

Magnus[®] Rotary Steerable System

Drills 8 1/2-In. Section in 1 Run, Increases ROP by 50%, and Saves 2.8 Days of Rig Time

Objectives

- Improve the on-bottom rate of penetration (ROP) compared to offset wells by between 10 and 20 ft/hr (3 and 6 m/hr.)
- Maintain the well trajectory by keeping the dogleg severity (DLS) less than 3°/100 ft (30 m) to minimize borehole tortuosity and maintain a smooth wellbore.
- Eliminate nonproductive time (NPT) related to tool failures and service quality issues.

Our Approach

- The Weatherford drilling engineering team used a thorough designed-to-succeed approach to discover hydrocarbons when deploying the Magnus rotary steerable system (RSS). As part of this process, the team analyzed the customer's data from two offset wells and conducted a risk assessment to identify drilling hazards as well as best practices. The analysis helped them to do the following:
 - Recognize strong deviation tendencies and variable formation dips, with a maximum between 3 and 5°.
 - Develop connection and tripping methods to mitigate the unstable formations, swelling, caving, and caverns.
 - Optimize the bottomhole assembly (BHA), hydraulics, torque and drag, and shocks and vibrations with Weatherford engineering protocols.
 - Manage the hole cleaning regime using a broomstick chart.
- The team deployed the Magnus RSS along with the HEL[™] measurement-while-drilling (MWD) system and a polycrystalline diamond compact (PDC) drill bit. Successfully kicking off from vertical at a 79-ft (24-m) measured depth (MD), the RSS adjusted the steering BIAS to use only the force required to achieve the planned dogleg and drill the curve section up to a 35° inclination.
- The RSS reached the desired section depth at 5,607 ft (1,709 m) MD without NPT in only 13.2 days instead of the expected 16 days.

Value to Customer

- The Magnus RSS finished drilling the 8 1/2-in. section 2.8 days faster than planned as a result of three factors:
 - The RSS improved ROP by 50% in comparison to offset wells.
 - With 1/4-in. undergauge stabilization, the RSS enabled making smooth, slick wiper trips according to the customer's standard operating procedure every 590 ft (180 m), and only one problematic area needed remedial reaming. This enabled the customer to extend drilling intervals before trips.
 - The RSS build rate resulted in the planned DLS of 3°/100 ft (30 m) for the differential pressure and restrictor size. The system responded accurately and predictably to the set deflection. It minimized a number of downlinks, which consequently reduced operational time. This data provides a reference for use in future wells.



Using the Magnus RSS for the first time in Poland, the Weatherford drilling team reached the section total depth nearly 3 days faster than expected.

LOCATION

Poland

WELL TYPE

Offshore, exploratory, deviated, J-type

FORMATION

Carpathian Flysch

HOLE SIZE AND MAXIMUM INCLINATION

8-1/2 in., 35°

CASING SIZES AND TYPES

- 9-5/8 in. at 820 ft (250 m) MD
- 7 in. at ft 5,607 ft (1,709 m) MD

TEMPERATURE

118°F (48°C)

SECTION DEPTH

From 827 to 5,614 ft (252 to 1,711 m)

PRODUCTS/SERVICES

- Magnus RSS
- HEL MWD system
- HAGR[™] high-temperature azimuthal gamma ray sensor
- Automated downlink commander (DLC)

