

COURSE OVERVIEW DE0280
Advanced Well Testing Design & Analysis

Course Title

Advanced Well Testing Design & Analysis

Course Date/Venue

Session 1: January 05-09, 2025/
 Meeting Plus 8, City Centre
 Rotana Doha Hotel, Doha,
 Qatar
 Session 2: July 06-10, 2025/ Meeting
 Plus 8, City Centre Rotana
 Doha Hotel, Doha, Qatar



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INCLUDED

Course Reference

DE0280

Course Duration/Credits

Five days/2.6 CEUs/26 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
- Use applicable software and other recent technological development

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.

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**.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations:-


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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 **2.6 CEUs** (Continuing Education Units) or **26 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.

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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:

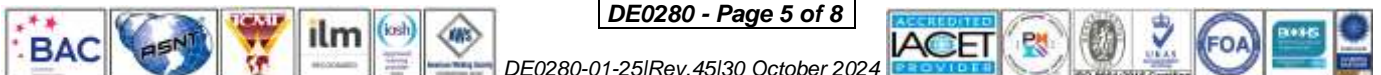


Mr. Brendon Billings, MSc, BSc, is a Senior Petroleum Engineer and Well Service Consultant with over 30 years of international experience in Drilling/Reservoir/Petroleum Engineering and Well Service Operations. He is a recognized authority in “Hands On” Service and Drilling Operations, Well Completions (Riggless Operations), Product Optimization, Wellhead Operations, Wellbore Interventions, High Volume Lift

Project Management, Reservoir Optimization, Well Testing, Wire/Slickilne Equipment and Operations, Coil Tubing, Water Flooding, Electric Submersible Pumps (ESPs), Gas Lifts & Steam Assist Gravity Drain (SAGD) Applications, Facility Inspection, Root Cause Failure Management and Power Factor Management. Currently, he is the **President** of a large specialized engineering services provider to the **North-American Sedimentary Basin Production** and other international clients. Moreover, he occupies a **consultant position** and remains to offer his expertise in many areas of the **drilling discipline** and is well **recognized & respected** for his process, procedural expertise, modus operandi as well as ongoing participation, interest and experience in continuing to promote technology to producers around the world.

Throughout his long career life, Mr. Billings 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, procedural expertise** and **modus operandi**. Further, he was the **Projects Manager** at **Sherrit Petreola** where he was fully responsible for all **Reservoir Development** activities. He has spent **more than 2000 days** total on **Rig Floors** for **Drilling (onshore/offshore)** and **Well Servicing Operations** jobs. Mr. Billings was the Senior **Applications Expert** for **Schlumberger Canada (REDA Services)** where he was greatly involved in high volume lift and reservoir optimization projects including specialty endeavours like **SAGD and Gas Lift**. He lead special projects for alternative technology applications and was referred to as the **‘technical specialist’** for severe services on ESP applications and had provided in-house & client instruction for ESP application schooling. Previously, he was the **Artificial Lift Services Developer** for **Weatherford**, a leading provider of oilfield services equipment for drilling, evaluation, completion, production and intervention areas. Herein, he was tasked to introduce new ESP technology and lead a project team for ESP facility development & design. Much earlier in his career, he has held positions such as **Operations Supervisor, Rig Consultant, Project Manager, Regional Manager, Engineering Representative, International Engineering Support Technician, Facility Services Manager** and **Power Plant Engineer**.

Mr. Billings has **Master** and **Bachelor** degrees in **Petroleum Engineering** and **Power Engineering**. He is a **licensed Professional Engineer**, a **Certified Instructor/Trainer** and a well respected member of the **Society of Petroleum Engineers (SPE)**. Further, he has conducted **numerous industry short courses** and **SPE workshops**.





Course Fee

US\$ 8,500 per Delegate 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 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

0800 – 0830	Registration & Coffee
0830 – 0845	Welcome & Introduction
0845 – 0900	PRE-TEST
0900 – 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 • Acidized Horizontal Wells
1100 – 1230	Horizontal Wells (cont'd) Effect of Layering, Formation Thickness
1230 – 1245	Break
1245 – 1350	Horizontal Wells (cont'd) Constant Pressure Boundary (Gas Cap) • Integration of Production Logging
1350 – 1400	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
1400	End of Day One

Day 2: Tuesday, 23rd of August 2022

0800 – 0930	Gas Condensate Wells Condensate-Gas Relative Permeability • Importance of Compositional Analysis
0930 – 0945	Break
0945 – 1100	Gas Condensate Wells (cont'd) Liquid Drop-out Effect • 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 – 1350	Extended Drawdown Testing (cont'd) Compartmentalized Reservoir Behavior • Extended Buildups and Recharging • Reserve Estimation
1350 – 1400	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
1400	End of Day Two

Day 3

0800 – 0930	Importance of WTA in Reservoir Modeling & Monitoring
0930 – 0945	Break
0945 – 1100	Importance of WTA in Reservoir Modeling & Monitoring (cont'd)
1100 – 1230	Post Hydraulic Fracture Analysis Finite Conductivity Fractures • Bilinear and Pseudo Radial Flow Regimes • Type Curves for Well Test Interpretation
1230 – 1245	Break
1245 – 1350	Post Hydraulic Fracture Analysis (cont'd) Fracture Skin • Non-Darcy Flow in Gas Wells • Importance of Pre Fracture Testing
1350 – 1400	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
1400	End of Day Three

Day 4

0800 – 0930	Difficulties in Analysing WT Incomplex
0930 – 0945	Break
0945 – 1100	Difficulties in Analysing WT Incomplex (cont'd)
1100 – 1230	Slug Test Analysis Variable Rate Methods • Wellbore Fill Up Phenomenon • Analytical Solution and Type Curve • Rate Determination from Pressure Signal
1230 – 1245	Break
1245 – 1350	Slug Test Analysis (cont'd) Convolution Analysis • Testing while Perforating • Application to Coal Bed Methane • Closed Chamber Tests
1350 – 1400	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
1400	End of Day Four



Day 5

0800 – 0900	Non-ideal Wellbore Storage <i>Models for Non-Ideal Wellbore Storage • Gas or Fluid Segregation in the Wellbore</i>
0900 – 1000	Non-ideal Wellbore Storage (cont'd) <i>Use of Multiple Pressure Gauges • Temperature Changes During Build Up • Wells Producing a Small Water Cut</i>
1000 – 1005	<i>Break</i>
1005 – 1100	Injection Wells <i>Radial Composite Analytical Solution • Interpretation Using Derivative Type Curves and Semilog Analysis • Pressure in Inner and Outer Regions</i>
1100 – 1130	Injection Wells (cont'd) <i>Gas and Steam Injection Wells • Problems Due to Unfavorable Displacement • Gas Storage Projects • Thermal Fracturing</i>
1130 – 1145	Course Conclusion <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course</i>
1145 – 1200	POST-TEST
1200	<i>End of Course</i>

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-



Course Coordinator

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