COURSE OVERVIEW DE0159-4D
Horizontal and Multilateral Wells: Completions and Simulation

Course Title
Horizontal and Multilateral Wells: Completions and Simulation

Course Reference
DE0159-4D

2.4 CEUs (24 PDHs) AWARD

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

Course Date/Venue

Session(s)	Date	Venue
1	September 09-12, 2024	Al Aziziya Hall, The Proud Hotel Al Khobar, Al Khobar, KSA
2	December 09-12, 2024	Club B Meeting Room, Ramada Plaza by Wyndham Istanbul City Center, Istanbul, Turkey

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.

Recent Advances in drilling and completion have resulted in a rapid increase in the number of horizontal and multilateral wells drilled each year around the world. A horizontal well, to some extent, is different from a vertical well because it requires an interdisciplinary interaction between various professionals, such as geologists, reservoir engineers, drilling engineers, production engineers, and completion engineers. A typical horizontal well project is different from a vertical well project because productivity of a well depends upon the well length. Moreover, the well length depends upon the drilling and completion techniques implemented.

Multilateral well technology is revolutionizing the way that reservoirs are accessed by wells. The ability to create wells with multiple branches that can target widely spaced reservoir compartments provides engineers unlimited options in optimizing economic extraction of oil and gas. Along with this opportunity comes the inherent complexity of these well architectures.

The type of well completion affects horizontal and multilateral well performance, and certain types of completions are possible only with certain types of drilling techniques. Thus, well length, the well's physical location in the reservoir, the tolerance in drilling location, and the type of completion that can be achieved, strongly depend upon the drilling method. Therefore, it is very important for reservoir engineers to understand different drilling techniques, their advantages and disadvantages. Similarly, drilling engineers, completion engineers, production engineers and geologists should also understand and appreciate the different factors that influence the performance of the horizontal and multilateral wells. Hence, cooperation and teamwork of different professionals is essential to ensure the successful horizontal and multilateral well project.

Successful multilateral and horizontal wells require new considerations, interdisciplinary planning, and special techniques. This intense course addresses the critical need for a proper understanding of all aspects of horizontal and multilateral design, completion and simulation that make these wells unique. It is designed for those planning or working with horizontal and multilateral wells and interested in effective use of the latest technology.

This course is designed to provide participants with an in-depth knowledge of the technology and processes of horizontal and multilateral well drilling and completion in a variety of environments for oil and gas exploration. It will cover drilling types, techniques, operation, calculations, equipment selections and planning for multilateral and horizontal wells. Specific problems associated with horizontal and multilateral drilling such as torque, drag, hole cleaning, logging, drill string component design, completion design and pay-zone-borehole connection will also be discussed.

Basic understanding of important reservoir characteristics, hole stability, formation damage, crucial zonal isolation, and hydraulic fracturing are just some of the critical issues addressed by this course. Hydraulic fracturing aspects of unconventional resources plays, including conductivity, proppant selection, and practices, are discussed. A combined practical and technical theme is employed, with emphasis on economy and efficiency in designing, completing, and producing horizontal and multilateral wells.

The course also analyzes the successes and failures of well integrity management from a series of real case studies in the oilfield and production facilities around the globe. During the course, the participants will review and discuss the requirements of operators and regulatory authorities for integrity assurance in wells and production facilities. They will also gain knowledge in the completion techniques and design of wells in increasingly complex field developments to ensure well integrity, failure-free and long-life production.

Course Objectives

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

- Apply a comprehensive knowledge on the latest techniques of drilling and completion of horizontal and multilateral wells and deal with the major concerns related to well integrity
- Design and optimize horizontal and multilateral well completions
- Take into account limitations imposed by well bore stability and borehole friction
- Determine appropriate zonal isolation methods for horizontal and multilaterals wells
- Perform hydraulic fracturing of horizontal wells
- Design damage removal, simulation, and workover operations
- Design horizontal and multilateral wells in a professional manner including drilling method selection, precompletion & completion design, planning, surveying and drilling fluid selection
- Explain the horizontal and multilateral drilling method using the turbodrills and perform measurement while drilling (MWD)
- Evaluate well formation using logging, sampling & coring and understand the various techniques of horizontal and multilateral well control & completion
- Solve the major drilling problems in horizontal and multilateral wells and know how to deal with well productivity and integrity
- Develop a proper well integrity management program and review the requirements of operators and regulatory authorities for integrity assurance in horizontal and multilateral wells and production facilities

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 a complete and up-to-date overview of the completions and simulation of horizontal and multilateral wells for drilling engineers, reservoir engineers, geologists, production and completion engineers and supervisors.

