COURSE OVERVIEW PE0216
Advanced Gas Dehydration & Mercury Removal

Course Title
Advanced Gas Dehydration and Mercury Removal

Course Date/Venue
Session 1: April 14-18, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: September 14-18, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
PE0216

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 Advanced Gas Dehydration and Mercury Removal. It covers the composition and properties of natural gas and the importance of dehydration and mercury removal; the sources of water in natural gas, formation and impact of hydrates and sources of mercury in and effects of mercury contamination; the gas hydrate formation and prevention, gas dehydration processes, mercury removal technologies and process flow and equipment; and the glycol-based dehydration systems, glycol regeneration and contamination control, solid desiccant dehydration, membrane-based dehydration technologies and hybrid dehydration technologies.

Further, the course will also discuss the fundamentals of mercury removal, activated carbon and metal sulfide-based adsorbents; the impregnated and non-impregnated adsorbents and mercury removal from LNG and cryogenic systems; the performance monitoring and optimization of mercury removal units; identifying health, safety, and environmental consideration by handling of mercury-contaminated waste; the process simulation and modeling for dehydration and mercury removal; and the importance of process simulation.

During this interactive course, participants will learn the advanced control strategies for dehydration systems and cost optimization in dehydration and mercury removal; the reliability-centered maintenance for dehydration and mercury removal units; the troubleshooting and root cause analysis of process failures; the environmental regulations and compliance for dehydration; the mercury removal, waste management and handling of spent adsorbents and glycol; and the future trends and innovations in gas dehydration and mercury removal.

Course Objectives

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

- Apply and gain advanced knowledge on gas dehydration and mercury removal
- Discuss the composition and properties of natural gas and the importance of dehydration and mercury removal
- Identify the sources of water in natural gas, formation and impact of hydrates, sources of mercury in and effects of mercury contamination
- Explain the gas hydrate formation and prevention, gas dehydration processes, mercury removal technologies and process flow and equipment
- Recognize glycol-based dehydration systems, glycol regeneration and contamination control, solid desiccant dehydration, membrane-based dehydration technologies and hybrid dehydration technologies
- Explain the fundamentals of mercury removal, activated carbon and metal sulfide-based adsorbents, impregnated and non-impregnated adsorbents and mercury removal from LNG and cryogenic systems
- Carryout performance monitoring and optimization of mercury removal units and identify health, safety, and environmental consideration by handling of mercury-contaminated waste
- Illustrate process simulation and modeling for dehydration and mercury removal and the importance of process simulation
- Apply advanced control strategies for dehydration systems and cost optimization in dehydration and mercury removal
- Carryout reliability-centered maintenance for dehydration and mercury removal units, as well as troubleshooting and root cause analysis of process failures
- Implement environmental regulations and compliance for dehydration as well as mercury removal, waste management and handling of spent adsorbents and glycol
- Discuss future trends and innovations in gas dehydration and mercury removal

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 advanced gas dehydration and mercury removal for project engineers/managers, gas processing engineers, regulatory and compliance professionals, process engineers, health, safety, and environmental (HSE) personnel, operations and maintenance personnel, technical sales and service representatives, consultants and specialists.

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. Saad Bedir, MSc, BSc, is a **Senior Chemical Engineer** with over **30 years** of extensive experience in the **Power**, **Petrochemical**, **Oil & Gas** and **Cement** industries. He is well-versed in the areas of Introduction to **Urea Manufacturing Process** Technology, **Fertilizer** Storage Management (**Ammonia & Urea**), **Ammonia** Production, **Urea Synthesis & HP Recovery Section**, **Gas Processing** Chemical Treatment Principles, **Process Troubleshooting**, **Polyethylene** Manufacturing & Process Troubleshooting, **Polyethylene Flexible Packaging**, **Polyethylene** Wire & Cable, **Polymers**, **Polymers & Composites**, **Distillation Column** Operation & Control, **Polymers & Polymerization**, **Oil Movement** Storage & Troubleshooting, **Process Equipment** Design, Applied **Process Engineering** Elements, **Polymer & Materials** Engineering, **Polyethylene Processing** Techniques, Advanced **Polymer Chemistry**, **Plastics** Technology, **LLDPE** Productions & Utilization, **Process Plant** Optimization, **Heat & Power Consumption**, **Heat Transfer**, **Clean Energy & Power Saving**, Fuel Handling System, **Oil Movement & Operation**, Oil Production, Gas Conditioning & Processing, Plastic Additives, Process Plant Performance & Efficiency, Plant Optimization and Process Operations. His expertise also includes the implementation of Environmental Impact Assessment (**EIA**), **OHSAS 18001**, **ISO 9001**, **ISO 14001**, **QHSE** Management Planning, Air Quality Management, Health, Fire, Safety, Security & Environmental Codes of Practice, Legislations and Procedures. Crisis & Business Continuity Management Planning, Emergency Response & Procedures, Industrial Security Risk Assessment & Management, , Behavioural Safety, Incident & Accident Investigation, Integrated EHS Aspects, Risk Assessment & Hazard Identification, Environmental Audits, Hazardous & Non-Hazardous Waste Management, Confined Space Safety, **SHEMS** Principles, Process Safety, Basic & Advanced Construction Safety, Rig & Barge Inspection, , Safety & Occupational Health Awareness, Loss Control, Lifting & Slinging, Marine Pollution Hazards & Control, Ground Contamination & Reclamation Processes, Waste Management & Recycling, **HAZOP**, **HAZID**, **HSEIA**, **QRA**, Hazardous Area Classification, Radiation Protection, Active and Positive Fire Fighting, Fire & Gas Detection Systems, Fire Fighting Systems, Fire Proofing, ESD, Escape Routes. Presently, he is the **HSE Director** for one of the largest and renowned companies in the Middle East, wherein he takes charge of all HSE and security operations of the company.

