

# Magnus<sup>®</sup> Rotary Steerable System Delivers 6-In. Section in 1 Run, Saves 9 Days of Drilling Time

## Objectives

- Obtain accurate logging-while-drilling (LWD) data as required in real time and memory in an offshore, horizontal well.
- Drill with improved performance compared to offset wells in the field by increasing the on-bottom rate of penetration (ROP), reducing stick-slip and vibration levels, and achieving zero nonproductive time (NPT).
- Maintain a trajectory with a maximum dogleg severity of 5.5°/30 m (100 ft) to minimize borehole tortuosity for post-drilling operations.

## Our Approach

- The Weatherford team recommended a drilling solution, including LWD technologies and the 4.75-in. Magnus rotary steerable system (RSS).
- During the planning stage, the team engaged with the customer to develop a Front-End Engineering Design report based on an offset well analysis and Weatherford experience in this field. This approach covered these critical points:
  - Best practices to maximize RSS performance while minimizing certain drilling hazards identified during the risk assessment stage.
  - Tailored bottomhole assembly (BHA) design focused on torque and drag, hydraulics, and vibration optimization.
  - Stuck-pipe mechanism assessment and mitigation controls to reduce the BHA stabilization points while managing job safety hazards.
  - Hole-cleaning procedure made for this well and agreed on with the customer.
  - Customized driller's roadmap with critical operations and field-crew guidance covering all the trajectory sections and formation specifics.
  - Implementation of operational guidelines with risk controls to perform the whipstock exit and drill directly after with the RSS BHA.
- Upon deployment, the Magnus RSS worked with LWD technologies to inform drilling. Its near-bit inclination coupled with LWD resistivity and sonic imaging to help minimize reservoir uncertainties, maintain pay-zone contact, and ultimately land the well. The HAGR sensor helped to identify formation tops in real time. LWD pressure measurements provided live information on downhole hydraulics and fluid performance.
- The Magnus RSS kicked off from the whipstock. It drilled 9,249 ft over 394 operating hours with a 26% increase in average ROP and a 50% reduction in stick-slip and vibration levels compared to offset wells.
- The RSS worked against a formation dip angle of 5 to 10° to intercept all planned geological targets within a target window having a 10-m radius and running 6.6 ft (2 m) above and 13.1 ft (4 m) below the reservoir top.

## Value to Customer

- The Weatherford solution, including the Magnus RSS and LWD technologies, acquired accurate data to mitigate drilling problems and optimize the process.
- The Magnus RSS helped to deliver the well 9 days faster than previous offset wells for a savings of more than US \$2.5 million by increasing the average ROP, reducing stick-slip and vibration during drilling, and avoiding NPT caused by Weatherford equipment.
- The solution provided excellent whipstock-exit and trajectory control with the longest step-out compared to previously drilled offset wells. This execution eliminated the need for an extra run using a positive displacement motor to initiate a sidetrack.



The Weatherford team delivered outstanding performance to save the customer 9 days of drilling time worth millions in an offshore, horizontal well.

### LOCATION

Black Sea, Romania

### WELL TYPE

Offshore, horizontal, oil

### FORMATION

Sandy marls, agrillaceous limestones, calcareous claystone, sandstone

### HOLE SIZE AND ANGLE

6 in., 90°

### CASING SIZE AND TYPE

9 5/8- and 7-in. N80

### LINER SIZE AND TYPE

4 1/2-in. P110

### TEMPERATURE

230°F (110°C)

### PRESSURE

3,989 psi (275 bar)

### DEPTH

5,358 to 14,606 ft (1,633 to 4,452 m)

### PRODUCTS/SERVICES

- 4.75-in. Magnus RSS
- HEL™ hostile-environment logging measurement-while-drilling system
- BAP™ bore and annular pressure sensor
- HAGR™ high-temperature azimuthal gamma ray tool
- MFR™ multifrequency resistivity tool
- ShockWave sonic tool
- Automated Downlink Commander® system

