# COURSE OVERVIEW PE1017
# AI in Crude Oil Refining

**Course Title**
AI in Crude Oil Refining


**Course Date/Venue**
Session 1: June 23-27, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: December 07-11, 2025/Tamra Meeting Room, Al Bandar Rotana Creek, Dubai UAE

**Course Reference**
PE1017

**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 Artificial Intelligence in Crude Oil Refining. It covers the evolution of AI in the oil refining industry and key AI technologies covering machine learning, deep learning, IoT and digital twins; the AI for crude oil feedstock analysis, distillation and fractionation optimization and refinery process control and automation; optimizing hydrocracking and reforming units and monitoring isomerization reactions; the AI-driven performance improvements in catalytic reforming and AI for optimizing alkylation and polymerization processes; the AI for predictive maintenance of refinery equipment, heat exchanger and boiler efficiency optimization; and the AI for fluid catalytic cracking (FCC) optimization.

Further, the course will also discuss the AI for pump and compressor health monitoring, pipeline and storage tank monitoring; the AI for crude oil blending and feedstock selection, hydroprocessing and desulfurization, hydrogen and sulfur recovery units (SRU); the AI for refinery energy efficiency and emissions reduction including aromatics, gasoline and diesel production; and the hazard identification in refineries, accident prediction and prevention, gas detection, leak prevention, emergency response and safety drills.

During this interactive course, participants will learn the AI-driven predictive analytics for greenhouse gas emissions and machine learning for refinery air quality monitoring; the AI-powered real-time monitoring of volatile organic compounds (VOCs) and AI-assisted compliance with environmental regulations; the digital twin, AI in advanced control systems and process automation; the smart refinery management and AI-driven decision making; the future AI trends in refining and crude oil processing; and the AI-driven predictive analytics in oil refining including reducing operational costs and increasing efficiency.

## Course Objectives

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

- Apply and gain an in-depth knowledge on artificial intelligence in crude oil refining
- Discuss the evolution of AI in the oil refining industry and key AI technologies covering machine learning, deep learning, IoT and digital twins
- Carryout AI for crude oil feedstock analysis, distillation and fractionation optimization and refinery process control and automation
- Optimize hydrocracking and reforming units and monitor isomerization reactions
- Apply AI-driven performance improvements in catalytic reforming and AI for optimizing alkylation and polymerization processes
- Employ AI for predictive maintenance of refinery equipment, heat exchanger and boiler efficiency optimization and fluid catalytic cracking (FCC) optimization
- Implement AI for pump and compressor health monitoring as well as pipeline and storage tank monitoring
- Carryout AI for crude oil blending and feedstock selection, hydroprocessing and desulfurization, hydrogen and sulfur recovery units (SRU)
- Employ AI for refinery energy efficiency and emissions reduction including aromatics, gasoline and diesel production
- Implement hazard identification in refineries, accident prediction and prevention, gas detection, leak prevention, emergency response and safety drills
- Apply AI-driven predictive analytics for greenhouse gas emissions, machine learning for refinery air quality monitoring, AI-powered real-time monitoring of volatile organic compounds (VOCs) and AI-assisted compliance with environmental regulations
- Discuss digital twin and apply AI in advanced control systems and process automation, smart refinery management and AI-driven decision making
- Discuss the future AI trends in refining and crude oil processing and apply AI-driven predictive analytics in oil refining including reducing operational costs and increasing efficiency

## Exclusive Smart Training Kit - H-STK®


*Participants of this course will receive the exclusive "Haward 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 an overview of all significant aspects and considerations of artificial intelligence in crude oil refining for engineers and technical professionals, refinery operations and maintenance personnel, data and AI specialists in oil and gas, managers and decision-makers, researchers and other technical staff.

## 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: -

- 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.

- 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.

**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.

## Accommodation

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

## 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 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***

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| *0730 – 0800* | *Registration & Coffee* |
| *0800 – 0815* | *Welcome & Introduction* |
| *0815 – 0830* | ***PRE-TEST*** |
| *0830 – 0930* | ***Overview of AI in Refining Operations***<br>*What Is Artificial Intelligence (AI)? • The Evolution of AI in the Oil Refining Industry • Key AI Technologies (Machine Learning, Deep Learning, IoT, Digital Twins) • AI versus Traditional Refinery Process Control* |
| *0930 – 0945* | *Break* |
| *0945 – 1030* | ***AI for Crude Oil Feedstock Analysis***<br>*AI-Based Crude Oil Quality Classification • Machine Learning for Predicting Feedstock Behavior in Refining • AI-Driven Crude Blending Optimization • AI for Real-Time Tracking of Crude Composition Changes* |
| *1030 – 1130* | ***AI in Distillation & Fractionation Optimization***<br>*AI-Powered Optimization of Crude Distillation Units (CDU) • Machine Learning for Predicting Distillation Efficiency • AI-Driven Yield Optimization for Light and Heavy Fractions • AI-Based Identification of Distillation Process Inefficiencies* |
| *1130 – 1215* | ***AI for Refinery Process Control & Automation***<br>*AI-Driven Predictive Process Control • Machine Learning for Real-Time Process Optimization • AI-Powered Anomaly Detection in Refining Operations • AI-Assisted Early Fault Detection in Refining Units* |
| *1215 – 1230* | *Break* |

