


Geothermal Drilling Training Course

The Vaults Members' Rooms
The Scotch Malt Whisky Society
The Vaults | 87 Giles Street | Leith EH6 6BZ

5th - 8th March 2024, Edinburgh, Scotland





“I was looking to participate in a training where we could compare oil and gas versus geothermal. Geothermal Drilling course provided exactly this; now I have a better understanding of the geothermal world and how important is the experience from the oil and gas industry for this type of projects. Kevin did a great job sharing his knowledge!”

Anna Ortin, Geological Operations Advisor, Repsol, Canada

Course Overview

The course will introduce the key technologies and engineering strategies required to plan and execute a successful geothermal project. It focuses on drilling technology, equipment and principles used in successful geothermal wells. Specific attention is given to metallurgy and well control issues for geothermal wells. Throughout the whole course, the critical areas of difference of geothermal drilling to conventional O&G well drilling will be highlighted. Overall, the course provides a holistic perspective to geothermal drilling from a point of view of geothermal developer.

Key benefits

By the end of the course the participants will be able to understand:

- Key technologies and engineering strategies required to design and execute successful geothermal projects
- Metallurgy of geothermal wells and well control issues for geothermal wells
- The interdependency between geothermal well drilling and the oil & gas business
- The specific tools and equipment required for efficient drilling operations – for oil & gas and geothermal applications
- Specific drilling challenges related to geothermal wells

Who should attend

- Oil & gas companies venturing into or active in Geothermal Drilling
 - Drilling engineers
 - Well site supervisors
 - Rig managers
 - Geo-scientists and reservoir engineers looking to get better value from the interactions with the drilling team
- Geothermal drilling and engineering companies, contractors and service companies
- Venture capital groups, civil engineering groups, authorities, energy generation and management companies



Your Expert Trainer

**Kevin Gray,
Black Reiver Consulting UK**

Kevin can offer the experience of over 5000 days of operational experience gained at rig sites and operations support positions from an oilfield career of over 31 years as well as working as lead trainer for a multi award winning ERD engineering team based in Perth Scotland.

Kevin has been consistently the highest rated drilling training instructor in a major multinational training company over the last four years and throughout his offshore career was repeatedly graded in top 5% within both offshore and onshore positions for the largest oilfield service company.

Kevin has designed and overseen the delivery of multi week training programs for offshore drilling, well intervention and fluid supervisors for a number of clients. This has included competency assessment and skills gap analysis throughout the programs.

Kevin is also able to draw on his well documented teaching skills to deliver courses or programs in directional drilling and surveying, stuck pipe, extended reach drilling and various other drilling related subject areas. He wrote the first Operation support centre SOP for directional drilling which was later adopted globally. In addition, he has designed and delivered various 'Real Time Centre' training courses including human dynamics training. In his former role as directional drilling coordinator, based in Aberdeen he still holds a number of world records for drilling achievements with motor and RSS tools.

In his earlier career he led an offshore team that developed the first multi axis drill vibration measurement tool to report measurements in real time, and subsequently wrote the core documentation on vibration control for D&M.

Later he was responsible for the introduction and field testing of Powerdrive RSS tools and had considerable input into their re-design as the X5 variant. Kevin has led many teams into both new fields and mature field redevelopment. Outside the industry he enjoys skiing and exploring, taking these two activities to the extreme in 2015 when he skied to the South Pole dragging a sledge behind him.

"I found the training very well prepared and well understandable. This is a complex topic, but with the presenter and the content of the training, I have learned a lot, actually more than I thought I could. Kevin was very professional and still casual. Great presenter with deep knowledge of the topic, yet still open for discussion."

**Michal Masek, Project Manager,
PW Energy, Slovakia**



Daria Ivakhnenko, Black Reiver Consulting France

Daria is a multilingual manager in the petroleum industry with 19 years of experience in technical translation, interpreting and enabling cross-cultural and cross-departmental communication.

During her career, Daria has worked in various oil and gas project environments, including operator-controlled projects and joint activities at various development phases. She has built and managed the best practice translation and interpreting projects from the ground up, developing vast experience and knowledge of the energy sector, its technologies, regulations, contracting, HSE and other aspects.

Daria has delivered significant time-saving cost optimisation in high-risk, high-value projects through rendering translation, interpreting and communication services for her employers and customers. She is responsible for negotiation, organisation, and administration of the training courses, writing and editing training content, and linguistic support. She also manages the company's communication and involvement in professional and industry associations, study, research and development of training modules and courses.

Training Manager,
Linguistic Consultant

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Tony Pink, Black Reiver Consulting UK

Tony graduated with a BSC in Geology from University College of Wales Aberystwyth in 1990 and has a postgraduate diploma (GMP) from Harvard Business School. He spent 5 years in the field as an MWD/LWD Engineer followed by 5 years as a Directional driller. He moved into management with Schlumberger in 2000 and worked in several posts including Drilling Training Manager and the Engineering Manager for US Land.

In June of 2011 Tony became the VP of Automated Drilling Applications with the objective of delivering an automated drilling solution for NOV and our industry. In 2014 He became the VP of services for a new division of NOV called Dynamic Drilling Solutions and is responsible for delivering Automated Drilling Solutions to NOV's customers. He has also been an active member of the Society of Petroleum Engineers (SPE) Drilling Systems Automation Technical Section (DSATS) including the role of program chairman.

In October 2018 of he became the CTO for NOV, Wellbore Technologies. Responsible for the digital strategy and technology portfolio for the segment including geothermal drilling technology. In March 2022 Tony moved into his current role responsible for Subsurface Technology particularly focussed on Geothermal and Carbon Storage. He has published and presented 13 SPE/IADC papers and has 5 US and EU Patents on Closed Loop Drilling Automation, Automated Directional Drilling, Early Kick Detection Particle Drilling and Insulated Drill Pipe.

