COURSE OVERVIEW DE0280-4D
Advanced Well Testing Design & Analysis

Course Title
Advanced Well Testing Design & Analysis

Course Date/Venue
April 28-May 01, 2024/Club B Meeting Room, Ramada Plaza by Wyndham Istanbul City Center, Istanbul, Turkey

Course Reference
DE0280-4D

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

Well testing is a dynamic process. At its simplest, a test discovers if a formation can flow and permits sampling of the produced fluid. Analysis can yield further information like the extent of formation damage near the borehole, reservoir permeability and heterogeneity, and initial productivity index. For this, engineers induce pressure transients by changing the rate that formation fluids enter the borehole and recording the resulting downhole pressure versus time. Transient tests can also reveal the reservoir's areal extent and vertical layering.

Primary concerns in testing exploration wells are obtaining representative samples and estimating reservoir producibility. Fluid samples are needed to determine various physical parameters required for well test analysis, such as compressibility and viscosity, and for pressure-volume-temperature (PVT) analysis that unlocks how the hydrocarbon phases coexist at different pressures and temperatures.

The analysis and interpretation of well tests have evolved remarkably since the technique became established. Today, a unified methodology has developed to obtain the maximum information from any transient. Analysis, however, reaches deeper than just the near-wellbore region. Today, it contributes so much to characterizing the reservoir that engineers increasingly refer to well testing as reservoir testing. Analysis can indicate the likely producing mechanism of the formation-for example, how much production comes from fractures, how much from intergranular porosity- and it can determine the producing zone's permeability-thickness product, kh. It can see to the limits of the reservoir indicating the probable shape {but not orientation} of the reservoir boundaries and can show whether the primary recovery mechanism is from water or gas-cap support. This information becomes crucial in the appraisal and production stages of field development when engineers combine testing interpretation results with seismic and geologic data to refine their understanding of the reservoir.

Designing well tests involves many of the same steps the interpreter uses. This is because once a test has been proposed, both the pressure data and the data's interpretation can be simulated to show that the test as designed meets it's goals – design simulation requires estimates of formation and fluid parameters from nearby wells or the well in question. By predicting the likely shape of the log-log Δp and derivative curves, the engineer can demonstrate the feasibility of detecting and characterizing the anticipated reservoir features. For example, design simulation ensures that wellbore storage does not smother the feature being sought and guarantees a test that is long enough to view suspected reservoir boundaries. Another important feature of simulation is determining the accuracy and precision required of the pressure gauges. The design phase not only maps out the mechanics of a test, but also ensures that once underway objectives are met.

This is an advanced level seminar designed for petroleum and reservoir engineers who may be required to design and/or interpret non-routine well tests. Participants will be introduced to a systematic approach to well test analysis and will apply it using modern well test analysis software. Numerous data sets with non-ideal behavior will be reviewed and analyzed to allow participants to gain experience with real world problems. Participants will be able to apply their newly acquired skills in their job assignments immediately upon seminar completion. A well test that achieves the objectives is not accomplished by accident. A well test design is a planned activity that uses the pre-test well/reservoir information to reduce the risk of wasting test money. By coupling the well test design service with the real-time operations (RTO) service that monitors and analyzes the test data in real-time, the success of a well test is greatly enhanced. The seminar provides many examples from all over the world which are used to illustrate the various techniques. Participants will take from the seminar clear and systematic methodologies to tackle the more demanding types of well test commonly encountered.

Course Objectives

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

- Apply and gain an in-depth knowledge in well test design and analysis
- Identify properties of gas condensate wells and implement the latest techniques for extended drawdown testing
- Appreciate the importance of WTA in reservoir modeling and monitoring
- Increase confidence in carrying out post hydraulic fracture analysis
- Determine the common difficulties in analyzing WT incomplex
- Illustrate how slug test analyses are performed
- Improve understanding in non-ideal wellbore storage
- Identify injection wells and its components
- Recognize the procedures and advantages of computer aid analysis (hands on simulators)
- Gain ample lessons from relevant real cases for analysis & interpretation

Who Should Attend

This course provides an overview of all significant aspects and considerations of well test design and analysis for petroleum engineers, reservoir engineers and reservoir technical assistants.