Mr. Saad's vast professional experience in directing & managing process operations and health, safety and the environment aspects as per OSHA framework and guidelines can be traced back to his stint with a few international companies like **Saudi ARAMCO**, **CONOCO**, **Kuwait Oil Co.** (**KOC**), etc, where he worked as the **Field Senior Process Consultant** handling major projects and activities related to the discipline. Through these, he gained much experience and knowledge in the implementation and maintenance of **internationally accepted principles** of process operations. Through this, he has also gained knowledge regarding international safety standards for the National Fire Protection Association (**NFPA**), the American Petroleum Institute (**API**), Safety of Life at Sea (**SOLAS**), and Safety for Mobile Offshore Drilling Unit (**MODU**).

Mr. Saad has a **Bachelor's** degree in **Chemistry** from the **Ain Shams University** and a **NEBOSH** certificate holder. Further, he is a **Certified Instructor/Trainer**, a **Certified Lead Auditor** for **OHSAS 18001**, **ISO 9001**, **ISO 14001** and a **member** of the **Egyptian Syndicate** & **Scientific Professions**. His passion for development and acquiring new skills and knowledge has taken him all over the Middle East to attend and share his expertise in numerous trainings and workshops.

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 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.

Accommodation

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

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course 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	***Introduction to Natural Gas Processing*** *Composition and Properties of Natural Gas • Importance of Dehydration and Mercury Removal • Safety and Environmental Considerations • Industry Regulations and Standards*
0930 – 0945	*Break*
0945 - 1030	***Overview of Water & Mercury Contaminants in Natural Gas*** *Sources of Water in Natural Gas • Formation and Impact of Hydrates • Sources of Mercury in Gas Reservoirs • Effects of Mercury Contamination in Processing Facilities*
1030 – 1130	***Gas Hydrate Formation & Prevention*** *Conditions for Hydrate Formation • Hydrate Inhibitors and their Application • Thermodynamic versus Kinetic Hydrate Prevention • Field Experiences and Mitigation Techniques*
1130 – 1230	***Basics of Gas Dehydration Processes*** *Concept of Water Dew Point Control • Types of Dehydration Methods • Comparison of Dehydration Technologies • Selection Criteria for Dehydration Methods*
1230 – 1245	*Break*
1245 - 1330	***Mercury Removal Technologies*** *Effects of Mercury on Pipelines and Equipment • Methods of Mercury Removal (Adsorption, Chemical Treatment, etc.) • Selection Criteria for Mercury Removal Technologies • Case Studies on Mercury Contamination Incidents*

1330 – 1420	***Process Flow & Equipment Overview*** *Overview of Typical Gas Processing Plant Layout • Key Equipment in Gas Dehydration and Mercury Removal • Operating Principles of Major Process Units • Importance of Process Control in Efficiency and Safety*
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	***Glycol-Based Dehydration Systems*** *Types of Glycols Used (TEG, DEG, MEG, etc.) • Process Flow and Major Equipment • Advantages and Limitations of Glycol Dehydration • Key Operating Parameters for Optimization*
0830 – 0930	***Glycol Regeneration & Contamination Control*** *Regeneration Process in Glycol Dehydration • Common Glycol Contaminants and their Impact • Methods for Glycol Reclamation and Purification • Best Practices for Extending Glycol Life*
0930 – 0945	*Break*
0945 – 1100	***Solid Desiccant Dehydration*** *Types of Solid Desiccants (Silica Gel, Molecular Sieves, Activated Alumina) • Adsorption and Regeneration Cycles • Comparison with Glycol Dehydration • Typical Applications and Limitations*
1100 – 1230	***Membrane-Based Dehydration Technologies*** *Principles of Membrane Separation • Types of Membranes Used in Dehydration • Performance Factors Affecting Efficiency • Advantages and Challenges of Membrane Dehydration*
1230 – 1245	*Break*
1245 - 1330	***Emerging & Hybrid Dehydration Technologies*** *Combination of Technologies for Enhanced Efficiency • Low-Energy Dehydration Methods • New Advancements in Dehydration Materials • Future Trends in Dehydration Technologies*
1330 – 1420	***Case Studies & Troubleshooting Common Issues*** *Case Studies on Glycol Dehydration Failures • Solid Desiccant Bed Failures and Remedies • Common Operational Challenges in Dehydration • Best Practices for Improving Reliability*
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	***Fundamentals of Mercury Removal*** *Mercury Species in Natural Gas • Adsorption Mechanisms for Mercury Removal • Key Process Considerations in Removal Efficiency • Challenges in Mercury Removal Processes*
0830 – 0930	***Activated Carbon & Metal Sulfide-Based Adsorbents*** *Types of Mercury Adsorbents • Performance Comparison of Different Adsorbents • Factors Affecting Adsorption Efficiency • Regeneration and Disposal of Spent Adsorbents*

