COURSE OVERVIEW DE0259
Gas Injection Mechanisms

Course Title
Gas Injection Mechanisms

Course Date/Venue
Session 1: February 23-27, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: August 25-29, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
DE0259

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

Course Description

This practical and highly-interactive course includes practical sessions and exercises where participants will visit the laboratory and they will be introduced to various lab instruments and their calibration process. Practical sessions will be performed using one of the lab equipment in order to apply the theory learnt in the class.

Acid gas injection (AGI) was developed in Western Canada and it has become the method of choice to monetize small reserves of sour natural gas. AGI is an environmentally friend way to deal with hydrogen sulfide producing almost no sulfurous emissions. It also plays an important role in reducing carbon dioxide emissions from gas processing plants. AGI is also an option for larger producer who do not want to produce elemental sulfur. Many of the principles in AGI can be directly transferred to the emerging technology of carbon capture and storage (CCS).

The course is a treatment of the important subject acid gas injection. This course provides the following information: a discussion of the relevant physical properties of hydrogen sulfide, carbon dioxide, and acid gas mixtures; a detailed review of the water content of acid gas mixtures and its relevance to the injection process; selection of an injection zone; considerations for the design of an acid gas compressor; and health and safety concerns. Case studies from actual injection schemes showing the application of the design principles are presented, many worked on by the instructor.

This course is designed to provide participants with a detailed and up-to-date overview on acid/sun gas injection. It covers the hydrogen sulfide and carbon dioxide; the non-aqueous phase equilibrium; the fluid phase equilibrium involving water; the hydrates, compression and dehydration of acid gas that includes glycol dehydration, molecular sieves and refrigeration; the pressure drop, temperature loss, guidelines, metering and other considerations of pipelines; the injection profiles; the selection of disposal zones; and the health, safety and the environment and monitoring of capital costs.

Course Objectives

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

- Apply an in-depth knowledge and skills in acid/sun gas injection
- Define acid gas, anthropogenic CO2, flue gas, standard volumes, sulfur equivalent, sweetening natural gas and acid gas injection
- Identify hydrogen sulfide and carbon dioxide covering its properties, estimation techniques for physical properties and effect of hydrocarbons
- Discuss non-aqueous phase equilibrium and fluid phase involving water
- Recognize hydrates, compression and dehydration of acid gas that includes glycol dehydration, molecular sieves and refrigeration
- Determine the pressure drop, temperature loss, guidelines, metering and other considerations of pipeline
- Explain injection profiles and select disposal zones
- Describe health, safety and the environment and monitor capital costs

Who Should Attend

This course provides systematic techniques on acid/sun gas injection for those who are involved in the operation, design, or specification of acid gas injection projects, specifically operations and technical personnel.

