COURSE OVERVIEW DE0086-4D
CO2 Surface Facilities & Injection System

Course Title
CO2 Surface Facilities & Injection System

Course Reference
DE0086-4D

Course Duration/Credits
Four days/2.4 CEUs/24 PDHs

Course Date/Venue

Session(s)	Date	Venue
1	January 15-18, 2024	Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
2	April 15-18, 2024	Ajman Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
3	July 01-04, 2024	Jubail Hall, Signature Al Khobar Hotel, Al Khobar, KSA
4	October 21-24, 2024	Business Center, Concorde Hotel Doha, Doha Qatar

Course Description

This practical and highly-interactive course includes real-life case studies where participants will be engaged in a series of interactive small groups and class workshops.

When an oil reservoir is first produced, the pressure that exists in the subsurface provides the energy for moving the oil, gas and water that is in the rock to the surface. After a while, the pressure dissipates and pumps must be used to remove additional volumes of oil. Depending on the characteristics of the rock and the oil, a considerable amount of the original oil in place may be left behind (perhaps 60 percent or more) as residual oil.

As the production decline phase begins, it is carefully managed to extract every last drop of oil possible using enhanced oil recovery techniques, such as waterflooding and CO_2 injection. Where CO_2 enhanced recovery operations are employed, they typically take place after the less expensive waterflooding option has already been implemented, although the remaining oil saturation in the post-waterflood reservoir is still significant, perhaps 50 percent of the original oil in place.

In a typical CO_2 flood operation, a pipeline delivers the CO_2 to the field at a pressure and density high enough for the project requirements and a meter is used to measure the volume of gas purchased. This CO_2 is directed to injection wells strategically placed within the pattern of wells to optimize the areal sweep of the reservoir. The injected CO_2 enters the reservoir and moves through the pore spaces of the rock, encountering residual droplets of crude oil, becoming miscible with the oil, and forming a concentrated oil bank that is swept towards the producing wells.

This course is designed to provide delegates with a detailed and up-to-date overview of CO_2 surface facilities and injection system. It covers the CO_2 injection and process facilities; the heavy emphasis on CO_2 for enhanced oil recovery; the physical and thermodynamic properties of CO_2 and high CO_2 mixtures; the materials selection and design consideration in CO_2 systems; the process vessel specification, pumps and compressors; the fluid flow and special pipeline design considerations that includes control of ductile fractures; the dehydration of CO_2 and CO_2 rich gases; and the general overview of processes to treat/recover CO_2.

Course Objectives

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

- Apply and gain a comprehensive knowledge on CO2 surface facilities and injection system
- Discuss CO_2 injection and process facilities
- Recognize the heavy emphasis on CO_2 for enhanced oil recovery
- Identify the physical and thermodynamic properties of CO_2 and high CO_2 mixtures
- Carryout materials selection and design consideration in CO_2 systems
- Recognize process vessel specification, pumps and compressors
- Apply fluid flow and special pipeline design considerations that includes control of ductile fractures
- Explain dehydration of CO_2 and CO_2 rich gases and the general overview of processes to treat/recover CO_2

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, sample video clips of the instructor's actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of CO_2 surface facilities and injection system for engineers and senior operating personnel involved with carbon dioxide, natural gas, CO_2 and EOR systems.

Training Methodology

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Workshops & Work Presentations
30% Case Studies & Practical Exercises
20% Software, Simulators & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Fee

Dubai	**US$ 6,500** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Abu Dhabi	**US$ 6,500** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day
Al Khobar	**US$ 6,500** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Doha	**US$ 7,500** 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 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:

- 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 **2.4 CEUs** (Continuing Education Units) or **24 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.

- 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.

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:

