

## COURSE OVERVIEW PE0055

### Process Reactors

### Operation, Troubleshooting, Start-Up & Shutdown

#### Course Title

Process Reactors: Operation, Troubleshooting, Start-Up & Shutdown

#### Course Date/Venue

Session 1: February 16-20, 2025/Al Khobar Meeting Room, Hilton Garden Inn, Al Khobar, KSA

Session 2: September 28- October 02, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE



#### Course Reference

PE0055

#### Course Duration/Credits

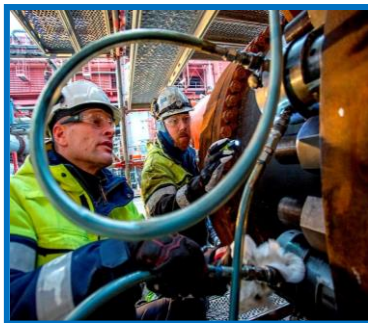
Five days/3.0 CEUs/30 PDHs



#### Course Description



***This practical and highly-interactive course includes real-life case studies and exercises where participants will be engaged in a series of interactive small groups and class workshops.***



This course is designed to provide participants with a detailed and up-to-date overview of Chemical Reactors Design, Operation & Control. It covers the role and importance of chemical reactors in industry; the types of reactors and basic reactor design equations; the thermodynamics and kinetics in reactor design, heat and mass transfer in reactors and reactor sizing and scale-up principles; the types of catalysts and their impact on reactor design; the non-ideal flow patterns in reactors, multiphase reactor design and reactor modeling and simulation; the optimization techniques in reactor design; the safety considerations in reactor design; the startup and shutdown procedures and best practices monitoring; and the proper monitoring and control of reactor conditions.



During this interactive course, participants will learn to troubleshoot the common operational issues; the reactor maintenance and reliability, quality control in reactor operations and environmental and regulatory compliance; the reactor control systems, reactor control strategies, reactor safety and emergency control systems; the process optimization and efficiency by maximizing output while minimizing waste and energy use; integrating reactors with plant operations; the emerging technologies in reactor design; the green chemistry and sustainable reactor design; and the digitalization and smart reactors, future challenges and opportunities in reactor technology.

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## Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on chemical reactors design, operation and control
- Discuss the role and importance of chemical reactors in industry and identify the types of reactors and basic reactor design equations
- Describe thermodynamics and kinetics in reactor design, heat and mass transfer in reactors and reactor sizing and scale-up principles
- Recognize the types of catalysts and their impact on reactor design
- Illustrate non-ideal flow patterns in reactors, multiphase reactor design and reactor modeling and simulation
- Carryout optimization techniques in reactor design as well as safety considerations in reactor design
- Apply startup and shutdown procedures and best practices including proper monitoring and control of reactor conditions
- Troubleshoot common operational issues and implement reactor maintenance and reliability, quality control in reactor operations and environmental and regulatory compliance
- Recognize reactor control systems, reactor control strategies, reactor safety and emergency control systems
- Implement process optimization and efficiency by maximizing output while minimizing waste and energy use
- Integrate reactors with plant operations and discuss emerging technologies in reactor design
- Discuss green chemistry and sustainable reactor design, digitalization and smart reactors, future challenges and opportunities in reactor technology

## Exclusive Smart Training Kit - H-STK®



*Participants of this course will receive the exclusive “Howard Smart Training Kit” (H-STK®). The H-STK® consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

## Who Should Attend

This course provides a complete and up-to-date overview of chemical reactors design, operation and control for process engineers, production engineers, section heads, shift supervisors and other operational staff.

