COURSE OVERVIEW DE0498
Pulsed Neutron Cased Hole Formation Evaluation (Intermediate to Advanced)

Course Title
Pulsed Neutron Cased Hole Formation Evaluation (Intermediate to Advanced)

Course Date/Venue
Session 1: July 20-24, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: December 15-19, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
DE0498

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

This course is designed to provide participants with a detailed and up-to-date overview of Pulsed Neutron Cased Hole Formation Evaluation (Intermediate to Advanced). It covers the pulsed neutron logging (PNL) including its principles and applications in formation evaluation; the physics of neutron interaction with matter, tool design and configuration; the key nuclear measurements, data acquisition systems and tool deployment and operational considerations; and the Sigma interpretation techniques and describe porosity from pulsed neutron tools.

Further, the course will also discuss the carbon/oxygen (C/O) logging and wellbore environment corrections; the signal-to-noise ratio optimization, depth of investigation limitations, tool failure modes and troubleshooting; the quality control checks in data processing; the gamma-ray emissions and detection and spectral analysis techniques for element identification; the spectroscopy calibration and resolution and applications in lithology and mineralogy; and the elemental yield interpretation, cased hole saturation monitoring and quantitative interpretation techniques.

During this interactive course, participants will learn the environmental and borehole effects and reservoir saturation interpretation; the reservoir lithology and composition including production logging and pulsed neutron tools; the time-lapse logging (4D logging) and data analytics in pulsed neutron interpretation; the high-pressure, high-temperature (HPHT) applications as well as low porosity and low permeability formations; and the unconventional reservoir applications, tool limitations and emerging technologies.

Course Objectives

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

- Apply and gain an advanced knowledge on pulsed neutron cased hole formation evaluation
- Discuss pulsed neutron logging (PNL) including its principles and applications in formation evaluation
- Explain the physics of neutron interaction with matter, tool design and configuration
- Recognize key nuclear measurements, data acquisition systems and tool deployment and operational considerations
- Apply Sigma interpretation techniques and describe porosity from pulsed neutron tools
- Discuss carbon/oxygen (C/O) logging and wellbore environment corrections
- Carryout signal-to-noise ratio optimization, depth of investigation limitations, tool failure modes and troubleshooting and quality control checks in data processing
- Apply gamma-ray emissions and detection, spectral analysis techniques for element identification, spectroscopy calibration and resolution and applications in lithology and mineralogy
- Employ elemental yield interpretation, cased hole saturation monitoring and quantitative interpretation techniques
- Discuss environmental and borehole effects and apply reservoir saturation interpretation
- Identify reservoir lithology and composition including production logging and pulsed neutron tools
- Recognize time-lapse logging (4D logging) and apply data analytics in pulsed neutron interpretation
- Discuss high-pressure, high-temperature (HPHT) applications as well as low porosity and low permeability formations
- Carryout unconventional reservoir applications, tool limitations and emerging technologies

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**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of on pulsed neutron cased hole formation evaluation for petroleum engineers, geoscientists, logging engineers, reservoir engineers, petrophysicists, drilling and completion engineers, field technicians, managers and decision-makers and other technical staff.

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$ 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.

