

Lukoil Saves USD 6.8 Million Using First Extended-Reach Intelligent TAML 5 Multilateral Well

Integrated technologies address numerous technical challenges in complex oil rim environment in the Caspian Sea

CHALLENGE

- Overcome slot constraint and recovery factor to optimize drainage pattern.
- Maximize productivity index and production of the well.
- Measure pressure and temperature and be able to shut off or choke lateral production separately to prevent early water and gas breakthrough.

SOLUTION

Deploy integrated solution featuring several Schlumberger drilling, cementing, and completion technologies.

RESULTS

- Prolonged life of the well by delaying catastrophic gas breakthrough.
- Saved USD 6.8 million by eliminating the need to drill an additional well.
- Drilled Schlumberger-first intelligent TAML 5 multilateral well—with zero NPT.
- Maximized productivity index and production.
- Optimized drainage pattern in challenging oil rim environment.
- Introduced multilateral approach on the project, helping to overcome slot constraints.



Lukoil encounters challenges in Caspian Sea

Lukoil was targeting a thin oil rim of approximately 20 m [65.6 ft] between an active gas cap and the water zone. The first phase of the development plan was to drill extended-reach horizontal wells equipped with inflow control devices (ICDs). After several years of drilling and production, most of the wells encountered catastrophic gas breakthrough, and production declined to critical levels 3 months after the breakthrough. Therefore, extended-reach wells with ICDs were not flexible enough for this challenging oil rim environment.

Schlumberger technologies enable maximum production and delay gas breakthrough

To delay the early gas breakthrough and maximize oil production, Lukoil and Schlumberger developed an advanced multilateral well design using multiple Schlumberger technologies. The resulting well design included one horizontal mainbore and one horizontal lateral. This addressed the operator's concerns regarding the feasibility of successfully placing extended-reach wells in the target zone while maintaining the necessary ROP and wellbore stability in preparation for a one-trip casing exit.