## Accommodation


Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

### Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

### Certificate Accreditations


Certificates are accredited by the following international accreditation organizations:-

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The International Accreditors for Continuing Education and Training (IACET - USA)

Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

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British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council for Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

### Course Fee

**US\$ 5,500** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

### Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:



**Mr. Mervyn Frampton** is a **Senior Process Engineer** with over **30 years** of industrial experience within the **Oil & Gas, Refinery, Petrochemical** and **Utilities** industries. His expertise lies extensively in the areas of **Process Troubleshooting, Distillation Towers, Fundamentals of Distillation** for Engineers, **Distillation Operation and Troubleshooting, Advanced Distillation Troubleshooting, Distillation Technology, Vacuum Distillation, Distillation Column Operation & Control, Oil Movement Storage & Troubleshooting, Process Equipment Design, Applied Process Engineering Elements, Process Plant Optimization, Revamping & Debottlenecking, Process Plant Troubleshooting & Engineering Problem Solving, Process Plant Monitoring, Catalyst Selection & Production Optimization, Operations Abnormalities & Plant Upset, Process Plant Start-up & Commissioning, Clean Fuel Technology & Standards, Flare, Blowdown & Pressure Relief Systems, Oil & Gas Field Commissioning Techniques, Pressure Vessel Operation, Gas Processing, Chemical Engineering, Process Reactors Start-Up & Shutdown, Gasoline Blending for Refineries, Urea Manufacturing Process Technology, Continuous Catalytic Reformer (CCR), De-Sulfurization Technology, Advanced Operational & Troubleshooting Skills, Principles of Operations Planning, Rotating Equipment Maintenance & Troubleshooting, Hazardous Waste Management & Pollution Prevention, Heat Exchangers & Fired Heaters Operation & Troubleshooting, Energy Conservation Skills, Catalyst Technology, Refinery & Process Industry, Chemical Analysis, Process Plant, Commissioning & Start-Up, Alkylation, Hydrogenation, Dehydrogenation, Isomerization, Hydrocracking & De-Alkylation, Fluidized Catalytic Cracking, Catalytic Hydrodesulphuriser, Kerosene Hydrotreater, Thermal Cracker, Catalytic Reforming, Polymerization, Polyethylene, Polypropylene, Pilot Water Treatment Plant, Gas Cooling, Cooling Water Systems, Effluent Systems, Material Handling Systems, Gasifier, Gasification, Coal Feeder System, Sulphur Extraction Plant, Crude Distillation Unit, Acid Plant Revamp and Crude Pumping.** Further, he is also well-versed in HSE Leadership, Project and Programme Management, Project Coordination, Project Cost & Schedule Monitoring, Control & Analysis, Team Building, Relationship Management, Quality Management, Performance Reporting, Project Change Control, Commercial Awareness and Risk Management.

During his career life, Mr. Frampton held significant positions as the **Site Engineering Manager, Senior Project Manager, Process Engineering Manager, Project Engineering Manager, Construction Manager, Site Manager, Area Manager, Procurement Manager, Factory Manager, Technical Services Manager, Senior Project Engineer, Process Engineer, Project Engineer, Assistant Project Manager, Handover Coordinator and Engineering Coordinator** from various international companies such as the **Fluor Daniel, KBR South Africa, ESKOM, MEGAWATT PARK, CHEMEPIC, PDPS, CAKASA, Worley Parsons, Lurgi South Africa, Sasol, Foster Wheeler, Bosch & Associates, BCG Engineering Contractors, Fina Refinery, Sapref Refinery, Secunda Engine Refinery** just to name a few.

Mr. Frampton has a **Bachelor's degree in Industrial Chemistry** from **The City University in London**. Further, he is a **Certified Instructor/Trainer, a Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management (ILM)** and has delivered numerous trainings, courses, workshops, conferences and seminars internationally.

### Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures
- 20% Practical Workshops & Work Presentations
- 30% Hands-on Practical Exercises & Case Studies
- 20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

### Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

#### Day 1

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<i>Introduction to Chemical Reactors in Industry: Overview of their Role &amp; Importance</i>
0930 – 0945	Break
0945 – 1030	<i>Types of Reactors: Batch, Continuous, PFR, CSTR, etc.</i>
1030 – 1130	<i>Basic Reactor Design Equations: Understanding Material &amp; Energy Balances</i>
1130 – 1215	<i>Thermodynamics &amp; Kinetics in Reactor Design: Fundamentals &amp; their Application</i>
1215 – 1230	Break
1230 – 1330	<i>Heat &amp; Mass Transfer in Reactors: Principles &amp; Considerations in Design</i>
1330 – 1420	<i>Reactor Sizing &amp; Scale-Up Principles: Techniques &amp; Challenges in Scaling Up Reactors</i>
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day One

