CHALLENGE
Minimize effect of stick/slip on ROP and BHA wear while drilling 9½-in hole sections of deepwater wells in very abrasive formations offshore Angola.

SOLUTION
Use BHA incorporating
- PowerDrive vortex RT* powered rotary steerable system (RSS) with wireless communicator
- Smith polycrystalline diamond compact (PDC) bit
- Scope* LWD and MWD services
- geoVISION675* 6⅓-in MWD/LWD imaging system.

RESULTS
- Minimized stick/slip.
- Increased ROP up to 257%.
- Avoided abnormal BHA component wear.

The PowerDrive vortex RT RSS delivered power and torque close to the bit to improve drilling performance.

Minimize stick/slip
The 9½-in hole sections of deepwater wells in a field offshore Angola were being drilled through very abrasive formations. This resulted in severe stick/slip that damaged BHA components, quickly wore out stabilizers, and adversely affected drilling performance. To avoid the damage, abnormal wear, and low ROP, the operator wanted to minimize stick/slip.

Optimize BHA design
That objective was achieved through efficient drilling with a BHA that incorporated a Smith PDC bit, a PowerDrive vortex RT powered RSS with wireless communicator, a geoVISION675 6⅓-in MWD/LWD imaging system, and a comprehensive suite of Scope LWD and MWD services. Those services were the EcoScope 675* multifunction logging-while-drilling service†, the StethoScope 675* formation pressure-while-drilling service, and the TeleScope* high-speed telemetry-while-drilling service.

To find the most efficient set of drilling parameters, Schlumberger used modeling and simulations that included i-DRILL* engineered drilling system design and BHA-TV, a model that analyzes how a drilling system changes over time. Modeling and simulation also were used to optimize the BHA design and to select the proper type of bit and the bit hydraulic horsepower per square inch that would be required.

Average on-bottom ROP for drilling the 9½-in hole section increased 257% from Well 1 to Well 3.
**CASE STUDY:** Three 9½-in hole sections drilled through abrasive formations offshore Angola at increased ROP

The PowerDrive vortex RT power unit—a PowerPak* greater torque motor for drilling with aggressive bits—maximized ROP. To achieve the planned dogleg severity (DLS) in the abrasive formations, the powered RSS control unit was a point-the-bit PowerDrive Xceed* RSS for harsh, rugged environments. A C-Link* electromagnetic induction propagation (IMAG) communicator provided wireless transmission of real-time measurements of rotation speed and torque from the control unit across the power unit to the TeleScope telemetry system, which sent the data to the surface along with the Scope and geoVISION675 data. The real-time availability of the torque and rotation speed measurements enabled the driller to adjust drilling parameters to maximize ROP and minimize stick/slip.

**Increase ROP**

Use of the PowerDrive vortex RT BHA to drill the 9½-in well sections, and the application of lessons learned, enabled the drilling team to minimize stick/slip, avoid abnormal BHA wear, and significantly increase ROP. Average ROP improved from 6.67 m/h in the first 9½-in hole section drilled to 11.01 m/h in the second, then to 17.16 m/h in the third—an increase of 257% from the first section to the third.

Contact your local Schlumberger representative to learn more.

*Mark of Schlumberger. Other company, product, and service names are the properties of their respective owners.

†Japan Oil, Gas and Metals National Corporation (JOGMEC), formerly Japan National Oil Corporation (JNOC), and Schlumberger collaborated on a research project to develop LWD technology that reduces the need for traditional chemical sources. Designed around the pulsed neutron generator (PNG), EcoScope service uses technology that resulted from this collaboration. The PNG and the comprehensive suite of measurements in a single collar are key components of the EcoScope service that deliver game-changing LWD technology.

Copyright © 2011 Schlumberger. All rights reserved. 11-DR-0292