EC036: Delivering Exploration & Appraisal Wells Safely

Format and Duration
Self-Paced - 8 Hours

Summary

This course is designed to help participants deliver safe exploration activity by learning about the key aspects of well planning, design and drilling. Planning a successful well is a multidisciplinary endeavour and as such topics covered will range from the initial planning through to completion of drilling operations. Through the extensive use of visual examples and interactive content the learner will develop an understanding of time to depth conversion in order to generate target horizons for a well plan. Sources of uncertainty in depth estimates from seismic are discussed along with the impact of depth errors on safe operations. Surface and subsurface geohazards will be described alongside planning for a site survey and emergency relief wells. The course will explore the causes and impacts of anomalous pore pressure and explain how pore pressure and fracture gradient estimates can be used when designing a well. As part of the well design discussion, casing, mud, data acquisition and safety systems will be considered in addition to the common communication channels between subsurface, well engineering and wellsite teams. Finally, aspects of safe well operations, well monitoring and post well review methods will be discussed.

Learning Outcomes

Participants will:

1. Learn about time to depth conversion, sources of uncertainty and the impact of this information on well planning and drilling.
2. Develop an understanding of surface and subsurface geohazards, planning a site survey and drilling a relief well.
3. Become aware of the causes and impacts of anomalous pore pressure and how this can influence well design and safe operations.
4. Consider the environmental and social implications of drilling and develop an awareness of operational legislation and regulations.
5. Learn about detailed well design and safe drilling operations.

Training Method

This is a self-paced e-learning course. Learning materials are structured into short sections, each including interactive text and image content, animations, video, and audio. An end of course quiz is scored to provide the learner with their learning progress. Approximately 8 hours learning time

Who Should Attend

Thsi course is suitable for all subsurface professoinals involved in the planning and execution of drilling a well. This course is designed to be an alternative to EC025 and focusses on risk and safety aspects of the processes

Course Content

Introduction to the Elements of Well Planning and Delivery

Planning an exploratory well is a multidiscipline endeavour. Geoscientists, engineers, Drilling and Regulatory staff work closely together to design a well that can be drilled safely, achieves the objectives of

the well, and minimizes drilling cost. This module provides an overview of the well-planning process, starting with a description of the initial well-planning meeting, followed by a review of data often collected when planning a well.

Predicting Target Depths: Seismic Time to Depth Conversion

Depth information provided by seismic time-to-depth analyses provides information essential to planning a well. For example, seismic can be used to estimate the depth of the top of overpressure, depths of targeted reservoirs, depths of faults cutting the well path, and total well depth. These depth estimates support many aspects of planning a well, such as the determination of the casing program, the estimate of the total well cost, and the design of a safe well. This module provides an overview of basic methods used to convert seismic horizons and structure maps, measured in time, to depth. Sources of uncertainty in depth estimates from seismic are discussed, as is the need to communicate uncertainty in depth predictions to engineers planning a well. The module concludes with a discussion of the impact of depth prediction errors on drilling exploration wells safely.

Geohazard Identification

This module will examine the various geohazards associated with delivering exploration wells safely. This will include seabed and sub-surface hazards, fault identification and avoidance, and depositional architecture from seismic and fluid identification (DHIs). We will also explore shallow gas hazards, and geomechanical hazards before concluding with risk and mitigation strategies.

Pore Pressure and Fracture Gradient, Temperature Prediction

Here we will explore the causes and impacts of anomalous pore pressure and the impacts of anomalous fracture gradients. Using worked examples we will review data and techniques for pore pressure fracture gradient predictions. This module will go on to explain capturing uncertainty, preliminary well design from PPFG as well as basic casing design, basic casing set selection, cement and tubing design and conclude with a look at temperature prediction.

Well Data Acquisition Planning

In the Well Data Acquisition Planning module we will review, well objectives, LWD data, PPFG from LWD, the hazards and implications of wireline data, well testing and coring. The module will also introduce fluid sampling fluid contaminants and the implications of the data acquisition plan on well design.

Environmental and Social Considerations

In this module we'll cover Basic ESG – implications for well design and execution. This will include an Introduction to Environmental Impact Assessment, the Legislation, EIA operations (sampling, data acquisition etc) and how to handle emissions and stewardship expectations. The module will also touch on on the social impact of well design and execution and contractor management.

Detailed Well Design

Starting with an introduction to basic well engineering, this module will cover several topics including: Types of drilling rigs, Open water versus platform-led wells and Vertical versus extended reach. The module will also cover various fundamental topics such as Basic operations, Casing design, Mud systems, Monitoring systems and Safety systems. We'll conclude by reviewing the communication between subsurface and well engineering teams and contractor HSE management.

Well Execution

In this module we'll explore geological operations and the roles and responsibilities for key offshore well execution positions. Realtime PWD PPFG prediction and monitoring. The module will also introduce cuttings / cavings observations (stability), updates to prognosis and geohazard risking, wellsite biostratigraphy / chemostratigraphy and remote monitoring and intervention. Finally we'll cover communication between Geological Operations, Well Engineering and Asset Teams and an introduction to contractor management.

Post Well Review and Summary

The final module of the series will cover checking outcomes against Well Objectives and the Lessons learned.