COURSE OVERVIEW PE1016
AI in Natural Gas Treatment

Course Title
AI in Natural Gas Treatment

Course Date/Venue
Session 1: May 25-29, 2025/Tamra Meeting Room, Al Bandar Rotana Creek, Dubai UAE
Session 2: November 17-21, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
PE1016

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 Natural Gas Treatment. It covers the fundamentals of AI in natural gas processing and AI for gas feedstock characterization and quality prediction; the AI in gas separation and fractionation optimization; the AI for process control, real-time monitoring and acid gas removal; the AI for predictive maintenance of gas processing equipment, heat exchanger and gas cooler efficiency optimization; the AI in gas dehydration and water removal optimization, pump and compressor health monitoring; and the AI for pipeline and storage tank monitoring.

Further, the course will also discuss the AI for gas sweetening and acid gas processing, natural gas liquefaction (LNG) optimization, mercury removal and trace contaminant detection; the AI for sulfur recovery and flue gas optimization including NGL (natural gas liquids) processing; the AI for gas processing safety and risk management; and the AI for environmental compliance and emission monitoring.

During this interactive course, participants will learn the AI-driven real-time gas plant simulation models, machine learning for process optimization in digital twins and AI-powered predictive analytics for plant performance monitoring; the AI in advanced control systems and process automation, smart gas plant management and AI-driven decision making; the future AI trends in gas processing and LNG production; and the AI for AI-driven predictive analytics in gas treatment, 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 natural gas treatment
- Discuss the fundamentals of AI in natural gas processing and apply AI for gas feedstock characterization and quality prediction
- Carryout AI in gas separation and fractionation optimization, AI for process control and real-time monitoring and acid gas removal
- Employ AI for predictive maintenance of gas processing equipment, heat exchanger and gas cooler efficiency optimization
- Apply AI in gas dehydration and water removal optimization, pump and compressor health monitoring and pipeline and storage tank monitoring
- Illustrate AI for gas sweetening and acid gas processing, natural gas liquefaction (LNG) optimization, mercury removal and trace contaminant detection
- Carryout AI for sulfur recovery and flue gas optimization including NGL (natural gas liquids) processing
- Employ AI for gas processing safety and risk management, environmental compliance and emission monitoring
- Describe AI-driven real-time gas plant simulation models, machine learning for process optimization in digital twins and AI-powered predictive analytics for plant performance monitoring
- Implement AI in advanced control systems and process automation, smart gas plant management and AI-driven decision making
- Discuss the future AI trends in gas processing and LNG production and apply AI for AI-driven predictive analytics in gas treatment, 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 natural gas treatment for engineers and technical professionals, 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. Hany Ghazal, BSc, is a **Senior Process Engineer** with over **35 years** of experience within the **Oil & Gas**, **Hydrocarbon** and **Petrochemical** industries. His expertise widely covers in the areas of **Desalination & Mixed Bed**, **Absorption & Stripping Columns** Operation, **Mass** Transfer, **Gas** Absorption, **Tray Column & Packed Column Absorbers**, **Acid Gas** Removal Operation & Troubleshooting, **Ion Exchange**, **Demineralization**, **Resin** Testing, **Deaeration**, **Process Plant** Operations, **Process Plant** Troubleshooting & Engineering Problem Solving, Safety & Pollution Control, **Water Injection**, **Corrosion** Monitoring & Corrosion Mitigation, **Drilling**, **Maintenance**, **Production**, **Process**, **Equipment** Maintenance, **Engineering Drawing** Screening, **Surface Production** Facilities, **Infrastructure Integrity** Assurance, **Emergency Response**, Safety Awareness, Advanced **Safety Auditing**, **HAZOP**, **Integrity** Management Rolling Plan, **Gas Wells** Production, **Reservoir** Management, Marine Services, Production, Pumping, Transportation, Processing, Storage, Shipping, Facilities Change Process, Training & Implementation, Capital & Expense Budgets, Managing Expenditures, General Performance, Tendering Process, Prepare Bid Packages, Technical & Commercial Evaluation, Tendering Process, Training Course Implementation, Documents, Production Daily Reports and Business Plan.

During his career life, Mr. Ghazal has gained his practical and field experience through his various significant positions and dedication as the **Training Instructor & Consultant, Chairman & Managing Director**, **Operation General Manager & Board Member**, **Field Operation General & Manager**, **Facilities Assistance General Manager**, **Environment & Corrosion Department Head** and **Operations Engineer** (Water Injection Plants) for Cairo University and Britch University, Joint ventures companies in the Egyptian oil & Gas sector, Natural gas production Company in The Egyptian Oil & Gas Sector Established and Ras Shukeir Oil Fields (GUPCO).

