Record-Breaking ERD Success in Bahrain

Magnus® RSS, Advanced Geomechanical Modeling Drill Longest Unconventional Lateral

Objectives

- Drill an unconventional extended-reach (ERD) lateral in the minimum stress direction, staying within the target hot shale zone throughout the lateral section.
- Maintain tool durability and precise wellbore placement using advanced logging tools to total depth (TD).
- Overcome wellbore stability issues while landing the well.
- Ensure efficient hole cleaning and torque reduction.

Our Approach

- **Advanced geomechanical modeling**: Weatherford experts performed detailed geomechanical analysis to navigate an unconformity zone in the curve section. This enabled optimal casing placement to maximize hole stability and reduce anticipated high drilling torque while drilling the lateral.
- **Optimized BHA configuration**: The bottomhole assembly (BHA) was customized to complete the ERD lateral in a single run. The 6 3/4-in. BHA included:
  - Magnus rotary steerable system (RSS)
  - SpectralWave® spectral azimuthal gamma ray sensor
  - HEL™ hostile-environment-logging measurement-while-drilling system
- **Customized drill bit selection**: A drill bit with enhanced steerability and durability was chosen specifically for the hot shale formation. This ensured consistent performance and directional control throughout the lateral section.
- **Torque, drag, and hole cleaning optimization**: Engineering efforts focused on accurately predicting and mitigating downhole friction, minimizing torque and drag issues by maintaining efficient hole cleaning.
- **SpectralWave LWD**: Spectral azimuthal gamma ray solution for clay typing and petrophysical analysis identifying potassium, uranium, and thorium while providing a high quality 16-bin azimuthal in real-time for accurate well placement.

The Magnus RSS uses proportional steering control to improve wellbore quality by eliminating unnecessary pad activation.

LOCATION
Bahrain

WELL TYPE
Unconventional, hot shale play

HOLE SIZE AND ANGLE
8-3/8 in., 88° inclination, 180° azimuth

CASING SIZE AND TYPE
9 5/8 in., casing at 10,260 ft (3,127 m) MD

DEPTH
8-3/8 in. from 10,280 to 22,572 ft (3,133 to 6,879 m)

PRODUCTS/SERVICES
- Magnus RSS
- SpectralWave sensor
- HEL hostile-environment-logging MWD system

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Our Approach (continued)

- **Updated RSS features**:
  - Control System: Stay on plan and on target
    - The new steering system control algorithm ensures optimal pad control in the most challenging dynamic conditions.
    - Added control logic is optimized for precise pad activation when it's needed most.
  - Power Generator: Stay downhole longer
    - Ruggedized power electronics system with new monolithic chassis design has been tested for reliable operation under extreme shock and vibration to ensure continuous power through long runs in harsh operating conditions.
    - Turbine system design optimized for enhanced reliability and tolerance to drilling fluid solids and metallic debris.

Value to Customer

- **Record-breaking performance**: The operator drilled a 12,292-ft (3,746-m) lateral in a single run—a new field record—achieving an impressive rate of penetration (ROP) of 118.1 ft/hr (35.9 m/hr).
- **Reliable logging tools**: The SpectralWave sensor delivered accurate and consistent data, helping maintain wellbore integrity and trajectory control to TD.
- **Zero nonproductive time**: Operational excellence and expert execution by the Weatherford team resulted in zero nonproductive time (NPT) throughout the job.

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