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$ 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.

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:

Mr. Samer Shukri, BSc, IWCF, is a **Senior Drilling & Petroleum Engineer** with over **25 years** of **offshore** and **onshore** experience in the **Oil** & **Gas**, **Refinery** & **Petrochemical** industries. His wide expertise includes **Workovers & Completions**, **Well Completion** Design & Operations, **Well Intervention**, **Well Life Cyle**, **Well Stimulation** & **Workover** Planning, **Workover** Practices, **Workover** Operations, **Well Integrity** System, **Well Control**, **Oil & Water Wells**, **Workover/Remedial** Operations & **Heavy Oil** Technology, Plug & Abandonment of **Oil & Gas Wells**, **Petroleum** Engineering, **Open Hole & Cased Hole Logs**, **Petroleum Risk & Decision** Analysis, **Well Testing** Analysis, **Stimulation** Operations, **Coiled Tubing** Operations, **Coiled Tubing Equipment**, **Rigless** Operations, **Reserves Evaluation**, **Reservoir Fluid** Properties, **Reservoir** Engineering & Simulation Studies, **Reservoir** Monitoring, **Geology & Reservoir** Engineering, **Artificial Lift Design**, **Gas** Operations, **Applied Water** Technology, **Oil & Gas Production**, **X-mas Tree** & **Wellhead** Operations & **Testing**, **Wellbore Design & Construction**, **Drilling Fluids & Solids Control**, **Drilling Fluids & Cementing** Operations, **Drilling Practices & Techniques**, **Well Control & Blow Out Prevention**, **Stuck Piping & Fishing** Operations, **Rig Equipment** Maintenance & Inspection, **Rigging & Lifting** Operations, **WellCAP** Driller, **WellCAP** Supervisor, **Artificial Lift** Systems (**Gas Lift**, **ESP** and **Rod Pumping**), **Well Cementing**, **Oil Field Cementing**, **Production Optimization**, **PLT** Correlation, **Slickline** Operations, **Well Testing**, **Production Logging**, **Wireline Logging**, **Wireline** Technology, **Wireline Fishing** Operations, **Project Evaluation** & **Economic Analysis**. Further, he is also well-versed in Marine Environment Protection, Maritime Professional Training, Operational Audit, Improvement, Planning & Management, Climate Change & Emissions Trading Services, International Trade & Shipping, **Fitness for Service-API 579**, **Refining Process & Petroleum** Products, **OSHA** (General Industry & Construction), **IOSH** (Managing Safely, Working Safely), **HSE** Standards & Procedures in the Oilfield, HSE Principles, Incident Prevention & Incidents, Working at Height, **First Aid**, **H2S** Awareness, Defensive Driving, Risk Assessment, Authorized Gas Tester (**AGT**), Confined Space Entry (**CSE**), Root Cause Analysis (**RCA**), Negotiation & Persuasion Skills, **ISO-9001** Quality Management System (**QMS**), ISO-14001 Environmental Management System (**EMS**), **ISO-45001** Occupational Health and Safety Management System (**OHSMS**), **ISO-17020** Conformity Assessment, ISO/TS-29001 Quality Management System, **IOS-50001**-Energy Management System (**EnM**S) and Basic Offshore Safety Induction & Emergency. Currently, he is actively involved in **Project Management** with special emphasis in **commissioning of new wells**, **completion design**, **well integrity** management, **production technology** and field optimization, performing conceptual studies, economic analysis with risk assessment and field development planning.

During his career life, Mr. Samer has gained his field experience through his various significant positions and dedication as the **Senior Production Engineer**, **Well Services Department Head**, **Senior Well Services Supervisor**, **Senior Well Integrity Engineer**, **Senior HSE Engineer**, **Well Services Supervisor**, **Drilling/Workover Supervisor**, **International oil & Gas Trainer**, **Leadership & Management Instructor** and **Senior Instructor/Trainer** from the various international companies such as the ADCO, Al Furat Petroleum Company (AFPC), Syrian Petroleum Company (SPC), Petrotech, Global Horizon-UK, HDTC, Petroleum Engineers Association, STC, Basra University and Velesto Drilling Academy, just to name a few.