Mr. Hany has a **Bachelor's** degree of **Chemical Engineering**. Further, he is a **Certified Instructor/Trainer** and has delivered numerous trainings, courses, workshops, conferences and seminars internationally.

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.

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	***PRE-TEST***
0830 – 0930	***Fundamentals of AI in Natural Gas Processing*** *What is Artificial Intelligence (AI)? • Role of AI in Gas Processing & Treatment • AI versus Traditional Gas Treatment Techniques • Key AI Technologies (Machine Learning, Deep Learning, IoT, Digital Twins)*
0930 – 0945	*Break*
0945 – 1030	***AI for Gas Feedstock Characterization & Quality Prediction*** *AI-Based Natural Gas Composition Analysis • Machine Learning for Predicting Gas Quality Variations • AI-Driven Forecasting of Gas Impurities in Processing • AI-Assisted Gas Blending Optimization*
1030 – 1130	***AI in Gas Separation & Fractionation Optimization*** *AI-Powered Optimization of Gas Separation Units • Machine Learning for Cryogenic Distillation Efficiency • AI-Driven Yield Optimization for NGL Recovery • AI for Identifying Gas Separation Inefficiencies*
1130 – 1215	***AI for Process Control & Real-Time Monitoring*** *AI-Driven Predictive Process Control • Machine Learning for Detecting Anomalies in Gas Treatment • AI-Assisted Real-Time Process Optimization • AI-Powered Early Fault Detection in Gas Processing Units*
1215 – 1230	*Break*
1230 – 1330	***AI in Acid Gas Removal (CO_2 & H_2S Removal)*** *AI-Based Optimization of Amine Treatment Processes • Machine Learning for Solvent Degradation Prediction • AI-Driven Mass Transfer Efficiency Improvement • AI-Powered Predictive Modeling for CO_2 & H_2S Levels*
1330 – 1420	***Hands-On: AI-Based Data Analysis for Gas Processing*** *Implementing AI Models for Natural Gas Composition Prediction • AI-Driven Process Monitoring in Gas Treatment Units • Machine Learning for Fraction Yield Optimization • AI-Powered Real-Time Gas Quality Monitoring*
1420 – 1430	***Recap*** *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

0730 – 0830	***AI for Predictive Maintenance of Gas Processing Equipment*** *AI-Driven Predictive Failure Detection in Gas Plants • Machine Learning for Gas Compressor Health Monitoring • AI-Powered Maintenance Scheduling for Key Processing Units • Case Studies of AI-Driven Maintenance in Gas Treatment*
0830 – 0930	***AI for Heat Exchanger & Gas Cooler Efficiency Optimization*** *AI-Assisted Heat Exchanger Fouling Prediction • Machine Learning for Optimizing Heat Recovery Units • AI-Powered Efficiency Monitoring in Thermal Processing • AI-Driven Predictive Maintenance for Gas Coolers*
0930 – 0945	*Break*
0945 – 1100	***AI in Gas Dehydration & Water Removal Optimization*** *AI-Driven Optimization of Glycol Dehydration Systems • Machine Learning for Predicting Water Content in Gas Streams • AI-Powered Performance Monitoring of Molecular Sieves • AI-Assisted Predictive Maintenance for Dehydration Units*
1100 – 1215	***AI for Pump & Compressor Health Monitoring*** *Machine Learning for Gas Compressor Failure Prediction • AI-Powered Vibration Analysis for Rotating Equipment • AI-Driven Performance Monitoring for Centrifugal & Reciprocating Compressors • AI-Assisted Predictive Maintenance for Gas Pumping Stations*
1215 – 1230	*Break*
1230 – 1330	***AI for Pipeline & Storage Tank Monitoring*** *AI-Based Pipeline Leak Detection Systems • Machine Learning for Corrosion and Crack Prediction • AI-Driven Real-Time Monitoring of Gas Storage Tanks • AI-Powered Inventory and Pressure Optimization*
1330 – 1420	***Hands-On: AI for Predictive Maintenance & Equipment Health*** *AI-Based Vibration Analysis for Gas Compressors • Machine Learning Models for Pump Failure Prediction • AI-Driven Predictive Maintenance for Heat Exchangers • AI-Powered Real-Time Efficiency Monitoring in Gas Cooling Systems*
1420 – 1430	***Recap*** *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