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**.*

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 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. Konstantin Zorbalas (**Konstantinos Zorbalas**), MSc, BSc, is a **Senior Petroleum Engineer & Well Completions Specialist** with **35 years** of **offshore** and **onshore** experience in the **Oil** & **Gas**, **Refinery** & **Petroleum** industries. His wide expertise includes **OIP Estimation & Range** of **Uncertainty**, **Waterflood** Management, **Water Flooding**, **Water Flooding & Reservoir** Sourcing Issues, **Water Flooding**, **Reservoir** Souring & Water Breakthrough, **Well & Reservoir Management** and Monitoring, **Fishing Operations**, **Drilling & Work-Over Operations**, **Workover Best Practices**, Well Testing, Completion Design & Operation, Well Stimulation and **Workover**, **Well Stimulation & Workover** Planning, **Well Completion**, **Servicing & Work-Over** Operations, **Completions & Workover**, HSE in **Work-Over & Drilling** Operations, **Well Testing Completion & Workover**, Basic **Drilling**, **Completion & Workover** Operations, Advanced **Drilling**, **Completion & Workovers Fluids**, **Cementing** Integrity Evaluation, **Cementing** Design, **Cement** Integrity Assurance & Evaluation, Basic **Cementing** (Operations) & Basic Acidizing, **Advanced** Cementing Technology, **Casing & Cementing, Advanced** Cementing & Stimulation, **Artificial Lift** Systems, New Technology in **Artificial Lift Systems**, **Artificial Lift** Methods, **Crude Oil Artificial Lift** Operations, **Artificial Lift** Systems, **Artificial Lift** & Challenges, **Artificial Lift** Systems & Optimization Technology, Production Optimization with **Artificial Lift** System, **Well Integrity & Artificial Lift**, **Formation Damage** & Flow Assurance Issues, **Formation Damage** Evaluation, Prevention, Remediation & Control, **Formation Damage** (Causes, Prevention & Remediation), **Well Completion** Design & Operations, Crude **Oil Market**, Oil **Reserves**, Global Oil **Supply & Demand**, Government Legislation & Oil **Contractual** Agreements, Oil **Projects & Their Feasibility** (Revenue and Profitability), Oil & Gas **Exploration** and **Methods**, Oil & Gas **Extraction**, Oil **Production & Refining**, Technology Usage in Industrial Security; **Oil & Gas Economics** Modelling Evaluation Decision Making & Risk Analysis, **Economic Evaluation** & Global Profitability Criteria, **Petroleum Economics**, Fluid Properties & Phase Behaviour (**PVT**), **Workovers & Completions**, Acidizing Application in **Sandstone & Carbonate**, **Well Testing** Analysis, **Reserves** Evaluation, **Reservoir** Fluid Properties, **Reservoir** Monitoring, **Heavy Oil** Technology, Applied **Water Technology**, **X-mas Tree & Wellhead** Operations & Testing, **Artificial Lift** Systems (**Gas Lift**, **ESP**, and **Rod Pumping**), **Well Cementing**, **Well Completion** Design, **Slickline** Operations, **Cased Hole Logging** and **Production Logging**. Further, he is actively involved in **Project Management** with special emphasis in production technology and field optimization, performing conceptual studies, economic analysis with risk assessment and field development planning. He is currently the **Senior Petroleum Engineer & Consultant** of **Abu Dhabi National Oil Company** (**ADNOC**) Group of companies wherein he is involved in the mega-mature fields in the Arabian Gulf, predominantly carbonate reservoirs; designing the acid stimulation treatments with post-drilling rigless operations; utilizing CT with tractors and DTS systems; and he is responsible for gas production and preparing for reservoir engineering and simulation studies, well testing activities, field and reservoir monitoring, production logging and optimization and well completion design.

During his career life, Mr. Zorbalas worked as a **Senior Production Engineer**, **Well Completion Specialist**, **Production Manager**, **Project Manager**, **Technical Manager**, **Trainer**, **Technical Supervisor** & **Contracts Manager**, **Production Engineer**, **Production Supervisor**, **Production Technologist**, **Technical Specialist**, **Business Development Analyst**, **Field Production Engineer** and **Field Engineer**. He worked for many **world-class oil/gas companies** such as **ZADCO**, **ADMA-OPCO**, **Oilfield International Ltd**, **Burlington Resources** (later acquired by **Conoco Phillips**), **MOBIL E&P**, **Saudi Aramco**, **Pluspetrol E&P SA**, **Wintershall**, **Taylor Energy**, **Schlumberger**, **Rowan Drilling** and **Yukos EP** where he was in-charge of the **design and technical analysis** of a gas plant with capacity **1.8 billion m3/yr gas**. His achievements include **boosting oil production 17.2% per year** since 1999 using **ESP** and **Gas Lift systems**.

Mr. Zorbalas has **Master's** and **Bachelor's** degrees in **Petroleum Engineering** from the **Mississippi State University**, **USA**. Further, he is an **SPE Certified Petroleum Engineer**, **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**), an active member of the Society of Petroleum Engineers (**SPE**) and has numerous scientific and technical publications and delivered innumerable training courses, seminars and workshops worldwide.

