COURSE OVERVIEW PE0300B(AD6)
Gas Conditioning & Processing

Course Title
Gas Conditioning & Processing

Course Date/Venue
Session 1: January 12-16, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: July 14-18, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
PE0300B(AD6)

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes practical case studies 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 gas conditioning and processing. It covers the gas processing; the turbo expansion; the principle of distillation and its performance; the LNG, LPG and NGL products including its applications, specifications, homogenization and sampling; the custody transfer, HHV, MW and relationship for both LNG and LPG; the gas separation and the fundamental of multi-component system, process variables and process troubleshooting; and the various technology and processes of gas dehydration including hydrate formation and highlights of operating problems.

Further, the course will also discuss the principles of drying and hydrates; the process applied for drying of hydrocarbon gases and of LPG and the process for achieving for low dew points; the hydrate formation viability, leaking types, symptoms, effects and highlights of typical operating problems; the gas sweetening and CO_2 removal; the sulfur recovery and tail gas treatment; the effects of mercury removal covering process, purpose, concentrations; and the performance of mercury removal process versus design.

During this interactive course participants will learn the principles and carnot cycle of refrigeration including the function and control of system equipment; the propane cycle, analysis of gas cooling curves and mixed component refrigerant; the loop components and functions with comparison between pure and mixed refrigeration process; the gas cooling curves at different pressures; the system and P-T phase diagram in principles; the mixed component refrigerant; and the conceptual overview on the relationship of the power required for temperatures below ambient, water versus air cooling and steam versus gas turbine drives.

Course Objectives

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

- Apply and gain a comprehensive knowledge on gas conditioning and processing
- Carryout gas processing and its practical systems application
- Discuss turbo expansion including the principle of distillation and its performance
- Recognize LNG, LPG and NGL products including its applications, specifications, homogenization and sampling
- Determine custody transfer, representatives of sampling, HHV, MW and relationship for both LNG and LPG
- Describe how oil and gas formed, migrated, trapped in reservoirs and how it was found
- Maximize reserve recovery in case of oil or gas reservoirs and identify the different types of natural gas reservoirs and its phase behaviors
- Illustrate gas separation, the requirements from the separator, the different basis for separators, the different types and detailed internal parts of separators and the fundamental of multi-component system, process variables and process troubleshooting
- Apply dehydration techniques, process description, design considerations and operational problem troubleshooting as well as identify various technology and processes of gas dehydration including hydrate formation and highlights of operating problems
- Explain the principles of gas drying and hydrates, process applied for drying of hydrocarbon gases and of LPG and the process for achieving for low dew points
- Describe the phase diagram of hydrocarbon mixtures and flash calculation mechanism
- Predict hydrate formation in gas stream and estimate water content at any point of the process system
- Calculate hydrate formation viability and identify leaking types, symptoms, effects and highlights of typical operating problems
- Carryout gas sweetening and CO_2 removal as well as sulfur recovery and tail gas treatment
- Perform acid gases removal, sulfur recovery techniques, process description and operational problems troubleshooting

- Discuss the effects of mercury removal covering process, purpose, concentrations and performance of mercury removal process versus design
- Discuss the principles and carnot cycle of refrigeration including the function and control of system equipment
- Illustrate propane cycle, analysis of gas cooling curves and mixed component refrigerant
- Identify the loop components and functions with comparison between pure and mixed refrigeration process
- Analyze gas cooling curves at different pressures and recognize system and P-T phase diagram in principles
- Determine mixed component refrigerant and the conceptual overview on the relationship of the power required for temperatures below ambient, water versus air cooling and steam versus gas turbine drives

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 gas conditioning and processing for production supervisors, process engineers, operators and discipline-related graduates drawn from across the operating companies in the oil and gas industry in Abu Dhabi. The extent of their work experience will depend on how long they have been in the CAMS programme and in general terms they are grouped in batches according to the assignment level.

Furthermore, this course is specifically designed for those who typically hold a bachelor's degree or higher diploma and have a reasonable grasp of English and has level 5 on the ADNOC scale of English.

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 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 Fee

US$ 5,000 per Delegate. 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 Instructor

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 **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**, **Project Engineering Manager**, **Construction Manager**, **Site Manager**, **Area Manager**, **Procurement Manager**, **Factory Manager**, **Technical Services Manager**, **Senior Project 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 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.