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: -

- 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(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. Chris Kapetan, PhD, MSc, is a **Senior Drilling & Petroleum Engineer** with over **40 years** of international experience within the **onshore** and **offshore oil** & **gas** industry. His wide experience covers **Horizontal & Multilateral Wells**, **Well Completion & Stimulation**, **Artificial Lift System Selection & Design**, **Drilling Practices**, **Drilling Fluids Technology**, Drilling **Operations**, **Directional** Drilling**, Formation Damage** Evaluation & Preventive, **Formation Damage** Remediation, **Drilling & Formation Damage**, Simulation Program for The **International Petroleum Business**, **Well** Testing & Analysis, **Well** Design, **Well** Testing & Oil Well Performance, **Well** Test Design Analysis, **Well Test** Operations, **Well Testing & Perforation**, Root Cause Analysis (**RCA**), RCA Method for Process Plant, **RCA** Techniques, Control Well-Flow Lines Parameters, Decision Analytic Modelling Methods for **Economic Evaluation**, **Probabilistic Risk Analysis** (**Monte Carlo Simulator**) **Risk Analysis** Foundations, Sulphur, Sour Natural Gas, **Natural Gas Sweeting**, **Petroleum Production**, Field Layout, **Production** Techniques & Control, **Surface Production** Operations, **Project Risk Analysis**, **Feasibility Analysis** Techniques, **Capital Operational Costs**, **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**, **Cased Hole** Formation Evaluation, **Cased Hole** Applications, **Cased Hole** Logs, **Production Wells** Operations, **Production** Management, **Perforating** Methods & Design, **Perforating** Operations, **Fishing** Operations, **Well & Reservoir** Testing, **Reservoir** Stimulation, **Hydraulic Fracturing**, **Carbonate** Acidizing, **Sandstone** Acidizing, **Drilling Fluids** Technology, Drilling Operations, **Directional** Drilling, **Artificial Lift**, **Gas Lift Design**, **Gas Lift** Operations, Petroleum Business, **Petroleum Economics**, Field Development Planning, **Gas Lift Valve** Changing & Installation, **Well Completion** Design & Operation, **Well** Surveillance, **Well** Testing, **Well** Stimulation & Control and **Workover** Planning, Completions & Workover, **Rig Sizing**, **Hole Cleaning & Logging**, **Well Completion**, **Servicing & Work-Over** Operations, Practical **Reservoir Engineering**, **X-mas Tree & Wellhead** Operations, Maintenance & Testing, Advanced **Petrophysics/Interpretation** of **Well Composite**, **Construction Integrity** & **Completion**, **Coiled Tubing** Technology, **Corrosion Control**, **Slickline**, **Wireline & Coil Tubing**, **Pipeline Pigging**, **Corrosion** Monitoring, **Cathodic Protection** as well as Root Cause Analysis (**RCA**), Root Cause Failure Analysis (**RCFA**), **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**, **Drilling** & **Workover Engineer**, **Process Engineer**, **Operations Consultant** and **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 Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the workshop 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 to Pulsed Neutron Logging (PNL)*** *History & Evolution of Neutron Logging Tools • Principles of Pulsed Neutron Generation & Detection • Applications of PNL in Formation Evaluation • Comparison of Pulsed Neutron versus Traditional Neutron Tools*
0930 – 0945	*Break*
0945 – 1030	***Physics of Neutron Interaction with Matter*** *Neutron Moderation & Scattering Processes • Capture Cross-Section & Isotopic Responses • Gamma-Ray Spectroscopy Fundamentals • Fast versus Thermal Neutron Interactions*
1030 – 1130	***Tool Design & Configuration*** *Key Components of Pulsed Neutron Tools • Detectors (He-3, Scintillation & Photomultiplier Tubes) • Measurement Modes: Sigma, Capture & Elemental Analysis • Calibration Procedures & Environmental Corrections*
1130 – 1215	***Key Nuclear Measurements*** *Capture Cross-Section (Sigma) Measurement • Neutron Porosity & Density Estimation • Carbon/Oxygen (C/O) Ratios • Elemental Yields & Spectroscopy*
1215 – 1230	*Break*
1230 – 1330	***Data Acquisition Systems*** *Principles of Real-Time Data Acquisition • Role of Timing & Telemetry in Pulsed Neutron Tools • Sampling Rates & Resolution • Tool Diagnostics & Error Handling*
1330 – 1420	***Tool Deployment & Operational Considerations*** *Logging in Cased versus Open Hole Environments • Challenges in Wellbore Conditions (e.g., Temperature, Pressure) • Centralization & Positioning in Deviated Wells • Safety Protocols for Nuclear Tools*
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	***Sigma Interpretation Techniques*** *Principles of Macroscopic Capture Cross-Section (Sigma) • Formation Water Salinity Effects on Sigma • Gas Presence & its Impact on Sigma Measurements • Applications for Identifying Fluid Contacts*
0830 – 0930	***Porosity from Pulsed Neutron Tools*** *Neutron Moderation & its Relationship with Porosity • Lithology Effects on Porosity Measurements • Applications for Gas-Bearing & Complex Lithology Zones • Comparison with Density-Neutron Porosity Measurements*