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| *1230 – 1330* | ***AI in Hydrocarbon Processing & Conversion***<br>*AI for Optimization of Hydrocracking and Reforming Units • Machine Learning for Monitoring Isomerization Reactions • AI-Driven Performance Improvements in Catalytic Reforming • AI for Optimizing Alkylation and Polymerization Processes* |
| *1330 – 1420* | ***Hands-On: AI-Based Refinery Data Analysis***<br>*Implementing AI Models for Crude Oil Quality Prediction • AI-Driven Process Monitoring in Distillation Units • Machine Learning for Fraction Yield Optimization • AI-Powered Real-Time Refinery Performance Analysis* |
| *1420 – 1430* | ***Recap***<br>*Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow* |
| *1430* | *Lunch & End of Day One* |

***Day 2***

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| *0730 – 0830* | ***AI for Predictive Maintenance of Refinery Equipment***<br>*AI-Driven Predictive Failure Detection in Processing Units • Machine Learning for Refinery Asset Condition Monitoring • AI-Powered Maintenance Scheduling for Critical Equipment • Case Studies of AI-Driven Maintenance in Refineries* |
| *0830 – 0930* | ***AI for Heat Exchanger & Boiler Efficiency Optimization***<br>*AI-Assisted Heat Exchanger Fouling Prediction • Machine Learning for Optimizing Boiler Performance • AI-Powered Efficiency Monitoring in Thermal Units • AI-Driven Predictive Maintenance for Heat Exchangers* |
| *0930 – 0945* | *Break* |
| *0945 – 1100* | ***AI in Fluid Catalytic Cracking (FCC) Optimization***<br>*AI-Based Catalyst Performance Monitoring • Machine Learning for Optimizing FCC Unit Yield • AI-Driven Prediction of Coke Formation • AI-Powered Monitoring of Regenerator Efficiency* |
| *1100 – 1215* | ***AI for Pump & Compressor Health Monitoring***<br>*Machine Learning for Pump Failure Prediction • AI-Powered Vibration Analysis for Rotating Equipment • AI-Driven Compressor Performance Monitoring • AI-Assisted Predictive Maintenance for Refinery Pumps* |
| *1215 – 1230* | *Break* |
| *1230 – 1330* | ***AI for Pipeline & Storage Tank Monitoring***<br>*AI-Based Pipeline Leak Detection Systems • Machine Learning for Corrosion and Crack Prediction • AI-Driven Real-Time Monitoring of Crude Oil Storage Tanks • AI-Powered Tank Level and Inventory Optimization* |
| *1330 – 1420* | ***Hands-On: AI for Predictive Maintenance & Equipment Health***<br>*AI-Based Vibration Analysis for Rotating Machinery • Machine Learning Models for Refinery Pump Failure Prediction • AI-Driven Predictive Maintenance for Heat Exchangers • AI-Powered Efficiency Monitoring in Refinery Boilers* |
| *1420 – 1430* | ***Recap***<br>*Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow* |
| *1430* | *Lunch & End of Day Two* |

**Day 3**

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| 0730 – 0830 | ***AI for Crude Oil Blending & Feedstock Selection***<br>*AI-Driven Crude Oil Compatibility Analysis • Machine Learning for Optimal Crude Blending Strategies • AI-Powered Viscosity and API Gravity Predictions • AI-Assisted Real-Time Blending Control* |
| 0830 – 0930 | ***AI in Hydroprocessing & Desulfurization***<br>*AI-Driven Optimization of Hydrotreater Units • Machine Learning for Sulfur Content Prediction in Fuels • AI-Powered Catalyst Performance Monitoring in Hydroprocessing • AI-Assisted Predictive Modeling of Desulfurization Processes* |
| 0930 – 0945 | *Break* |
| 0945 – 1100 | ***AI for Hydrogen & Sulfur Recovery Units (SRU)***<br>*AI-Driven Hydrogen Demand Forecasting • Machine Learning for Sulfur Recovery Efficiency Improvement • AI-Powered Optimization of Tail Gas Treatment Processes • AI-Assisted Predictive Modeling of Claus Unit Performance* |
| 1100 – 1215 | ***AI for Refinery Energy Efficiency & Emissions Reduction***<br>*AI-Driven Refinery Energy Consumption Forecasting • Machine Learning for Fuel Gas Optimization • AI-Powered Emissions Monitoring and Reduction Strategies • AI-Assisted Predictive Analytics for Carbon Footprint Reduction* |
| 1215 – 1230 | *Break* |
| 1230 – 1330 | ***AI in Aromatics, Gasoline & Diesel Production***<br>*AI for Gasoline Blending and Octane Number Prediction • Machine Learning for Diesel Sulfur Content Optimization • AI-Powered Optimization of Aromatics Production • AI-Assisted Predictive Analytics for Product Quality Assurance* |
| 1330 – 1420 | ***Hands-On: AI-Based Process Optimization***<br>*AI-Driven Crude Blending Optimization Model • Machine Learning for Hydrogen Consumption Forecasting • AI-Powered Predictive Analytics for Sulfur Recovery Units • AI-Assisted Refinery Emissions Monitoring System* |
| 1420 – 1430 | ***Recap***<br>*Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow* |
| 1430 | *Lunch & End of Day Three* |

