UNCONVENTIONALS

CASE STUDY

Operator Drills Country's Longest Lateral and Deepest Well in Unconventional Field

iCRUISE® INTELLIGENT ROTARY STEERABLE SYSTEM HELPS REACH TOTAL DEPTH AND PLACE WELL 100 PERCENT IN-ZONE IN VACA MUERTA RESERVOIR

NEUQUÉN BASIN, ARGENTINA

CHALLENGES

- Drilling in harsh conditions with high temperatures, high mud weights, and high amounts of solids in the mud
- Overcome high walking tendencies, observed in a previous well, that generated dogleg severity
- Meet customer requirements to drill extended horizontal section in one run, and to steer the well to TD

SOLUTION

Engineered drilling solution, consisting of:

- iCruise® intelligent RSS to drill long lateral through severely doglegged wellbore
- GeoTech® intelligent drill bit, designed by DatCI℠ using Direction by Design® software, to allow for good ROP and precise directional control
- LWD sensors (including a continuous inclination and azimuth package close to the bit, along with gamma ray and PWD sensors) to provide real-time measurements for accurate geosteering and wellbore placement

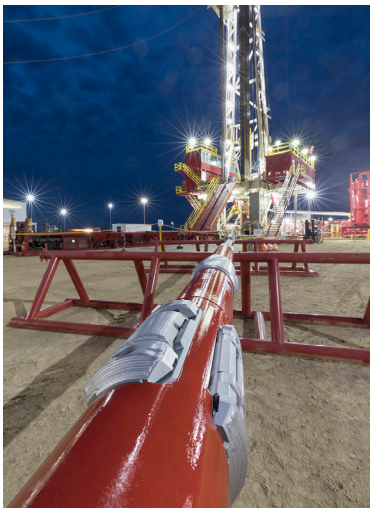
RESULTS

- Drilled longest lateral section in an unconventional play in Argentina (10,978 feet/3346 meters), in just one run
- Successfully reached TD of 22,435 feet (6840 meters), the deepest for Argentina in unconventional field
- Increased formation understanding and optimized steering control through real-time, close-to-the-bit sensors
- Reduced tortuosity, providing better hole quality for trips and casing running
- Maintained a high ROP, reducing drilling time

OVERVIEW

Exploration and production of shale gas in Argentina's Neuquén Basin present complex horizontal drilling challenges to operators, as they strive to supply the country with this valuable resource. A major operator is actively developing wells in the basin's Vaca Muerta formation with different results – the main goal being to drill wells with the least number of runs, and to extend the longest possible horizontal sections in a consistent manner.

Halliburton Sperry Drilling responded to the customer's challenge with an engineered drilling solution – the new technology of the iCruise® intelligent rotary steerable system (RSS), capable of drilling longer laterals fast and placing wells accurately. Featuring advanced electronics and automated commands, the iCruise intelligent RSS helped the operator reduce well time and costs by reaching total depth (TD) according to plan – maximizing asset value, in addition to setting new records by drilling the longest lateral section and deepest well ever achieved in Argentina in an unconventional field.



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The iCruise® intelligent RSS is delivering record-breaking results at the Vaca Muerta wellsite.

HARSH DIRECTIONAL DRILLING ENVIRONMENT

The new technology was to be used for directional drilling in a particularly harsh environment, with a temperature of 316.4°F (158°C), mud weight of 16.8 ppg, an equivalent circulating density (ECD) of 17.8 ppg, and a high percentage of solids in the mud. Based on a previously drilled well in the proximity of this one, there was also expected to be an aggressive walking tendency, resulting in severe dogleg turns and, thus, difficult navigation.

COMPREHENSIVE ENGINEERED DRILLING SOLUTION

Sperry Drilling engineered a drilling solution comprising a well trajectory bottomhole assembly (BHA) with the iCruise intelligent RSS matched to the GeoTech® (GTi) drill bit – designed by the Design at the Customer Interface (DatCI℠) service, using Direction by Design® software – for drilling the extended lateral section. Advanced sensors – including a continuous inclination and azimuth package close to the bit, along with gamma ray and pressure-while-drilling (PWD) sensors – were used to deliver accurate logging-while-drilling (LWD) measurements in real time, and to optimize geosteering and rate of penetration (ROP).

The iCruise® intelligent RSS successfully drilled the longest lateral and deepest well in an unconventional play in Argentina.

This comprehensive solution made it possible to drill the complete well per the customer's requirements and to place the well trajectory 100 percent within the target formation, despite the harsh environment.

iCRUISE® INTELLIGENT RSS DELIVERS RECORD-BREAKING RESULTS AND HELPS MAXIMIZE ASSET VALUE

The iCruise intelligent RSS drilled the lateral section of 10,977 feet (3346 meters) in one run and reached the target depth of 22,435 feet (6840 meters) – the longest lateral and deepest well in an unconventional play in Argentina. Even with the harsh environment of this formation, the iCruise RSS was able to control the walking tendency and maintain a smooth, continuous path within the well; furthermore, tortuosity of the lateral section was minimized by sensing sudden directional changes in real time and making immediate trajectory corrections. Advanced electronics, sophisticated algorithms, and high-speed processors built within the tool enabled complex downhole calculations and precise, real-time measurement-while-drilling (MWD). This helped the operator reduce well time through fast drilling, and to place the well accurately by steering 100 percent in the zone while delivering consistent and predictable results.

The success of this project can also be linked to a multidisciplinary, collaborative approach, starting in the early planning phase with active participation in the design of service, and close collaboration between Halliburton and customer teams – all the way through to execution. As a result of this success, the operator decided to deploy the same technology on subsequent wells in its Vaca Muerta reservoir development project.

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