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 **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.

- 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.

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 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:

Dr. Chris Kapetan, PhD, MSc, is a **Senior Drilling & Petroleum Engineer** with **40 years** of international experience within the **onshore** and **offshore oil** & **gas** industry. His wide experience covers **Cased Hole Logging** Interpretation, **Cased Hole Formation** Evaluation, **Cased Hole** Applications, **Data Acquisition** in **Cased-hole Logging**, **Drill String Design & Drilling** Optimization, **Drill String Design** Calculations, Enhanced Oil Recovery (**EOR**), Improved Oil Recovery (**IOR**), Performance Analysis, Prediction, and Optimization Using **NODAL** Analysis, **Stuck Pipe** Prevention, **Stuck Piping & Fishing** Operation, **Fishing** Operations, **Fishing** Techniques, **Fishing** Methodologies, **Wireline Fishing** Procedures, **Wireline & Coil Tubing**, **Coiled Tubing Fishing** Operation, **Coiled Tubing Technology**, **Fishing** Options in **Horizontal Wells**, **Horizontal & Multilateral Wells**, **Well Completion & Stimulation**, **Refining & Trading**, **Control Well-Flow Lines Parameters**, **Decision Analytic Modelling Methods** for **Economic Evaluation**, **Probabilistic Risk Analysis** (**Monte Carlo Simulator**) **Risk Analysis Foundations**, **Global Oil Demand**, Crude Oil Market, Global Oil Reserves, Oil Supply & Demand, Governmental Legislation, Contractual Agreements, **Financial** Modeling, **Oil Contracts**, **Project Risk Analysis**, **Feasibility Analysis** Techniques, **Capital Operational Costs**, Oil & Gas Exploration Methods, **Reservoir** Evaluation, **Extraction of Oil & Gas**, **Crude** Oil Types & Specifications, Sulphur, Sour Natural Gas, **Natural Gas Sweeting**, **Petroleum Production**, Field Layout, **Production** Techniques & Control, **Surface Production** Operations, **Oil Processing**, Oil Transportation-Methods, **Flowmetering & Custody Transfer** and **Oil Refinery**. Further, he is also well-versed in Enhanced Oil Recovery (**EOR**), Electrical Submersible Pumps (**ESP**), **Oil Industries Orientation**, **Geophysics**, **Gas Conditioning & Process Technology**, **Production Safety** and **Delusion of Asphalt**. Currently, he is the **Operations Consultant** & the **Technical Advisor** at **GEOTECH** and an independent **Drilling Operations Consultant** of various engineering services providers to the international clients as he offers his expertise in many areas of the **drilling & petroleum discipline** and is well **recognized & respected** for his process and procedural expertise as well as ongoing participation, interest and experience in continuing to promote technology to producers around the world.

Throughout his long career life, Dr. Chris has worked for many international companies and has spent several years **managing** technically **complex wellbore interventions** in both **drilling** & **servicing**. He is a **well-regarded** for his **process** and **procedural expertise**. Further, he was the **Operations Manager** at **ETP Crude Oil Pipeline Services** where he was fully responsible for optimum operations of crude oil pipeline, **workover** and **directional drilling**, **drilling rigs** and equipment, drilling of various geothermal deep wells and **exploration wells**. Dr. Chris was the **Drilling** & **Workover Manager** & **Superintendent** for **Kavala Oil** wherein he was responsible for supervision of **drilling operations** and **offshore exploration**, quality control of performance of **rigs**, **coiled tubing**, crude oil transportation via pipeline and abandonment of **well** as per the API requirements. He had occupied various key positions as the **Drilling Operations Consultant**, **Site Manager**, **Branch Manager**, **Senior Drilling** & **Workover Manager** & **Engineer** and **Drilling** & **Workover Engineer**, **Operations Consultant**, **Technical Advisor** in several petroleum companies responsible mainly on an **offshore** sour oil field (under water flood and gas lift) and a gas field. Further, Dr. Chris has been a **Professor** of the **Oil Technology College**.

Dr. Chris has **PhD** in **Reservoir Engineering** and a **Master's** degree in **Drilling & Production Engineering** from the **Petrol-Gaze Din Ploiesti University**. Further, he is a **Certified Surfaced BOP Stack Supervisor** of **IWCF**, a **Certified Instructor/Trainer**, a **Certified Trainer/Assessor/Internal Verifier** by the **Institute of Leadership & Management** (**ILM**) and has conducted **numerous short courses**, **seminars** and **workshops** and has published several technical books on **Production Logging**, **Safety Drilling Rigs** and **Oil Reservoir**.