Mr. Samer has **Bachelor's** degree in **Petroleum Engineering**. Further, he is an **Accredited IWCF Drilling & Well Intervention Instructor**, a **Certified Instructor/Trainer**, a **Certified Train-the-Trainer** and further delivered innumerable training courses, seminars, conferences and workshops 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: ***Sunday, 28th of April 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction*** *Welltest Analysis –Review of Basic Concepts ● Brief Review of Basic Concepts for Test Analysis; Type Curves: Semilog Analysis, Analytical ● Welltest Analysis -Gas Wells and Multi-Phase Flow ● Fluid Properties: Modifications for Gas Wells and Multiphase Flow*
0930 – 0945	*Break*
0945 – 1100	***Horizontal Wells*** *Interpretation for Horizontal & Vertical Permeability, Skin and Effective Flowing Length*
1100 – 1230	***Horizontal Wells (cont'd)*** *Acidized Horizontal Wells ● Effect of Layering, Formation Thickness*
1230 – 1245	*Break*
1245 – 1420	***Horizontal Wells (cont'd)*** *Constant Pressure Boundary (Gas Cap) ● Integration of Production Logging*
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: ***Monday, 29th of April 2024***

0730 – 0930	***Gas Condensate Wells*** *Condensate-Gas Relative Permeability ● Importance of Compositional Analysis ● Liquid Drop-out Effect*
0930 – 0945	*Break*
0945 – 1100	***Gas Condensate Wells (cont'd)*** *Non-Darcy Flow in Gas Condensate Wells ● Radial Composite Behavior*
1100 – 1230	***Extended Drawdown Testing*** *Objectives of Extended Tests ● Problems of Rate Variation ● Approximate and Exact Convolution*
1230 – 1245	*Break*
1245 – 1420	***Extended Drawdown Testing (cont'd)*** *Compartmentalized Reservoir Behavior ● Extended Buildups and Recharging ● Reserve Estimation*
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: Tuesday, 30th of April 2024

0730 – 0930	***Importance of WTA in Reservoir Modeling & Monitoring***
0930 – 0945	*Break*
0945 – 1100	***Post Hydraulic Fracture Analysis*** *Finite Conductivity Fractures ● Bilinear and Pseudo Radial Flow Regimes ● Type Curves for Well Test Interpretation*
1100 – 1230	***Post Hydraulic Fracture Analysis (cont'd)*** *Fracture Skin ● Non-Darcy Flow in Gas Wells ● Importance of Pre Fracture Testing*
1230 – 1245	*Break*
1245 – 1420	***Difficulties in Analysing WT Incomplex***
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: Wednesday, 01st of May 2024

0730 – 0930	***Slug Test Analysis*** *Variable Rate Methods ● Wellbore Fill Up Phenomenon ● Analytical Solution and Type Curve ● Rate Determination from Pressure Signal*
0930 – 0945	*Break*
0945 – 1100	***Slug Test Analysis (cont'd)*** *Convolution Analysis ● Testing while Perforating ● Application to Coal Bed Methane ● Closed Chamber Tests*
1100 – 1230	***Non-ideal Wellbore Storage*** *Models for Non-Ideal Wellbore Storage ● Gas or Fluid Segregation in the Wellbore ● Use of Multiple Pressure Gauges ● Temperature Changes During Build Up ● Wells Producing a Small Water Cut*
1230 – 1245	*Break*
1245 – 1345	***Injection Wells*** *Radial Composite Analytical Solution ● Interpretation Using Derivative Type Curves and Semilog Analysis ● Pressure in Inner and Outer Regions ● Gas and Steam Injection Wells ● Problems Due to Unfavorable Displacement ● Gas Storage Projects ● Thermal Fracturing*
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 the real-life case studies and exercises:-

Course Coordinator

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