

Premier Oil Saves 15.8 Drilling Days, USD 10 Million in Multiwell Campaign Offshore Indonesia

19% time savings achieved and two ROP records across Schlumberger operations set using the PowerDrive Xceed RSS in a 16-in hole

CHALLENGE

Mitigate collision risk, achieve sufficient dogleg severity (DLS), improve hole cleaning, and reduce bit balling in an unconsolidated formation.

SOLUTION

Design and implement a drilling plan combining Schlumberger technologies and services for enhanced steerability, accurate surveying, reliable jarring, and fluid system management.

RESULT

Saved 15.8 rig days and more than USD 10 million through the following measures:

- Set two Schlumberger ROP records for a 16-in hole drilled with the PowerDrive Xceed* ruggedized rotary steerable system (RSS) in a 9-in collar configuration.
- Achieved 19% time savings versus AFE.
- Reduced mud cost by USD 1.45 million versus AFE.
- Increased DLS from 3.5°/100 ft to more than 5°/100 ft in the top section.

“We look forward to continuing our optimization efforts for the remainder of the campaign and have no hesitation in recommending Schlumberger to other operators requiring a high level of dedicated support.”

Bob Pelling
Drilling superintendent
Premier Oil



Addressing pore pressure uncertainty in an unconsolidated formation

During a drilling campaign in the remote Natuna Sea Block A offshore Indonesia, Premier Oil lost seven BHAs due to wellbore instability within the soft, unconsolidated formation. The operator encountered various issues in the upper, middle, and lower Arang sections, including stuck pipe occurrences, packoffs, lost circulation, and low ROP. Stuck pipe represented one of the greatest risks due to the reactive shales laminated between sand bodies within the formation. The operator also encountered challenges with hole cleaning and obtaining the required dogleg severity for kickoff at the top section in shallow wells while drilling long tangent sections at a critical angle. A lack of offset wells in the field meant that Premier Oil was unable to capture lessons learned from previous operations to apply to wells in the Naga, Pelikan, and Gajah Baru discoveries.

Minimizing drilling risk with integrated technologies and services

Schlumberger recommended the use of the PowerDrive Xceed RSS and QuikSurvey* high-speed surveying to minimize drilling risks and optimize ROP. The RSS was selected to enable superior trajectory control and hole cleaning through full rotation during directional drilling. QuikSurvey surveying was introduced for the first time in Premier Oil's Indonesia operations—and in all subsequent wells—to save survey-taking time and reduce stuck pipe risk when the pipe is stationary by maintaining constant flow.

In addition to the 30½-in Schlumberger drilling-type underreamer used to enlarge the wellbore at the top section, the Hydra-Jar AP* double-acting hydraulic drilling jar and Accelerator AP* impact tool were selected to apply force to stuck drillpipe while protecting the drillstring from shock.

To obtain real-time rock mechanical and petrophysical properties for fracturing design and optimal production, the SonicScope* multipole sonic-while-drilling service and adnVISION* azimuthal density neutron service were chosen. Using these services yields more-complex BHAs, so Schlumberger and Premier Oil devised a detailed engineering plan to avoid possible stick and slip as well as shock and vibration in the execution phase. Additionally, the GyroPulse* gyro-while-drilling service was selected to reduce collision risk and improve target sizing.

To overcome known wellbore stability and stuck pipe challenges, the ULTRADRIL[†] high-performance water-base drilling fluid system and MEGADRIL[†] oil-base drilling fluid system were suggested and custom-designed to suit the requirements of the top and reservoir sections, respectively. To efficiently make the transition from circulating synthetic-base mud to a clean wellbore ready for the completion phase, wellbore cleanup tools and train pills from M-I SWACO, a Schlumberger company, were used.

The use of VIRTUAL HYDRAULICS[†] drilling fluid simulation software in the planning stages with real-time mud monitoring and engineering during operations was suggested to determine the optimal mud parameters for hole cleaning and equivalent circulating density management. Hydraulics optimization also helped mitigate bit balling throughout operations.

The operator also decided to run the WELL COMMANDER[†] circulating tool as a bypass circulating sub in the 12¼-in hole section in eight wells to pump high-concentration medium or coarse lost circulation material in the case of mud losses or during packoff. The tool's ID also allows for the retrieval of radioactive sources from the adnVISION service for reduced well control risk.