Course Fee

Al Khobar	**US$ 6,750** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Istanbul	**US$ 7,250** per Delegate + **VAT**. This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), 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	***Overview of Horizontal & Multilateral Well Technology*** *Directional Drilling General • Limitations of Horizontal Wells • Horizontal Well Applications • Drilling Techniques • Horizontal Well Lengths Based upon Drilling Techniques and Drainage Area Limitations • Completion Techniques*
0930 - 0945	*Break*
0945 – 1030	***Horizontal & Multilateral Wells & Reservoir Concerns*** *Skin Factor • Skin Damage for Horizontal Wells • Effective Wellbore Radius • Productivity Index • Flow Regimes • Influence of Areal Anisotropy*
1030 -1130	***Horizontal & Multilateral Well Design*** *Planning the Wellpath • Dogleg Severity Limits – Combined Buildup and Turn Rate • BHA Performance Considerations • Design Considerations*
1130 - 1230	***Precompletion & Completion Design*** *How the Completion Relates to the Well Design • Monobore Completions • Multiple String Completions • Completion Fluids • Brines • Points to Check on the Completion Design*
1230 – 1245	*Break*
1245 - 1345	***Directional Planning*** *Downhole Tools Affecting Directional Control • Directional Measurement and Surveying • Kicking Off the Well • Drilling the Tangent Section • Dropping Hole Angle • Well Control in Horizontal Wells*
1345 – 1420	***Directional Surveying*** *Acid Bottle • Photomechanical Devices • Steering Tools • Solid State Directional Sensors • Rate Gyros • GCT (Schlumberger) • Inertial Navigation (FINDS) • Surveying Techniques to Locate Blow-outs*
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	***Drilling Fluids*** *Mud Types Available • Dispersed Water-Based Muds • Nondispersed or Polymer Water-Based Muds • Formation Damage with Water-Based Muds • Oil Muds •*

	Components of Invert Oil Emulsion Muds • Formation Damage with Oil Muds • Air, Foamed, & Aerated Systems
0830 - 0930	***Turbodrills*** *System Description • Performance Characteristics • Surface Checks on Turbodrill • Drilling with a Turbodrill • Drill String Rotation • Optimization While Drilling*
0930 – 0945	*Break*
0945 – 1100	***Measurement While Drilling (MWD)*** *Telemetry Channels • Transmission Systems • Power Sources • MWD Sensors • Surface System • Drilling with an MWD System • Applications of MWD*
1100 - 1230	***Formation Evaluation*** *Electric Logging and Sampling • Coring • Mud Logging*
1230 – 1245	*Break*
1245 – 1345	***Well Control*** *Kick Prevention • Kick Detection & Response • Drilling Below Normal Kick Tolerance Levels • Well Killing in Horizontal Wells • General Considerations for BOP Equipment • Suggested Rig Takeover Checklist • Minimum Mud Chemical Stock Levels*
1345 – 1420	***Drilling Problems in Horizontal & Multilateral Wells*** *Control Over Borehole Trajectory • Intersections • Dog-leg Severity • Keyseating • Wellbore Instability • Freeing Stuck Pipe • Baking-off the Drill String • Fishing & Milling • Sidetracking • Lost Circulation*
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	***Productivity of Horizontal & Multilateral Wells*** *Steady-state Productivity of Horizontal Wells • Effective Wellbore Radius of a Horizontal Well • Productivity of Slant Wells • Comparison of Slant Well and Horizontal Well Productivities • Formation Damage in Horizontal Wells*
0830 - 0930	***Well Integrity Management – Leak Detection Techniques*** *High Frequency Ultrasound Tool • Decision Analysis Example for Leak Repair in the Tubing String • Chemicals • Stradle Packers with or Without Expansion • Patches*
0930 – 0945	*Break*
0945 – 1100	***Flow Assurance Concerns & How They Are Related to Loss of Production & Integrity*** *Hydrates, Wax, Asphaltenes, Scale, Emulsions • Erosion & Corrosion*
1100 – 1230	***Influence of Well Eccentricity*** *Influence of Well Eccentricity • Drilling Several Wells • Horizontal Wells at Different Elevations*
1230 – 1245	*Break*

1245 – 1345	***Formation Damage*** *Quantify Formation Damage • Determination of Flow Efficiency & Skin • Formation Damage Vs. Pseudodamage • Drilling-Induced Formation Damage • Formation Damage Caused by Completion & Workover Fluids • Damage During Perforating & Cementing • Formation Damage Caused by Fines Mitigation •*