0930 – 0945	*Break*
0945 – 1100	***Carbon/Oxygen (C/O) Logging*** *Principles of C/O Ratio Measurement • Identification of Oil, Gas & Water Zones • Environmental Corrections for Borehole & Salinity Effects • Applications in Reservoir Saturation Monitoring*
1100 – 1215	***Wellbore Environment Corrections*** *Effect of Casing Size & Cement Thickness • Mud Weight & Salinity Impacts • Temperature & Pressure Corrections • Techniques for Minimizing Environmental Noise*
1215 – 1230	*Break*
1230 – 1330	***Case Studies: Advanced Sigma Applications*** *Water Flood Monitoring & Sweep Efficiency • Reservoir Compartmentalization Evaluation • Identifying Bypassed Pay Zones in Mature Wells • Cross-Plotting Techniques for Sigma Data Analysis*
1330 – 1420	***Tool Limitations & Quality Control*** *Signal-to-Noise Ratio Optimization • Depth of Investigation Limitations • Tool Failure Modes & Troubleshooting • Quality Control Checks in Data Processing*
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	***Basics of Gamma-Ray Spectroscopy*** *Fundamentals of Gamma-Ray Emissions & Detection • Spectral Analysis Techniques for Element Identification • Spectroscopy Calibration & Resolution • Applications in Lithology & Mineralogy*
0830 – 0930	***Elemental Yield Interpretation*** *Identification of Key Elements: Si, Ca, Fe, S, Mg, etc. • Lithology Determination from Elemental Yields • Shale Content Quantification • Correlation with Other Petrophysical Measurements*
0930 – 0945	*Break*
0945 – 1100	***Cased Hole Saturation Monitoring*** *Water, Gas & Oil Saturation Estimation Methods • Pulsed Neutron Spectroscopy versus Resistivity Tools • Applications in Enhanced Oil Recovery (EOR) Projects • Long-Term Saturation Tracking Case Studies*
1100 – 1215	***Quantitative Interpretation Techniques*** *Mineralogical & Volumetric Calculations • Combining Spectroscopy with Sigma & Porosity Data • Formation Matrix Effects on Spectral Yields • Advanced Interpretation Software & Workflows*
1215 – 1230	*Break*
1230 – 1330	***Environmental & Borehole Effects*** *Analyzing the Impact of Borehole Size & Fluid Type • Cement Integrity & its Influence on Measurements • Temperature-Dependent Spectral Corrections • Use of Monte Carlo Modeling in Borehole Corrections*

1330 – 1420	***Case Studies in Spectroscopy Applications*** *Mineralogical Characterization of Unconventional Reservoirs • Identifying Scaling & Deposition Issues • Application of Spectroscopy in Carbonate Reservoirs • Differentiating Dolomite, Limestone & Anhydrite*
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	***Reservoir Saturation Interpretation*** *Integration of Pulsed Neutron Data with Core & Log Data • Water Saturation Models for Cased Hole Environments • Archie's Equation Adaptations for Sigma & C/O Tools • Techniques for Saturation Uncertainty Reduction*
0830 – 0930	***Reservoir Lithology & Composition*** *Using Elemental Analysis for Lithology Modeling • Identifying Mixed Lithology Zones & Unconventional Reservoirs • Carbonate & Clastic Differentiation Techniques • Cross-Discipline Integration with Geological Data*
0930 – 0945	*Break*
0945 – 1100	***Production Logging & Pulsed Neutron Tools*** *Role of Pulsed Neutron in Identifying Production Issues • Gas Lift Optimization with Pulsed Neutron Logs • Identifying Water Break-Through Zones • Integration with Production & Reservoir Engineering Models*
1100 – 1215	***Time-Lapse Logging (4D Logging)*** *Principles of Time-Lapse Reservoir Monitoring • Tools & Techniques for Repeatability & Reproducibility • Applications in EOR Monitoring • Quantifying Reservoir Changes over Time*
1215 – 1230	*Break*
1230 – 1330	***Case Studies: Integration in Field Development*** *Mature Field Redevelopment Case Studies • Bypassed Pay Identification & Recovery Enhancement • Pulsed Neutron Data for Reservoir Simulation Inputs • Best Practices in Integrated Reservoir Workflows*
1330 – 1420	***Data Analytics in Pulsed Neutron Interpretation*** *Role of Machine Learning in Data Integration • Automation of Interpretation Workflows • Cross-Domain Data Fusion: Seismic, Core & Log Data • Future Trends in Data-Driven Formation Evaluation*
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 Four*

Day 5

0730 – 0830	***Challenging Environments*** *High-Pressure, High-Temperature (HPHT) Applications • Low Porosity & Low Permeability Formations • Evaluating Thin Beds & Laminated Formations • Applications in Heavy Oil & Tar Sands Reservoirs*
0830 – 0930	***Unconventional Reservoir Applications*** *Evaluating Shale Reservoirs Using Pulsed Neutron Logs • Integration with Microseismic & Fracture Data • Gas Hydrates Detection & Evaluation • Applications in Coal-Bed Methane Reservoirs*

0930 – 0945	*Break*
0945 – 1100	***Tool Limitations & Emerging Technologies*** *Advances in Pulsed Neutron Detector Technology • Multi-Detector & High-Resolution Systems • Hybrid Tools Combining Spectroscopy with Resistivity • Future Trends in Neutron Logging*
1100 – 1230	***Practical Data Interpretation Exercises*** *Hands-On Analysis of Sigma, C/O & Spectroscopy Logs • Integration of Multiple Data Sets for Reservoir Characterization • Case Study Interpretation: Complex Reservoirs • Best Practices for Report Generation & Presentation*
1230 – 1245	*Break*
1245 – 1345	***Workshop: Problem-Solving in Real Scenarios*** *Troubleshooting Complex Pulsed Neutron Log Responses • Group Discussions on Case Studies • Designing a Comprehensive Cased-Hole Logging Program • Developing Workflows for Interpretation in Challenging Reservoirs*
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

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