Accommodation

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

Course Fee

US$ 8,000 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 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*** *Acid Gas • Anthropogenic C02 • Flue Gas • Standard Volumes • Sulfur Equivalent • Sweetening Natural Gas • Acid Gas Injection • Who Uses Acid Gas Injection?*
0930 – 0945	*Break*
0945 – 1100	***Hydrogen Sulfide & Carbon Dioxide*** *Properties of Carbon Dioxide • Properties of Hydrogen Sulfide • Estimation Techniques for Physical Properties*
1100 – 1230	***Hydrogen Sulfide & Carbon Dioxide (cont'd)*** *Properties of Acid Gas Mixtures • Effect of Hydrocarbons*
1230 – 1245	*Break*
1245 – 1420	***Non-Aqueous Phase Equilibrium*** *Pressure-Temperature Diagrams • Calculation of Phase Equilibrium*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Fluid Phase Equilibria Involving Water*** *Water Content of Hydrocarbon Gas • Water Content of Acid Gas • Estimation Techniques • Acid Gas Solubility*
0930 – 0945	*Break*
0945 – 1100	***Hydrates*** *Introduction to Hydrates • Hydrates of Acid Gases • Estimation of Hydrate Forming Conditions • Mitigation of Hydrate Formation • Question! • Excess Water*
1100 – 1230	***Compression*** *Theoretical Considerations • Compressor Design and Operation • Design Calculations • Interstage Coolers*
1230 – 1245	*Break*
1245 – 1420	***Compression (cont'd)*** *Compression and Water Knockout • Materials of Construction • Advanced Design • Case studies*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Dehydration of Acid Gas*** *Glycol Dehydration • Molecular Sieves*
0930 – 0945	*Break*
0945 – 1100	***Dehydration of Acid Gas (cont'd)*** *Refrigeration • Case Studies*
1100 – 1230	***Pipeline*** *Pressure Drop • Temperature Loss*
1230 – 1245	*Break*
1245 – 1420	***Pipeline (cont'd)*** *Guidelines • Metering • Other Considerations*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

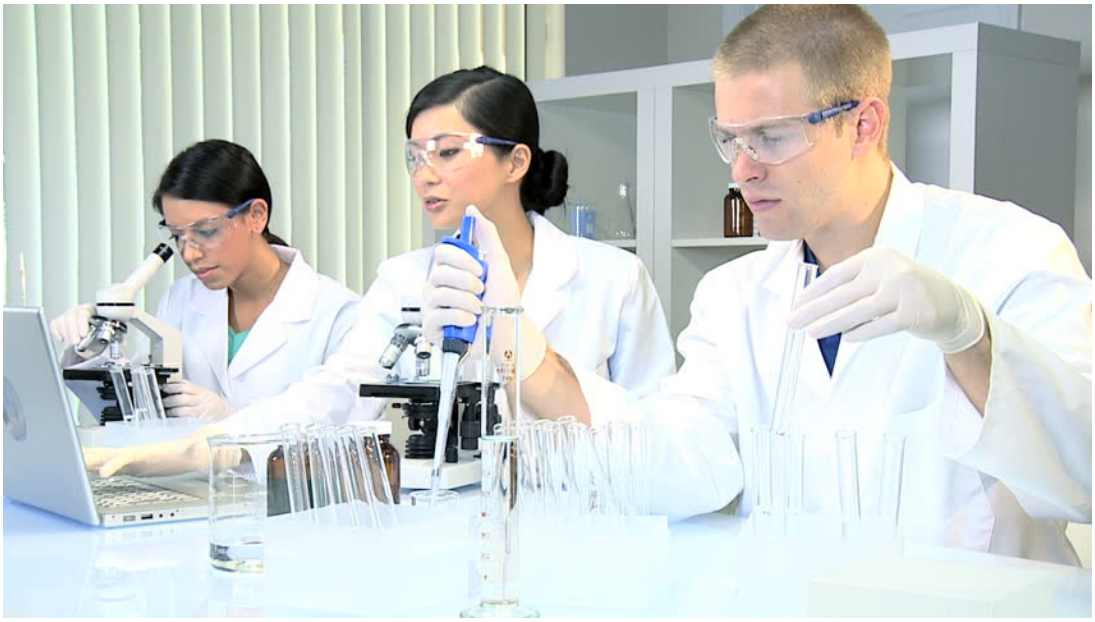
0730 – 0930	***Injection Profiles***
0930 – 0945	*Break*
0945 – 1100	***Selection of Disposal Zone*** *Containment • Injectivity*
1100 – 1230	***Selection of Disposal Zone (cont'd)*** *Interactions with Acid Gas*
1230 – 1245	*Break*
1245 – 1420	***Health, Safety & The Environment*** *Hydrogen Sulfide • Carbon Dioxide • Emergency Planning*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***Capital Costs*** *Compression • Pipeline*
0930 – 0945	*Break*
0945 – 1100	***Capital Costs (cont'd)*** *Wells*
1100 – 1230	***Additional Topics*** *Rules of Thumb • Graphical Summary*
1230 – 1245	*Break*
1245 – 1345	***Additional Topics (cont'd)*** *The Three Types of Gas*
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Practical Sessions/Site Visit

Site visit will be organized during the course for delegates to practice the theory learnt:-



Course Coordinator

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