	Formation Damage Caused by Swelling Clays • Formation Damage in Injection Wells • Formation Damage Resulting from Paraffins & Asphaltenes • Formation Damage Resulting Form Emulsion & Sludge Formation • Formation Damage Resulting from Condensate Banking • Formation Damage Resulting from Gas Breakout • Formation Damage Resulting from Water Blocks • Formation Damage Resulting for Wettability Alteration • Bacterial Plugging
1345 - 1420	***Matrix Acidizing*** *Acid Type and Concentration • Retarded Hf Acids • Geochemical Models • Acid Placements & Coverage • Mechanical Techniques • Particulates • Viscous Acid • Advances in Acid Diversion • Horizontal Wells • Acid Additives • Job Supervision • Safety & Environment Protection • Well Preparation • Quality Control • Injection-Rate Control & Monitoring • Pressure Behavior During Acid Injection • On-Site Evaluation of Acid Treatment Effectiveness • Spent Acid Production Control • Produced Fluid Sampling • Evaluation of Acid Treatments*
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*

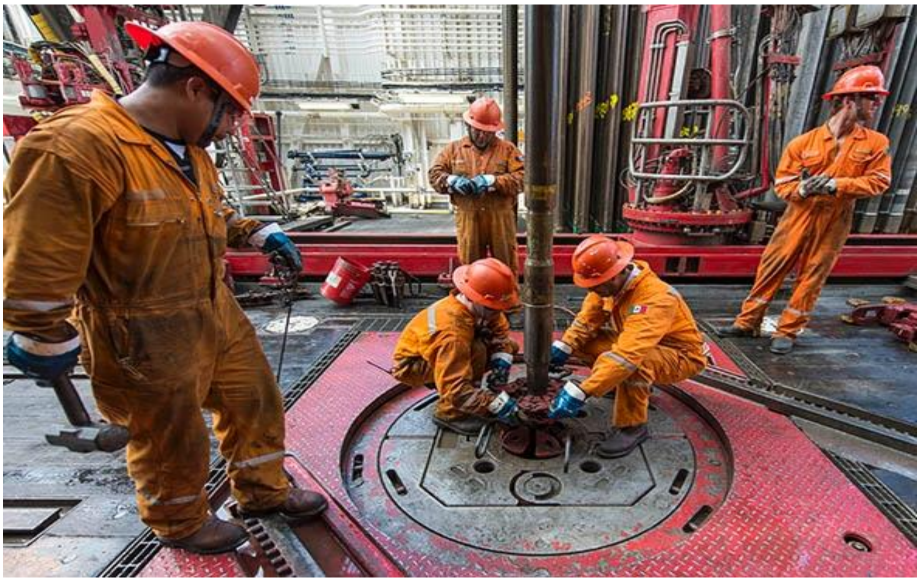
Day 4

0730 – 0830	***Hydraulic Fracturing*** *Fracture Mechanics • Fracture Propagation Models • Fracturing Fluids & Additives • Propping Agents and Fracture Conductivity • Fracture Treatment Design • Acid Fracturing • Fracturing High –Permeability Formations • Fracture Diagnostics • Post-Fracture Well Behavior*
0830 - 0930	***Comparison of Horizontal & Fractured Vertical Wells*** *Vertical Well Stimulation • Types of Fractures • Comparison of Horizontal Wells & Finite Conductivity Fractures • Horizontal Wells in Fractured Reservoirs • Fractured Horizontal Wells*
0930 – 0945	*Break*
0945 – 1030	***Horizontal & Multilateral Wells in Gas Reservoirs*** *Gas Reserve Estimation • Gas Flow Through Porous Media • Horizontal Well Application • Production Type Curves • Case Studies*
1030 – 1130	***Pressure Drop Through a Horizontal & Multilateral Well*** *Effects of High Pressure Drops • Remedies to Minimize High Wellbore Pressure Drops • Fully Developed Friction Factors • Pressure Drop in a Curved Wellbore Section • Drilled Wellbore Sizes & Liner Sizes • Single-Phase Pressure Drop Through a Horizontal Well • Multiphase Pressure Drop Through a Horizontal Well*
1130 - 1230	***Well Integrity in Multilateral Wells – A Challenge in Today's Petroleum Industry*** *Short Introduction to Multi-Lateral Wells • Water Influx in Dual Lateral Wells and Well Integrity Implications*
1230 – 1245	*Break*
1245 - 1345	***Improvement of Integrity Strategies Utilizing Imaging Technology*** *Examples of Downhole Imaging to Formulate Well Integrity Strategies • Combination of Caliper and Video Imaging • Magnetic Wall Thickness Tool*
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

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org