0930 – 0945	*Break*
0945 – 1100	***Impregnated & Non-Impregnated Adsorbents*** *Impregnated Sulfur Adsorbents • Metal-Based Impregnated Adsorbents • Advantages and Limitations of Impregnated Materials • Selection Criteria for Different Gas Conditions*
1100 – 1230	***Mercury Removal from LNG & Cryogenic Systems*** *Unique Challenges in Cryogenic Environments • Impact of Mercury on Heat Exchangers • Case Studies on Mercury-Related Failures • Best Practices in LNG Mercury Removal*
1230 – 1245	*Break*
1245 - 1330	***Performance Monitoring & Optimization of Mercury Removal Units*** *Key Performance Indicators for Removal Units • Sampling and Analysis Techniques • Optimization Strategies for Cost Efficiency • Troubleshooting Performance Issues*
1330 – 1420	***Health, Safety, & Environmental Considerations*** *Handling of Mercury-Contaminated Waste • Worker Safety and Exposure Limits • Environmental Impact and Disposal Regulations • Risk Mitigation Measures in Mercury Handling*
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	***Process Simulation & Modeling for Dehydration & Mercury Removal*** *Importance of Process Simulation • Software Tools Used for Modeling • Sensitivity Analysis for Performance Improvement • Case Study on Process Optimization Using Simulation*
0830 – 0930	***Advanced Control Strategies for Dehydration Systems*** *Importance of Control Systems in Dehydration • Process Automation and Control Loops • Advanced Monitoring Techniques • AI and Machine Learning Applications in Optimization*
0930 – 0945	*Break*
0945 – 1100	***Cost Optimization in Dehydration & Mercury Removal*** *Energy Efficiency Measures • Reducing Operational Costs without Compromising Performance • Maximizing Adsorbent Life and Glycol Recovery • Economic Evaluation of Process Improvements*
1100 – 1230	***Reliability-Centered Maintenance for Dehydration & Mercury Removal Units*** *Common Failure Modes and their Impact • Predictive Maintenance Strategies • Condition-Based Monitoring Techniques • Spare Parts Management and Inventory Control*
1230 – 1245	*Break*
1245 - 1330	***Troubleshooting & Root Cause Analysis of Process Failures*** *Systematic Approach to Troubleshooting • Case Studies on Dehydration Unit Failures • Mercury Removal System Malfunctions and Solutions • Lessons Learned from Past Incidents*

1330 – 1420	***Industry Best Practices & Case Studies*** *Benchmarking Against Industry Standards • Successful Dehydration and Mercury Removal Case Studies • Lessons from Operational Experiences • Open Discussion on Participant Experiences and Challenges*
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	***Environmental Regulations & Compliance for Dehydration & Mercury Removal*** *Overview of International Environmental Regulations • Emission Control and Regulatory Compliance • Environmental Impact Assessment Techniques • Case Studies on Regulatory Enforcement*
0930 – 0945	*Break*
0945 - 1100	***Waste Management & Handling of Spent Adsorbents & Glycol*** *Handling and Disposal of Used Glycol and Adsorbents • Regulatory Requirements for Hazardous Waste Disposal • Sustainable Practices in Waste Management • Recycling and Reclamation Techniques*
1100 – 1230	***Future Trends & Innovations in Gas Dehydration & Mercury Removal*** *Emerging Technologies in Dehydration and Mercury Removal • Green and Sustainable Approaches • Advances in Adsorbent Materials and Separation Processes • Digitalization and Automation Trends*
1230 – 1245	*Break*
1245 - 1345	***Interactive Workshop: Real-World Scenarios & Problem-Solving*** *Group Exercises on Troubleshooting Dehydration Units • Case Study on Mercury Contamination Incident • Designing an Optimized Dehydration and Mercury Removal System • Expert Panel Discussion on Industry Challenges*
1345 - 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course 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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