

Rotary Steerable Systems Optimize Wells In Variety Of Environments

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In any well delivery operation there are three drivers—drilling efficiency, accurate well placement and high-quality wellbores.

The main objective in directional drilling is to accurately position the well within the target to optimize returns. Nevertheless, wellbore quality is just as important a factor that must be considered—a precisely placed well does not necessarily mean the wellbore itself is ideal for later completions. While placing high-integrity wells in the best locations, drillers must also strive for higher performance during operations, which entails getting to total depth faster with less flat time.

High-quality wells delivered ahead of plan can help operators see a positive impact not only on cost per foot, but also cost per barrel produced. Early production, efficient post-drilling operations and optimum field development plans are all affected by superior well construction.

Extended-reach drilling (ERD) services provide a solution to restricted reservoir production, enabling operators to more efficiently develop their assets by maximizing the exposure of the targeted intervals and eliminating the need for additional platforms.

For example, in the Middle East an operator was planning to drill an ERD well in a challenging high-temperature (HT) geological environment. As an additional challenge, the subsurface target was located beneath an urban area. In-depth prejob planning and risk assessments were



The PowerDrive Orbit RSS is a push-the-bit rotary steerable system with improved drilling performance and precise wellbore positioning. (Source: Schlumberger)

conducted to design an integrated drilling system that included the PowerDrive Vortex rotary steerable system (RSS) to deliver high ROP, the PowerDrive Orbit RSS to drill an abrasive HT interval, logging while drilling (LWD) tools, drilling fluids, custom drill bits and hole-cleaning and surface logging services. The well was delivered within the planned time, with no HSE incidents, and fully within the planned subsurface targets. The well also set the record as the first and the deepest pre-Khuff HT well drilled by the operator.

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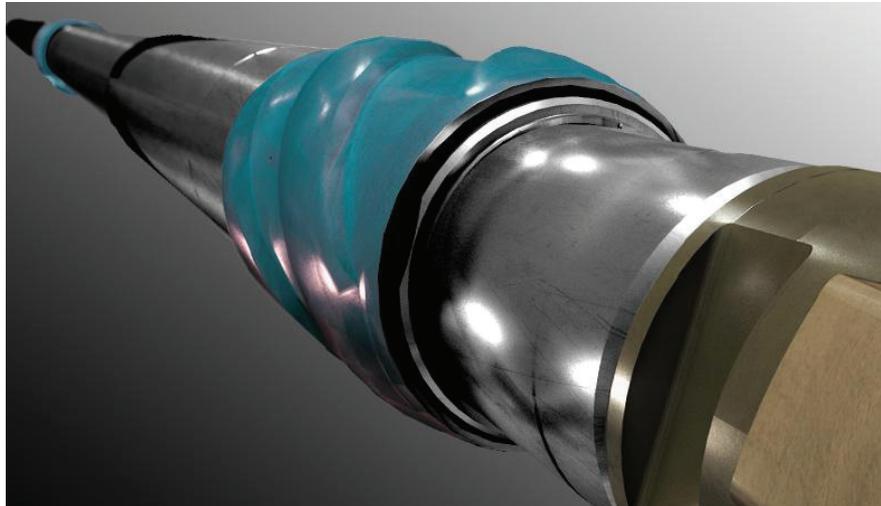
Rotary steerable systems have evolved throughout the years to continuously improve upon key deliverables: accurate wellbore positioning, optimum borehole quality and maximum drilling efficiency. A wide offering of systems makes achieving all three possible—in multiple applications.

All of the Schlumberger PowerDrive RSSs share distinctive characteristics to achieve drilling objectives. Rotation and torque are fully transmitted throughout the body of the tool to eliminate dragging components and enable maximum drilling performance to the target depth. These features also allow optimum efficiency when pulling out of hole and deliver maximum well integrity for post-drilling operations.

The systems also measure inclination and azimuth close to the bit. This close proximity and measurement accuracy is critical in maintaining an accurate 3-D well trajectory while pushing for drilling performance to enable precise kickoff delivery. Another inherent feature is the downhole closed automation loops, which provide directional consistency during well construction. In a recent drilling operation in the North Sea, the PowerDrive Orbit RSS reached a target total depth of 950-m (3,116-ft) section in one run and helped avoid close-proximity wells. An average of 25 m/h while drilling the first 475 m (1,558 ft) of the section was also achieved despite stick/slip severity of 90% to 100%.

More Power In More Places

While all RSSs seek to eliminate sliding and provide basic inclination measures, there are more factors to consider when choosing a system. With the variety of fully rotating designs, the technology should be selected to maximize performance for each application. This is why versatility is a key advantage. Different steering mechanisms match customer needs in the planning phase. They also meet any unexpected challenge during the execution of the drill plan.



The PowerDrive Xcel RSS was designed for use in high-profile directional drilling operations. It provides inertial directional control in deviated sections— a feature that can be toggled on and off by a downlink. (Source: Schlumberger)

The PowerDrive family comprises RSS for a host of applications, including operations that require extensive runs, high ROP drilling, vertical drilling and high dogleg severity. The latest member of the family, the PowerDrive Xcel RSS, was specifically designed to handle the challenges inherent during extended reach drilling, sidetracking and geostopping. The gyrosteering capability of the system enabled an operator offshore Brazil to sidetrack just 1 m (3 ft) below the casing shoe, achieve the full deviation from the pilot well after 16 m (52 ft), and build inclination from 82 degrees to 85 degrees with a dogleg severity of $5\frac{1}{3}$ degrees/30 m (even greater than the planned $3\frac{1}{2}$ degrees/30 m) despite magnetic interference caused by the $9\frac{5}{8}$ -in. casing.

Power For Ultimate Performance

With a quarter of a billion feet drilled around the globe, which is roughly twice the circumference of the Earth, the PowerDrive RSS is the most used RSS family in the world. Using these systems, operators have continually broken footage, measured depth and ROP records in North America, Latin America, the North Sea, Middle East, Asia Pacific and the Far East. The RSS family also holds the record for the top 12 longest wells in the world.

The PowerDrive family encompasses a range of directional drilling solutions, derived from expertise and proven success, applicable to any environment. It widens the operating envelope, placing power in the operator's hands, increasing ROP and lowering costs, however challenging the conditions. **ESP**