Geothermal Drilling Consultant

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Day 1

5th March 2024

10:00: Welcoming note and opening remarks

10:15: MODULE 1: Introduction to geothermal wells

- Geothermal definitions and well types
- Origin of geothermal heat and types of exploitation
- Main differences to conventional oilfield wells
- The Geothermal drilling performance gap
- Key aspects of geothermal well design
- Critical considerations in well engineering for geothermal well construction
- Defining value of a geothermal resource

11:30: Morning coffee and networking

11:45: MODULE 2: Basics of rotary drilling

- Rig types and equipment
- Rig personnel and roles
- Rig specification and defining rig capabilities
- Aspects of rig equipment for high temperature operation
- Rig power systems, hoisting systems, circulating systems rotating systems, well control systems, solids handling systems
- Drilling fluid handling systems for high temperature fluids
- Fluid cooling systems

13:15: Luncheon

14:15: MODULE 3: Downhole tools and equipment

- Types of bottom hole assembly (BHA)
- Mud motor and turbine technology
- Measurements while drilling and formation evaluation tools
- BHA tools
- Stabilisers
- Collars
- Types of drill bit
- Influence of temperature on tool operations and tool suitability

15:30: Afternoon refreshments and networking

15:45: MODULE 4: Directional drilling

- How wellbores are steered
- How increasing temperature limits well positioning options
- Rotary BHA design for build drop and hold
- Designing and using steerable rotary assemblies and rotary steerable tools

17:30: Networking event in Members Room

18:00: Scottish Malt Whisky Society led tasting

19:30: Three course showcase of Scottish cuisine



Day 2

6th March 2024

10:00: MODULE 5: Wellbore surveying

- Understanding the wellbore survey
- Uncertainty and well positioning
- Types of survey
- Survey corrections
- Well collision avoidance
- Well intersection in injection production loop type geothermal wells
- Understanding error models
- Survey accuracy
- Survey corrections

11:30: Morning coffee and networking

11:45: MODULE 6: Tubular design

- OCTG tubulars and casing design for HPHT wells
- Understanding tubular manufacturing for OCTG products
- Casing and tubing specification and standards
- Casing sizes and weights
- The design limitations of tension, compression, burst, collapse, and torsion for casing
- Casing seat selection
- Casing running and setting
- Wellhead components

13:15: Luncheon

14:15: MODULE 7: Metallurgy for geothermal wells

- Basic metallurgy
- The effects of corrosion on well components and flowlines
- Sweet corrosion
- Sour corrosion
- Types of alloys for geothermal wells
- Cost considerations in metallurgy choice
- Thermal de-rating of tubular strengths
- Souring of reservoir fluids in injection wells and influence of H₂S on metals

15:30: Afternoon refreshments and networking

15:45: MODULE 8: Basic well control for geothermal wells

- Principles of hydrostatic pressure in the formation and origin of over pressure
- The blow out preventer and associated equipment
- The principle of double barrier operation
- Well integrity and barrier envelopes
- Well kicks
- Conventional overbalance drilling
- Well control operations

17:30 End of day two



Day 3

7th March 2024

10:00: MODULE 9: Drill bit design and selection

- Understanding basic drill bit types
- Design features of drill bits
- Drive systems and drill bit choice
- The importance of wear grading
- New technologies for drill bits
- PDC cutter design
- Aspects of PDC cutter damage during drilling

10:30: Morning coffee and networking

11:45: MODULE 10: Drilling problems

- Stuck pipe and fishing
- Hole cleaning
- Types of stuck pipe
- Planning to avoid stuck pipe
- Torque and drag in directional wells
- Stuck pipe indications and freeing
- Fishing and well recovery operations

13:15: Luncheon

14:15: MODULE 11: Shock and vibration of drilling assemblies

- Types of shock and vibration
- Origins of S&V
- Designing BHA to reduce S&V impacts
- Tool damage
- Well bore issue with S&V in drilling assemblies
- Axial vibration
- Lateral vibration and torsional vibrations
- Measurement and identification of S&V

15:30: Afternoon refreshments and networking

15:45: MODULE 12: Drilling fluids

- Types of drilling fluid
- Basic drilling fluid properties
- Measurement of fluid properties
- Effect of temperature on drilling fluids
- Losses and Loss control
- HSE aspects of high temperature drilling fluids

17:30: End of day three



Day 4 8th March 2024

10:00: MODULE 13: Geomechanics of geothermal wells

- Understanding far field rock stresses
- Hoop Stress and its role in wellbore strengthening
- Thermal Stress
- Hydraulic and Thermal Fracturing
- The importance of ELLOT/XLOT

11:30 Morning coffee and networking

11:45 MODULE 14: Formation damage while drilling

- What is formation damage (skin factor)
- Impacts of reduced permeability on production value
- Strategies to reduce formation damage
- Aspects of drilling leading to skin formation

13:15 Luncheon

14:15 MODULE 15: Legislative environments

- Legislation, regulations, standards and guideline
- Current EU situation
- Future EU wide planned frameworks
- Public perception and issues of refusal

15:30 Afternoon refreshments and networking

- Building meaningful risk registers
- Setting nested Key Performance Indicators
- Introducing new technologies
- Managing team competencies

17:00 Discussion and certificates

17:30 End of course

“Thanks to Kevin and the Geothermal Wells training course, I not only have a newfound appreciation for geothermal energy, but also a solid understanding of how it works. I highly recommend this course to anyone who wants to learn about renewable energy in an engaging way.”

Zoltan Namesanszky, Senior Completion Engineer, MOL Group, Hungary

