Integrated Solution Saves Shell 25 Days and USD 1.3 Million in Changbei Well

Schlumberger and Smith Bits expertise and technologies improve drilling efficiency in hard, abrasive formation and place lateral in reservoir 1.5 m thick.

**CHALLENGE**
Improve drilling efficiency in hard, abrasive formation and place horizontal well in tight gas reservoir just 1.5 m thick.

**SOLUTION**
Integrate expertise and technologies of Schlumberger and Smith Bits, a Schlumberger company, including PowerDrive X6* rotary steerable system (RSS), geoVISION* imaging-while-drilling service, IDEAS* integrated drillbit design platform, and a Gemini* GF65 dynamic twin-seal drill bit.

**RESULTS**
- Saved more than 27 days and USD 1.9 million off AFE and precisely placed within 1.5-m target reservoir.
- Improved drilling efficiency in a single run. Doubled performance KPIs compared with those of mud motors, drilling total length of 548 m versus 210 m and increasing bit drilling hours to 105 versus 49. Saved 2.1 drilling days.

“*The applications have helped to significantly improve the drilling efficiency by doubling the total drilling footage and drilling hours in a single run.*”

Suresh Kottapurath
Well Operations Team Lead
Shell Exploration (China) Ltd.

**Place horizontal well in thin target reservoir**
Shell Exploration (China) Ltd had used motor and measurements-while-drilling (MWD) to drill dual-lateral wells in tight gas reservoirs with 15 m average thickness in the Changbei block of China’s Changqing field for 7 years. The development had recently moved toward a marginal thin-target reservoir in the flank area. Well placement was expected to be a challenge because the target was only about 1.5 m thick and because structural and stratigraphic uncertainty was high due to the sand body being poorly connected and interbedded with clay. Drilling efficiency also posed a challenge—high ROP in the very hard, abrasive formation would be difficult to achieve.

**Optimize well placement and improve drilling efficiency with integrated solution**
An integrated solution incorporating the expertise and technologies of Schlumberger and Smith Bits enabled Shell not only to successfully place the well within the thin target reservoir but to significantly improve drilling efficiency compared with performance on previous wells. The integrated solution teamed a PowerDrive X6 RSS with an 8½-in Gemini GF65 roller cone bit certified for this application by simulation with the IDEAS integrated drillbit design platform.

This RSS-bit combination provided a faster average ROP than the mud motors used in previous wells, at much lower bit rotation speeds, as well as better trajectory control that delivered a smoother wellbore. In addition to eliminating sliding, use of the PowerDrive X6 RSS instead of a mud motor reduced nondrilling time an average of 5 hours per day—from 6 hours to 1 hour—and substantially increased run length.

Well placement in the thin reservoir was optimized using geoVISION fullbore real-time, high-resolution resistivity and gamma ray images to evaluate structural dips and stratigraphic events, as well as near-bit direction and inclination (D&I) measurements to steer the RSS and keep the trajectory within a small window. High-resolution resistivity images from geoVISION service helped the team determine that the target reservoir had a structural updip rather than the downdip indicated in the predrill model. This enabled the team to adjust the trajectory to avoid exiting the reservoir.

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**The PowerDrive X6 RSS BHA set a new Changbei project record, doubling meters drilled and drilling hours in a single run achieved with a mud motor BHA in an offset well and saving approximately 2 days off AFE.**

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![Graph](image_url)
CASE STUDY: Integrated solution enables optimal well placement within reservoir 1.5 m thick

Well placement was optimized using geoVISION service for high-resolution images, which guided trajectory adjustments to avoid exiting the reservoir when unexpected upsides were encountered.

Saved 25 days or USD 1.3 million and doubled the production
The fit-for-purpose integrated solution and multidisciplinary teamwork resulted in optimal well placement within the 1.5-m target reservoir and saved Shell more than 25 days and USD 1.3 million off AFE. On its first run, the BHA with the PowerDrive X6 RSS and optimized Gemini roller cone bit set a new Changbei project record for a single run, drilling 548 m in 105 drilling hours. That more than doubled the 210 m and 49 drilling hours per run averaged with mud motor BHAs in previous Changbei wells, and saved more than 2 days. Furthermore, the thin gas reservoir has produced at the rate of 1.2 million m³/d—double the production goal for the well. Shell plans to continue using RSS and LWD BHAs, optimized drill bits, and well placement services in its Changbei horizontal well campaign.

Contact your local Schlumberger representative to learn more.

BHA with PowerDrive X6 RSS and Gemini GF65 bit drilled 548 m in a single run (Well 9)—more than double the 210 m per run averaged when drilling with mud motor BHAs (Wells 1 through 8). Drilling hours on the RSS run were also more than double the average drilling hours for the mud motor runs—105 versus 49.