**Day 4**

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| 0730 – 0830 | ***AI for Refinery Safety & Risk Management***<br>*AI-Driven Hazard Identification in Refineries • Machine Learning for Accident Prediction and Prevention • AI-Powered Real-Time Gas Detection and Leak Prevention • AI-Assisted Emergency Response and Safety Drills* |
| 0830 – 0930 | ***AI for Environmental Compliance & Emission Monitoring***<br>*AI-Driven Predictive Analytics for Greenhouse Gas Emissions • Machine Learning for Refinery Air Quality Monitoring • AI-Powered Real-Time Monitoring of Volatile Organic Compounds (VOCs) • AI-Assisted Compliance with Environmental Regulations* |
| 0930 – 0945 | *Break* |
| 0945 – 1100 | ***AI-Powered Digital Twin Technology for Refineries***<br>*What Is a Digital Twin? • AI-Driven Real-Time Refinery Simulation Models • Machine Learning for Process Optimization in Digital Twins • AI-Powered Predictive Analytics for Refinery Performance Monitoring* |

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| *1100 – 1215* | ***AI in Advanced Control Systems & Process Automation***<br>*AI-Assisted Distributed Control System (DCS) Optimization • Machine Learning for Advanced Process Control (APC) • AI-Driven Refinery-Wide Automation Strategies • AI-Powered Decision Support Systems for Operators* |
| *1215 – 1230* | *Break* |
| *1230 – 1330* | ***AI for Smart Refinery Management & AI-Driven Decision Making***<br>*AI-Powered Real-Time Refinery Production Scheduling • Machine Learning for Refinery Economics Optimization • AI-Driven Supply Chain and Logistics Planning • AI-Assisted Refinery Margin and Profitability Forecasting* |
| *1330 – 1420* | ***Hands-On: AI for Safety & Digital Twin Applications***<br>*AI-Driven Risk Prediction Model for Refinery Operations • Machine Learning for Environmental Compliance Monitoring • AI-Powered Refinery Digital Twin Simulation • AI-Assisted Refinery Production Scheduling Optimization* |
| *1420 – 1430* | ***Recap***<br>*Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow* |
| *1430* | *Lunch & End of Day Four* |

***Day 5***

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| *0730 – 0930* | ***Future AI Trends in Refining & Crude Oil Processing***<br>*AI-Powered Self-Optimizing Refinery Systems • AI-Driven Autonomous Plant Operations • AI-Assisted Refinery Digital Transformation Strategies • AI for Sustainability and Circular Economy in Refining* |
| *0930 – 0945* | *Break* |
| *0945 – 1100* | ***AI for AI-Driven Predictive Analytics in Oil Refining***<br>*AI-Powered Predictive Maintenance Evolution • AI-Driven Smart Refining Operations • AI-Assisted Refinery Workforce Optimization • AI-Powered Automated Process Troubleshooting* |
| *1100 – 1215* | ***AI for Reducing Operational Costs & Increasing Efficiency***<br>*AI-Driven Refinery Profitability Optimization • Machine Learning for Cost Reduction in Crude Oil Processing • AI-Powered Energy Efficiency Improvement Models • AI-Assisted Fuel Blending Cost Minimization* |
| *1215 – 1230* | *Break* |
| *1230 – 1345* | ***Hands-On: AI-Powered Refining Optimization Model***<br>*AI-Based Refinery Process Control Simulation • Machine Learning Model for Predictive Maintenance Strategy • AI-Powered Emissions Tracking and Compliance System • AI-Assisted Refinery Economics and Profitability Optimization* |
| *1345 – 1400* | ***Course Conclusion***<br>*Using this Course Overview, the Instructor(s) will Brief Participants about t Topics that were Covered During the Course* |
| *1400 – 1415* | ***POST-TEST*** |
| *1415 – 1430* | *Presentation of Course Certificates* |
| *1430* | *Lunch & End of Course* |

**Practical Sessions**

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

**Course Coordinator**

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