Dr. Abla Rhouma, PhD, MSc, BSc, is a **Senior Drilling & Petroleum Engineer** with extensive years of experience within the **Oil & Gas**, **Refinery** and **Petroleum** industries. Her expertise lies extensively in the areas of **Oil Industry Orientation**, **Crude Oil** Recovery, **Heavy Oil** Processing, **Oil & Gas Reserves** Evaluation, **Crude Oil Artificial Lift** Operations, **Fishing** Operations, **Pipe Sticking, Washover** Operations, **Milling** Operations, **Wireline Fishing**, **Fishing in Cavities**, **Sidetracking** Methods, **Thru-Tubing Fishing**, **Coiled-Tubing-Conveyed Tubing & Drill-Pipe Cutting**, **Drilling** Operation, **Completion & Workover** Operations, **Casing Cementing** Operations, **Wireline & LWD Sensors**, **Mud Logging** Services, **Drilling Rig**, **Bits & BHA**, **Mud Pumps**, **Cementing Operations**, **Cementing & Casing**, **Coiled Tubing** Operations, **Coiled Tubing** Technology, **Coiled Tubing** Design, **Petroleum** Engineering, **Drilling** Operations, **Horizontal & Directional Drilling**, **Drilling Optimization & Well** Planning, **Drill Bit & Drilling Hydraulics**, **Drilling & Production** Equipment, **Extended Reach Drilling**, **Rock Mechanics**, **Rock Physics**, **Seismic Sequence Stratigraphy**, Applied **Reservoir** Engineering & Management, **Naturally Fractured Reservoirs**, Practical **Reservoir Engineering**, **Steam Flood Reservoir** Management, **3D Reservoir Modelling**, **Reservoir** Surveillance & Management, Integrated **Reservoir** Characterization, **Naturally Fractured Reservoir** Engineering, **Drilling Fluids** Technology, Surface BOP Stack, **Hydraulic Fracturing**, **Decline Curve** Analysis, Oil & Gas Fields Operations, **Rig** System, **Reservoir** Simulation, Enhancing Production System, **Drilling & Hydraulic Fracture**, Technical Writing in **Drilling Fluid**, **Reservoir Fluids**, **Oil Analysis**, Formation Evaluation (**PVT**), Bottom Hole, **Wellbore Friction & Surface** Pressures, Step Rate Tests/Dfit Analysis, Friction Pressures, Tortuosity versus Perforations, Estimated Leak-Off & Pre-Treatment Frac Gradients, Water Analysis, Benchtop Pilot Testing, Linear & Hybrid Borate & Zirconate Gel Systems, Real-Time Fluid Analysis & Management, Drilling Fluid, **Reservoir Fluid & Well** Testing, Gas Measurement & Formation Evaluation (PVT), **Petroleum Design** Processing, **Workover & Completion**, Advanced **Drilling** Technology, **Well Head** Equipment, Oilfield Operation, **Hydraulic Fracture** and **Drilling & Completion** Engineering. She has also experience with some of the software's like the Eclipse, Fracpro, Ansys Fluent, Cemstress, Paso, Gohfer, Cemcat, Sas, CMG and modeling Proppant Transport using Ansys Fluent Software. She is currently the **Procurement Department Director** of **ALPHA Engineering Int'l**., wherein she is involved in developing and executing a long-term strategy to facilitate improvements for procurement services.

During Dr. Abla's career life, she has gained his practical and field experience through his various significant positions as the **Operations Manager**, **Business Development Manager**, **Client Relation Manager**, **Senior Petroleum Engineer**, **Lead Cement Engineer**, **Drilling & Hydraulic Fracture Engineer**, **Hydraulic Fracturing Field Engineer II**, **Frac Engineer**, **Drilling Engineer**, **Cementing Technical Engineer**, **Cementing Field Engineer**, **QA Supervisor**, **Supervisor**, **Chemistry Lab Technician**, **Head** of **Teacher Assistance & Research Assistance** and Intern for numerous international companies such as the **Schlumberger**, **ConocoPhillips**, **Energen**, Quality Repair & Modeling LLC, Liberty Oilfield Services, Sahara Chemical Solutions, **Colorado School** of **Mines**, Start Scientific Inc., MSI Oil Service and **Total Oil & Gas**.

Dr. Abla has **PhD**, **Master's** and **Bachelor's** degree in **Petroleum Engineering** from the **Colorado School** of **Mines** and the **Missouri University** of **Science & Technology**, **USA** respectively. Further, she is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership and Management** (**ILM**), and a member of the Society of Petroleum Engineers (**SPE**) International and American Association of Drilling Engineers (**AADE**). She has further published scientific papers and delivered numerous trainings, workshops and conferences worldwide.

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	***CO_2 Injection & Process Facilities***
0930 – 0945	*Break*
0945 – 1030	***CO_2 Injection & Process Facilities (cont'd)***
1030 – 1230	***Heavy Emphasis on CO_2 for Enhanced Oil Recovery***
1230 – 1245	*Break*
1245 – 1420	***Heavy Emphasis on CO_2 for Enhanced Oil Recovery (cont'd)***
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Physical & Thermodynamic Properties of CO_2 & High CO_2 Mixtures***
0930 – 0945	*Break*
0945 – 1100	***Physical & Thermodynamic Properties of CO_2 & High CO_2 Mixtures (cont'd)***
1100 – 1230	***Materials Selection & Design Consideration in CO_2 Systems***
1230 – 1245	*Break*
1245 – 1420	***Materials Selection & Design Consideration in CO_2 Systems (cont'd)***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Process Vessel Specification***
0930 – 0945	*Break*
0945 – 1100	***Process Vessel Specification (cont'd)***
1100 – 1230	***Pumps & Compressors***
1230 – 1245	*Break*
1245 – 1420	***Pumps & Compressors (cont'd)***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0930	***Fluid Flow & Special Pipeline Design Considerations Such as the Control of Ductile Fractures***
0930 – 0945	*Break*
0945 – 1100	***Dehydration of CO_2 & CO_2-Rich Gases***
1100 – 1230	***Dehydration of CO_2 & CO_2-Rich Gases (cont'd)***
1230 – 1245	*Break*
1245 – 1345	***Processes to Treat/Recover CO_2***
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 real-life case studies and exercises:-

Course Coordinator

Kamel Ghanem, Tel: +971 2 30 91 714, Email: kamel@haward.org