Geosteering

Overview

LEVEL
Knowledge

PURPOSE
This course provides unique opportunity to independently support the geosteering of horizontal wells in the conditions of real-time drilling, using an interactive simulator.

LEARNING OBJECTIVES
Upon completion of the course, participants will be able to:
- gain knowledge of the fundamentals of telemetry, measurements and logging while drilling and directional drilling technologies,
- become aware of the criteria for selecting the minimum required logging data set before a geosteering job,
- get acquainted with errors and uncertainties in the drilling of horizontal wells, related both to geology and to the limitations of telemetry and logging tools, and the methods of calculating the well trajectory,
- master the modern geosteering methods,
- become familiar with the basics of interpreting azimuthal logs,
- gain experience in modeling various geosteering scenarios before starting drilling for the risk management purposes,
- get real-time geosteering experience on-the-job.

WAYS AND MEANS
Geosteering requires practice, and this is inevitably associated with making mistakes and wrong decisions. The price of making a wrong decision on a real well can vary from a few hours of non-productive time to a million-dollar sidetrack or a million barrels of oil that can never be extracted. These factors make learning on a real horizontal well an extremely expensive training ground.

Participants will master the necessary knowledge to build a preliminary simulation and develop a strategy for drilling a horizontal well.

Using a unique interactive simulator, participants will independently follow the drilling of at least three horizontal wells, while learning how to independently make timely and technically correct trajectory corrections.

LEARNING ASSESSMENT
Practice on geosteering simulator, debriefing, evaluating of effective length of the well after geosteering.

PREREQUISITES
Basic geology, directional drilling and well logging knowledge are advised.

Agenda

BASICS OF TELEMETRY, MEASUREMENT WHILE DRILLING (MWD) & DIRECTIONAL DRILLING TECHNOLOGIES
Drilling technology with motor and RSS.
Logging and Measurements While Drilling (LWD/MWD).
Telemetry and surveys.
Errors and uncertainties while drilling.

**GEOSTEERING USING NON-AZIMUTHAL DATA (THEORY)**
Method of matching synthetic curves with actual LWD.
Benefits and limitations of synthetic curves method.

**PRACTICUM - PREPARATION OF PRE-JOB GEOSTEERING MODEL; GEOSTEERING OF WELL #1 IN REAL TIME**
Loading and analysis of initial data, choosing drilling strategies, risk analysis.
Geosteering of the training well #1 on the geosteering simulator in real time.
Making geosteering recommendations based on matching with trajectory adjustments.
Working with WITS and WITSML protocols.
Updating the 3D structural geological model based on geosteering results.
Presentation of the final geosteering model.

**GEOSTEERING USING AZIMUTHAL DATA (THEORY)**
Application of azimuthal data.
Application of borehole images.
“Zones of exclusion” and the error of the dips picked on the images.

**PRACTICE - GEOSTEERING OF WELL #2 USING AZIMUTHAL DATA**
Geosteering of well #2 on the geosteering simulator.
Interpretation of the borehole images in real time.
Uncertainty analysis using azimuthal data.
Presentation of the final geosteering model.

**GEOSTEERING WITH DISTANCE TO BOUNDARY TECHNOLOGIES (THEORY)**
Measurement principles of the distance to boundary technologies.
Ultra-deep reservoir mapping technologies.
Resistivity inversion in geosteering.

**PRACTICE - GEOSTEERING OF WELL #3**
Geosteering of well #3 in the geosteering simulator in a complex reservoir.

**GEOSTEERING "DEBRIEFING"**
The major mistakes in geosteering.
Geosteering tips and tricks.