

# Saudi Aramco Drills Record 4,747-ft Section, Achieves Directional Objectives Using Casing-Drilling Service

TDDirect CD service, PowerDrive Xceed RSS, and extensive preplanning overcome challenges in hard, abrasive formation, Saudi Arabia

## CHALLENGE

Drill 12¼-in section from 4,965-ft [1,513-m] MD to the casing point at 9,712-ft [2,960-m] MD with inclination of 37–69° in hard, abrasive formations.

## SOLUTION

Use TDDirect CD\* casing-while-drilling service and PowerDrive Xceed\* ruggedized RSS to achieve drilling objectives.

## RESULTS

- Drilled 4,747 ft [1,447 m], setting a Schlumberger record for Middle East footage.
- Avoided HSE events due to extensive preplanning, simulations, and ongoing risk management plans.
- Achieved the directional drilling plan with no hole problems.



## Increase footage by casing while drilling

Saudi Aramco was operating in a large oil field in Saudi Arabia. The commonly drilled 12¼-in borehole crosses several interbedded formations comprising limestone, shale, and abrasive sand and siltstone that have caused hole problems in offset wells. The operator sought to drill a deep, deviated 12¼-in section from 4,965-ft MD to the casing point at 9,712-ft MD and inclinations of 37–69°. Because of the long drilling footage and directional drilling aspects of the operation, an efficient solution was needed.

## Use casing-while-drilling technology and ruggedized RSS

Schlumberger and Saudi Aramco captured baseline data by conducting feasibility studies that included modeling torque, drag, equivalent circulating density, standpipe pressure, and hydraulic lift. Shock and vibration simulations on multiple BHA configurations were also performed to determine the relative impact of each option and to identify the best solution for the challenge. Based on the challenges experienced during previous runs and the results of the preplanning simulations, Saudi Aramco chose to run an integrated solution that included the TDDirect CD casing-while-drilling service and the PowerDrive Xceed RSS.

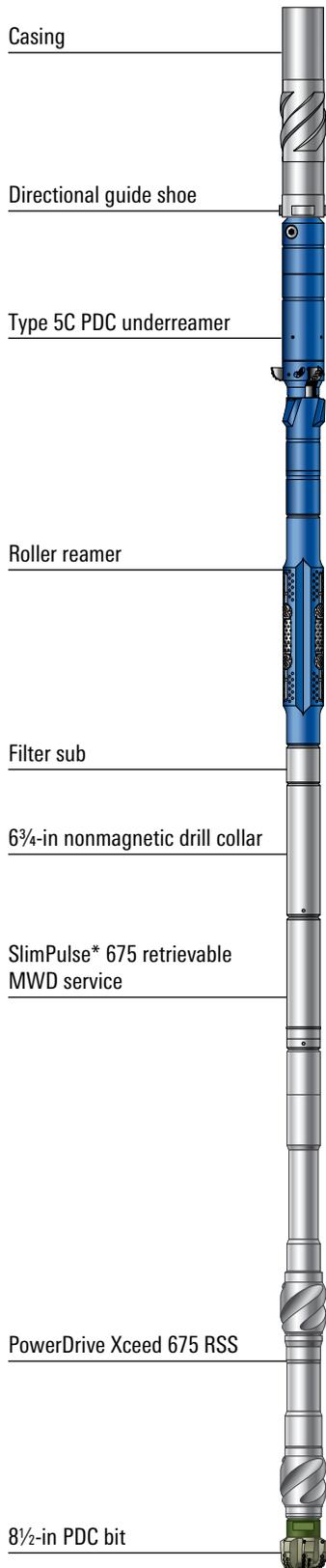
The TDDirect CD service can be used with any retrievable BHA when the interval must be logged while drilling or drilled directionally. The TDDirect CD service offers several key capabilities, including consistent casing rotation to break static friction, allowing even weight on bit; rotation and high-annular velocity to improve borehole cleaning; and the plastering effect (or smear effect) to maximize borehole strength and stability. This service also includes a drill lock assembly, which connects the BHA to the bottom of the casing shoe joint and enables torque and weight to be applied by the casing during drilling. The rig's topdrive rotates the casing, and a downhole motor provides additional rotational speed and torque to the BHA and bit.

The PowerDrive Xceed RSS is a fully rotating point-the-bit system, which features internal steering mechanisms that exceed performance limits of externally steered tools. This provides significant wear and reliability advantages for productive drilling in abrasive environments. PowerDrive Xceed systems do not depend on contact with the borehole wall to build angle, allowing the RSS to drill doglegs and sidetracks at high build rates and reducing the tendency of the hole to spiral because of variations in trajectory. Another advantage of directional casing-while-drilling technology is the ability to retrieve the BHA at any point without the need to pull the casing out of the hole.

## Achieved Middle East record for footage drilled

The customized casing-while-drilling system set the 9½-in section and drilled the 4,747-ft section, achieving a new Schlumberger record for footage drilled in the Middle East. The drilling BHA was retrieved three times without any latching or unlatching problems and without any stuck casing events. The maximum overpull experienced was 28,000 lbm [12,701 kg]. Well control drills were refined to approximately 3 min for effective well control response. The directional drilling plan was achieved with the maximum dogleg recorded of 2.77°/100 ft [2.77°/30 m]. Additionally, no tight hole or hole cleaning issues were recorded.

## CASE STUDY: Saudi Aramco reaches 9,712-ft TD, sets record using casing-while-drilling technology



*Casing-while-drilling BHA.*

Central to the project risk management was creating the internal project readiness assessment, risk register, and drilling timeline to ensure that appropriate risk prevention and mitigation plans were in place and continuously reviewed. Other measures to reduce possible causes of nonproductive time and unplanned events were also conducted, including a two-day Drill Well on Paper exercise and a prespud meeting held on location and attended by Saudi Aramco, Schlumberger, and the drilling contractor before drilling began. As a result, no HSE incidents were reported.

[slb.com/Drilling](http://slb.com/Drilling)