges.

Unit Five: Economics and Future Trends.

- Techno-economic analysis of PI projects.
- Life cycle assessment.
- Case studies: PI in the pharmaceutical and petrochemical industries.
- Regulatory and policy drivers.
- Future trends and emerging technologies.

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 principles of process intensification be combined with advanced automation and digital twin technologies to create truly autonomous and self-optimizing chemical plants?

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

This training course is unique because it focuses on a specific, high-impact area of chemical engineering that is critical for future sustainability and profitability. While many courses give a general overview of process design, our curriculum is focused on the practical methods and tools of process intensification, which are essential for reducing energy consumption and capital costs. We don't just teach you about the concepts; we help you find out how to apply them to solve complex industrial problems. The curriculum is heavily focused on real-world case studies and economic analysis, enabling participants to make data-driven decisions about adopting new technologies. It’s an advanced program that gives professionals the skills needed to innovate and lead the change toward more efficient and sustainable chemical manufacturing.