#### Day 2

0730 – 0830	<i>Catalysis in Chemical Reactors: Types of Catalysts &amp; their Impact on Reactor Design</i>
0830 – 0930	<i>Non-Ideal Flow Patterns in Reactors: Deviations from Ideal Behavior &amp; their Implications</i>
0930 – 0945	Break
0945 – 1100	<i>Multiphase Reactor Design: Designing for Liquid-Liquid, Gas-Liquid &amp; Solid-Liquid Systems</i>
1100 – 1215	<i>Reactor Modeling &amp; Simulation: Tools &amp; Techniques for Reactor Design Simulation</i>



1215 - 1230	Break
1230 - 1330	<b>Optimization Techniques in Reactor Design: Approaches to Optimize Reactor Performance</b>
1330 - 1420	<b>Safety Considerations in Reactor Design: Recognizing &amp; Mitigating Potential Hazards</b>
1420 - 1430	<b>Recap</b>
1430	Lunch & End of Day Two

**Day 3**

0730 - 0830	<b>Startup &amp; Shutdown Procedures: Best Practices for Starting &amp; Stopping Reactors Safely</b>
0830 - 0930	<b>Monitoring &amp; Control of Reactor Conditions: Temperature, Pressure &amp; Flow Controls</b>
0930 - 0945	Break
0945 - 1100	<b>Troubleshooting Common Operational Issues: Identifying &amp; Addressing Operational Problems</b>
1100 - 1215	<b>Reactor Maintenance &amp; Reliability: Ensuring Ongoing Operational Efficiency</b>
1215 - 1230	Break
1230 - 1330	<b>Quality Control in Reactor Operations: Ensuring Product Quality &amp; Consistency</b>
1330 - 1420	<b>Environmental &amp; Regulatory Compliance: Adhering to Environmental Regulations &amp; Standards</b>
1420 - 1430	<b>Recap</b>
1430	Lunch & End of Day Three

**Day 4**

0730 - 0830	<b>Reactor Control Systems: Introduction to Control Theory &amp; Applications</b>
0830 - 0930	<b>Reactor Control Strategies: PID Control, Cascade Control, Feedforward Control</b>
0930 - 0945	Break
0945 - 1100	<b>Reactor Safety &amp; Emergency Control Systems: Implementing Safety Interlocks &amp; Alarms</b>
1100 - 1215	<b>Process Optimization &amp; Efficiency: Maximizing Output While Minimizing Waste &amp; Energy Use</b>
1215 - 1230	Break
1230 - 1330	<b>Integration of Reactors with Plant Operations: Ensuring Smooth Operation within the Larger System</b>
1330 - 1420	<b>Case Studies of Reactor Control Challenges: Real-World Examples &amp; Solutions</b>
1420 - 1430	<b>Recap</b>
1430	Lunch & End of Day Four





**Day 5**

0730 – 0830	<i>Emerging Technologies in Reactor Design: Latest Advancements in Reactor Technology</i>
0830 – 0930	<i>Green Chemistry &amp; Sustainable Reactor Design: Eco-Friendly Approaches in Chemical Processing</i>
0930 – 0945	<i>Break</i>
0945 – 1100	<i>Digitalization &amp; Smart Reactors: The Role of IoT, AI &amp; Big Data in Reactor Operations</i>
1100 – 1230	<i>Future Challenges &amp; Opportunities in Reactor Technology: Predicting Future Industry Needs</i>
1230 – 1245	<i>Break</i>
1245 – 1345	<i>Interactive Workshop: Problem-Solving &amp; Design Exercises Based on Real Scenarios</i>
1345 – 1400	<i>Course Conclusion</i>
1400 – 1415	<b>POST-TEST</b>
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch &amp; End of Course</i>

**Practical Sessions**

This practical and highly-interactive course includes real-life case studies and exercises:-



**Course Coordinator**

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