



Autonomous downhole control system eliminates downlinks while drilling curve, revs up ROP

A Permian Basin operator used a PowerDrive Orbit G2™ RSS and xBolt G2™ accelerated drilling service with autonomous downhole technology to build a 6¾-in curve and lateral sections. The dogleg severity (DLS) achieved was between 8° and 11°.

The objective

An operator in the Permian Basin needed to drill the 6¾-in curve and lateral sections for a well planned in a pure-south zone of exclusion (ZOE), a razor-thin azimuthal window of 180°. Additionally, the DLS demand for the curve was a compact 8° to 11°.

Deploying rotary steerable systems for drilling curves previously required manual mode, which involves a sequence applied repeatedly to control the curve trajectory. This sequence comprises multiple interventions and downlinks from the directional driller at the surface for steering force, toolface (TF) orientation, and measurements. Twenty-minute cycle times lead to lost time, tortuous curves, and reduced ROP.

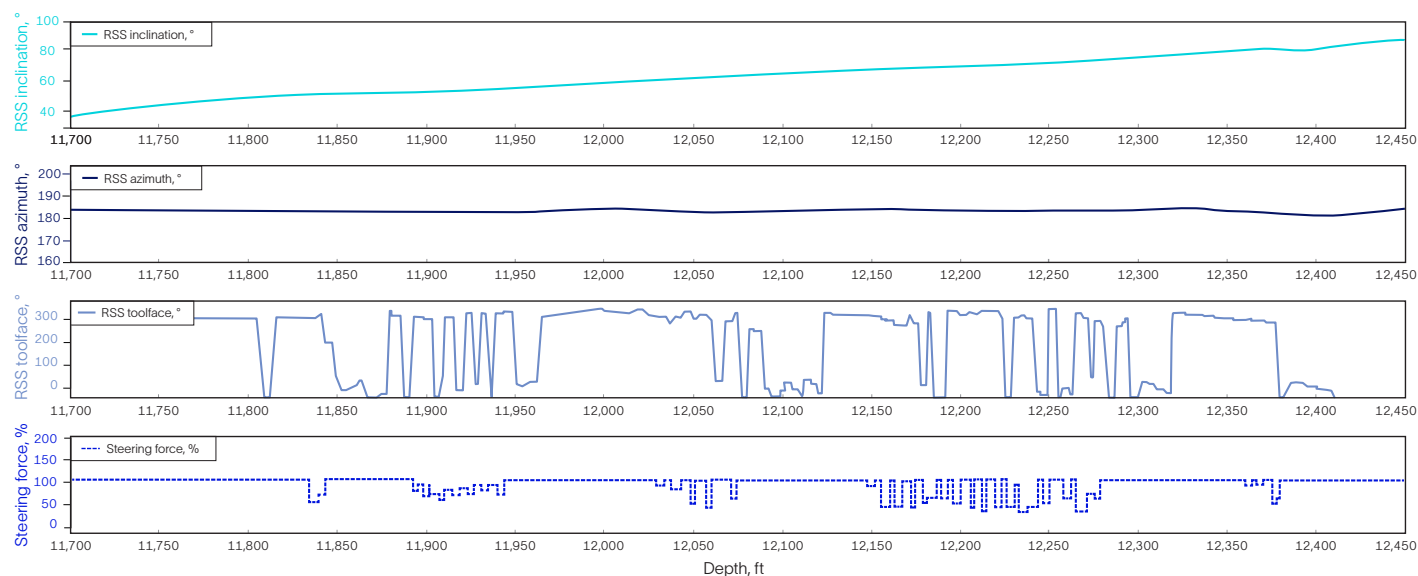
The solution

SLB recommended deploying the PowerDrive Orbit G2 RSS and xBolt G2 accelerated drilling service with the autonomous downhole control system—in this specific instance, the auto-curve and auto-tangent components.

These capabilities bundle all the steps of manual mode into a single downhole autonomous control process that begins with the directional driller downlinking the DLS and TF as required on the well plan. The RSS receives the command downhole and alone automatically adjusts its steering force and TF to match the demanded DLS and TF. The BHA incorporates sensors close to the bit (3-axis inclinometers and triple 3-axis magnetometers) so it can track its continuous inclination and azimuth. ROP data enables the RSS to compute its resulting DLS and TF, adjusting its steering parameters every second to sustain the designated trajectory. All of this is accomplished without the need for surface control, which means fewer downlinks and minimal lost time to cycle.

The results

The auto-curve engaged over the curve and auto-tangent engaged over the lateral. Results observed included reduced downlinks by 100% in the curve and increased ROP by 39%. Auto-curve engaged at 41° inclination, proceeding all the way to the horizontal landing at 180° azimuth—the ZOE. A smoother trajectory was delivered on the 579-ft interval of curve with no downlinks.



The autonomous downhole control system eliminated downlinks to the RSS in the curve while increasing ROP by 39%.