Achieving ROP records and improved DLS in second campaign

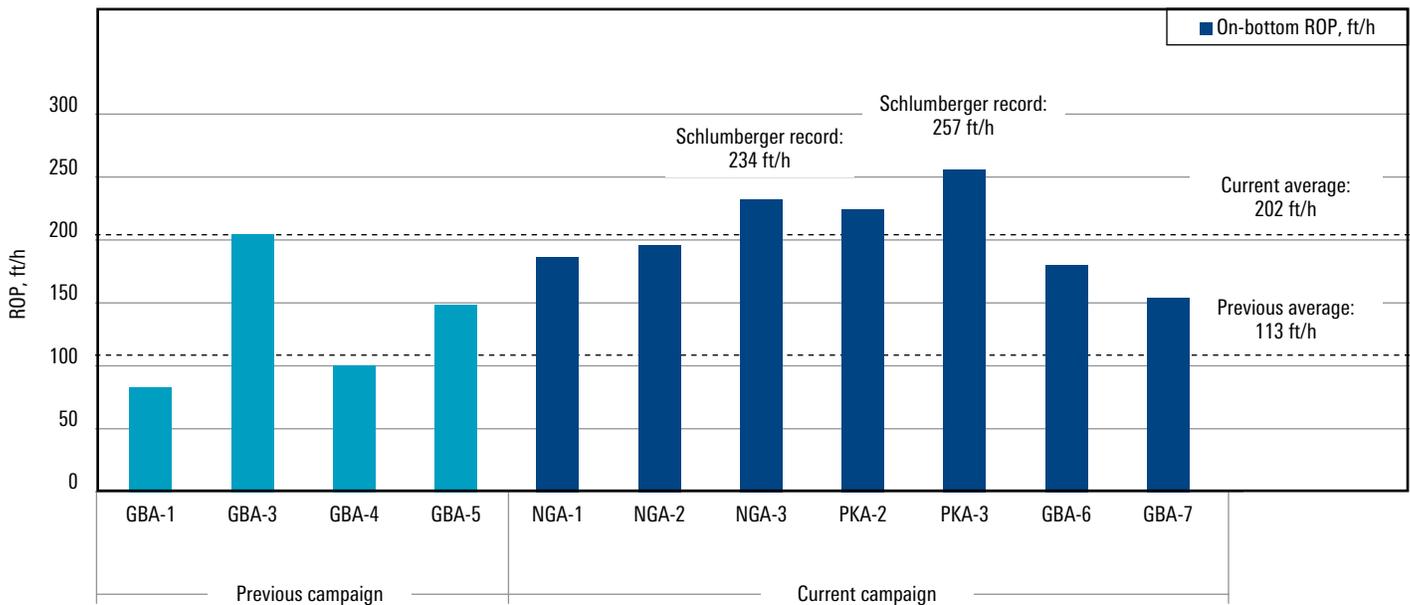
Throughout the months-long drilling campaign, two Schlumberger records were set for the fastest 16-in hole drilled with the PowerDrive Xceed RSS in a 9-in collar configuration. In September 2014, Premier Oil achieved an ROP of 234 ft/h in the NGA-3 well and, in November 2014, the operator achieved an ROP of 257 ft/h in the PKA-3 well.

The use of combined Schlumberger tools and services saved Premier Oil 15.8 rig days and more than USD 10 million across the campaign:

- Increased average on-bottom ROP 78% from the 2010–2011 campaign (113 ft/h to 202 ft/h)
- The first-ever use of gyro-while-drilling technology in a Premier Oil operation reduced rig time spent dropping gyro and decreased positional uncertainty, avoiding collision risks due to batch drilling from splitter wellheads and eliminating the need for a gyro run at TD.
- High-speed surveying reduced survey time 44% in critical stationary-pipe periods through Premier Oil's first-ever use of QuickSurvey surveying.

- Collaboration and coordination between Premier Oil and Schlumberger improved logistical efficiency by reducing operational exposures from field remoteness and logistical limitations.
- Replacing water-base mud with synthetic-base mud helped overcome stuck pipe occurrences, packoffs, lost circulation, and low ROP. The reduced mud cost saved more than USD 1.45 million from the predicted mud cost in the AFE.

Using data gathered during this operation, Schlumberger was able to provide Premier Oil real-time petrophysical evaluation for the first time. Based on the operation's positive results, the operator awarded Schlumberger a contract to perform a geomechanical study in its next well, Anoa West-1. Additionally, two simulations using the IDEAS platform are in progress to evaluate the potential use of products from Smith Bits, a Schlumberger company, in Premier Oil's next campaign.



Following a campaign in which seven BHAs were lost in hole, Premier Oil went on to achieve two Schlumberger ROP records using the PowerDrive Xceed RSS in a 9-in collar configuration.