0730 – 0830	***AI for Gas Sweetening & Acid Gas Processing*** *AI-Driven Optimization of Amine Circulation Rates • Machine Learning for Predicting CO_2 Absorption Efficiency • AI-Powered Optimization of Solvent Regeneration Processes • AI-Assisted Predictive Modeling of Acid Gas Removal Performance*
0830 – 0930	***AI in Natural Gas Liquefaction (LNG) Optimization*** *AI-Based Optimization of Liquefaction Cycles • Machine Learning for Cryogenic Heat Exchanger Performance Prediction • AI-Driven Efficiency Improvements in LNG Production • AI-Powered Forecasting of LNG Output Based on Feed Gas Variability*
0930 – 0945	*Break*

0945 – 1100	***AI for Mercury Removal & Trace Contaminant Detection*** *AI-Driven Detection of Trace Elements in Natural Gas • Machine Learning for Predicting Mercury Adsorption Efficiency • AI-Powered Optimization of Activated Carbon Beds • AI-Assisted Monitoring of Contaminant Breakthrough Points*
1100 – 1215	***AI for Sulfur Recovery & Flue Gas Optimization*** *AI-Driven Optimization of Claus Sulfur Recovery Units • Machine Learning for Tail Gas Treatment Efficiency Improvement • AI-Powered Emission Control in Sulfur Recovery Processes • AI-Assisted Predictive Modeling of SO_2 and NOx Emissions*
1215 – 1230	*Break*
1230 – 1330	***AI in NGL (Natural Gas Liquids) Processing*** *AI-Powered Separation Optimization in NGL Fractionation • Machine Learning for Predicting C1-C5 Product Yields • AI-Driven Optimization of Refrigeration Cycles • AI-Assisted Predictive Modeling of Fractionation Column Performance*
1330 – 1420	***Hands-On: AI-Based Process Optimization*** *AI-Driven Optimization of Amine-Based CO_2 Removal • Machine Learning for LNG Plant Efficiency Improvement • AI-Powered Predictive Analytics for Sulfur Recovery Units • AI-Assisted NGL Fractionation Yield Optimization*
1420 – 1430	***Recap*** *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

0730 – 0830	***AI for Gas Processing Safety & Risk Management*** *AI-Driven Hazard Identification in Gas Plants • 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*** *AI-Driven Predictive Analytics for Methane Emissions • Machine Learning for Gas Flaring & Venting Optimization • 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 Gas Plants*** *What Is a Digital Twin? • AI-Driven Real-Time Gas Plant Simulation Models • Machine Learning for Process Optimization in Digital Twins • AI-Powered Predictive Analytics for Plant Performance Monitoring*
1100 – 1215	***AI in Advanced Control Systems & Process Automation*** *AI-Assisted Distributed Control System (DCS) Optimization • Machine Learning for Advanced Process Control (APC) • AI-Driven Gas Treatment Automation Strategies • AI-Powered Decision Support Systems for Operators*
1215 – 1230	*Break*
1230 – 1330	***AI for Smart Gas Plant Management & AI-Driven Decision Making*** *AI-Powered Real-Time Gas Processing Scheduling • Machine Learning for Gas Supply Chain Optimization • AI-Driven Pipeline Network Pressure Balancing • AI-Assisted Plant Profitability Forecasting*

1330 – 1420	***Hands-On: AI for Safety & Digital Twin Applications*** *AI-Driven Risk Prediction Model for Gas Treatment Units • Machine Learning for Environmental Compliance Monitoring • AI-Powered Gas Plant Digital Twin Simulation • AI-Assisted Pipeline Network Optimization*
1420 – 1430	***Recap*** *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

0730 – 0930	***Future AI Trends in Gas Processing & LNG Production*** *AI-Powered Autonomous Gas Plant Operations • AI-Driven Real-Time Methane Leak Prevention • AI-Assisted Gas-to-Hydrogen Transformation Strategies • AI for Sustainability in Natural Gas Processing*
0930 – 0945	*Break*
0945 – 1100	***AI for AI-Driven Predictive Analytics in Gas Treatment*** *AI-Powered Predictive Maintenance Evolution • AI-Driven Smart Gas Processing Operations • AI-Assisted Workforce Optimization in Gas Plants • AI-Powered Automated Process Troubleshooting*
1100 – 1215	***AI for Reducing Operational Costs & Increasing Efficiency*** *AI-Driven Gas Processing Profitability Optimization • Machine Learning for Cost Reduction in Gas Treatment • AI-Powered Energy Efficiency Improvement Models • AI-Assisted Fuel Gas Optimization Strategies*
1215 – 1230	*Break*
1230 – 1345	***Hands-On: AI-Powered Gas Treatment Optimization Model*** *AI-Based Process Control Simulation for Gas Plants • Machine Learning Model for Predictive Maintenance Strategy • AI-Powered Emissions Tracking and Compliance System • AI-Assisted Gas Supply Chain and Logistics Optimization*
1345 – 1400	***Course Conclusion*** *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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