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 – 0900	***Gas Processing Practical Systems Applied*** *Processes ● Application*
0900 – 0930	***Turbo Expansion*** *Principles ● Process ● Joule-Thompson Effect ● Thermodynamics of Expansion ● Turbo Expansion Usage ● Turbo Expansion Design Parameters ● Components ● Control System ● Potential Problems ● Solutions ● Parameters Optimization ● Effects of Deteriorated Isentropic*
0930 – 0945	*Break*
0945 – 1030	***Principles of Distillation & Its Performance*** *Multi-Component System ● Tray Calculations ● Design Basis ● Design Feed ● Product Specification ● Process Variables ● De-Propaniser ● Pressure and Temperature Constraints ● The Impact of Separation Efficiency and Heat Exchangers ● Common Problems ● Solutions ● Static Simulator Software ● Troubleshooting ● Flooding Calculations*
1030 – 1230	***Products (LNG, LPG & NGL)*** *Definition ● Applications ● Specifications ● Homogenization ● Sampling ● Custody Transfer ● Representatives of Sampling*
1230 – 1245	*Break*
1245 – 1420	***Products (LNG, LPG & NGL) (cont'd)*** *HHV ● MW ● Relationship for both LNG and LPG*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***How Oil & Gas Formed, Migrated, Trapped in Reservoirs & How We Found It***
0830 - 0930	***How We Can Maximize Reserve Recovery In Case of Oil or Gas Reservoirs***
0930 – 0945	*Break*
0945 – 1100	***The Different Types of Natural Gas Reservoirs & Its Phase Behaviors***
1100 – 1230	***Gas Separation*** *The Requirements from the Separator, Why We Need Separation? & the Different Basis for Separators Classifications ● The Different Types of Two Phase & Three Phase Separators, Advantages & Disadvantages of Each Type ● All Detailed Internal Parts of Different Separators, Towers, the Function of Each Part & All Operating Parameters Controlling Devices ● Fundamental of Multi-component System*
1230 – 1245	*Break*
1245 – 1420	***Gas Separation (cont'd)*** *How to Select the Suitable Configuration for the Gas Processing Considering All Factors Affecting the Process Efficiency ● Process Variables ● Process Troubleshooting*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Gas Dehydration*** *All Dehydration Techniques, Process Description, Design Considerations & Operational Problems Troubleshooting ● Various Technology & Processes ● Hydrate Formation ● Highlights of Operating Problems ● Principles of Gas Drying and Hydrates ● Process Applied for Drying of Hydrocarbon Gases and of LPG ● The Phase Diagram of Hydrocarbon Mixtures & Flash Calculation Mechanism*
0830 – 0930	***Gas Dehydration (cont'd)*** *Process for Achieving for Low Dew Points ● How to Predict Hydrate Formation in Gas Stream & Estimate Water Content At Any Point of the Process System ● Calculations for Hydrate Formation Viability ● Valves Leaking Types ● Symptoms ● Effects ● Highlights of Typical Operating Problems*
0930 – 0945	*Break*
0945 – 1100	***Gas Sweetening & CO_2 Removal*** *Various Technology & Processes ● Chemical and Physical Absorbents ● When to Go for Good Absorption and when to Go for Good Regeneration ● Deactivation/Degradation of the Process Materials and their Causes*
1100 – 1230	***Gas Sweetening & CO_2 Removal (cont'd)*** *Solvent Foaming, Causes and Reduction Techniques ● Basics of H_2S Removal ● Operating Problems*
1230 – 1245	*Break*
1245 – 1420	***Natural Gas Liquids Recovery, LPG & GTL Technologies, Process Description, Design Considerations, Safety Requirements & Operational Problems Troubleshooting***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0930	***Sulfur Recovery & Tail Gas Treatment*** *Acid Gases Removal & Sulfur Recovery Techniques, Process Description, Design Considerations & Operational Problems Troubleshooting ● Principles ● Operating ● Variables ● Performance Monitoring ● Sulfur Components in the Feed to Sulfur Recovery System with Emphasis on the Main Reaction Occurring ● Sulfur Production Estimation ● Class Unit/Tail Gas Unit with the Operating Principles of the Equipment ● Changes Applied to CS2 and COS in both Claus and Tail Gas Treatment Units*
0930 – 0945	*Break*
0945 – 1100	***Sulfur Recovery & Tail Gas Treatment (cont'd)*** *Catalyst Types ● Deactivation ● The Affecting Key Parameters ● Operations in Deviated Temperature (Low/High)*
1100 – 1230	***Mercury Removal: The Effects*** *Process ● Purpose ● Effects (Aluminium Alloys)*
1230 – 1245	*Break*
1245 – 1420	***Mercury Removal: The Effects (cont'd)*** *Concentrations ● Performance of Mercury Removal Process Versus Design*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***Refrigeration*** *Principles ● Carnot Cycle ● Function and Control of System Equipment ● Propane Cycle (Pressure-Enthalpy Diagram) ● Analysis of Gas Cooling Curves ● Mixed Component Refrigerant ● Loop Components and Functions with Comparison Between Pure and Mixed Refrigeration Process*
0930 – 0945	*Break*
0945 – 1100	***Refrigeration (cont'd)*** *Analysis of Gad Cooling Curves at Different Pressures ● End-Flash System and P-T Phase Diagram in Principle ● Mixed Component Refrigerant ● Conceptual Overview on the Relationship of the Power Required for Temperatures Below Ambient, Water Versus Air Cooling and Steam Versus Gas Turbine Drives*
1100 – 1230	***Gas Custody Transfer***
1230 – 1245	*Break*
1245 – 1345	***Gas Custody Transfer (cont'd)***
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Practical Sessions

This practical and highly-interactive course includes the following Practical case studies and Exercises: -

Course Coordinator

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