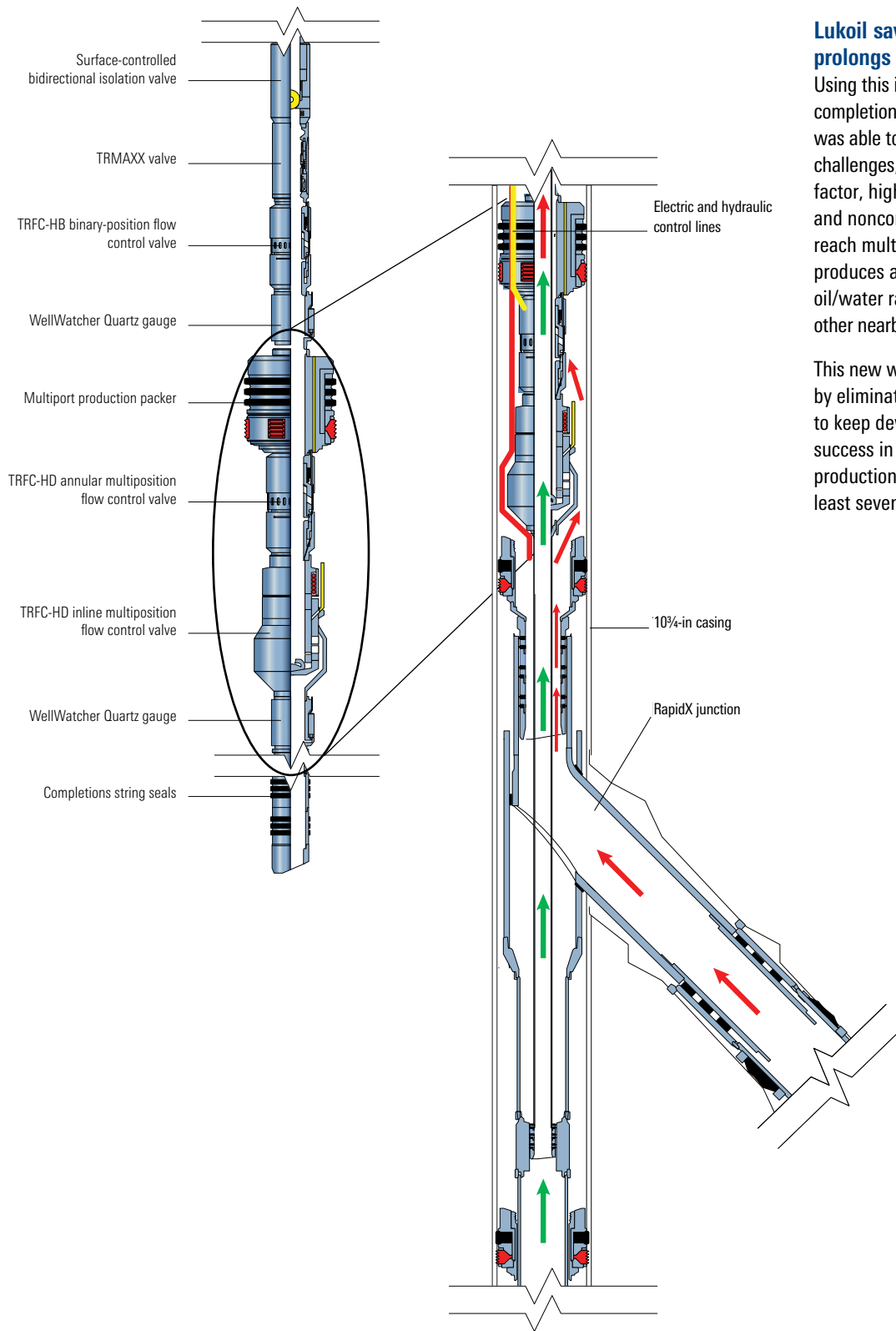
- The well was drilled using PowerDrive Xceed* ruggedized rotary steerable system with EcoScope* multifunction logging-while-drilling service[†] and TeleScope* high-speed telemetry-while-drilling service to place the extended-reach well precisely between the active gas cap and the water.
- Bits from Smith Bits, a Schlumberger company, and DBOS OnTime* real-time drilling optimization service provided significant ROP and real-time optimization of the drilling process.
- The laterals were drilled with MEGADRIL* oil-base temperature-stable invert-emulsion drilling fluid system from M-I SWACO, a Schlumberger company, to ensure stability and proper cutting removal.
- GASBLOK* gas migration control cement system and LITEFIL* cement additive for low-density slurries were used to achieve an excellent cement bond and successful casing exit job.
- The TrackMaster CH* cased hole whipstock system performed as planned, providing a one-trip casing exit with a window of predicted geometry.

The RapidX* TAML 5 high-strength, hydraulic-sealed multilateral junction was recommended because it provides the flexibility to drill sidetracks in any interval of the well. The junction also

- provides hydraulic isolation, avoiding production of undesirable fluids
- overcomes slot constraints on the platform, preventing disruption to existing operations
- achieves higher productivity index, leading to increased production
- reduces gas breakthrough, prolonging the life of the well.

The intelligent completion string included WellWatcher Quartz* premium high-temperature, high-resolution PT gauges and TRFC-HD flow control valves to help monitor and control each leg of the well separately and, in the event of catastrophic gas breakthrough, choke off one of the laterals to maintain production while controlling GOR. Along with the SFIV-II* surface-controlled bidirectional isolation valve protecting the lower completion and the TRMAXX* surface-controlled subsurface safety valve providing the isolation barrier, the multilateral installations and processes were all performed with zero NPT—even with the short time given for delivery and preparation.

CASE STUDY: Lukoil saves USD 6.8 million with extended-reach multilateral well, Caspian Sea



Lukoil saves USD 6.8 million and prolongs life of well

Using this interdisciplinary approach of intelligent completion and multilateral technologies, Lukoil was able to resolve many of its technical challenges, including slot restraint, low recovery factor, high GOR, catastrophic gas breakthroughs, and noncontributing toe zones of the extended-reach multilateral wells. The well consistently produces approximately 3,200 bbl/d, and the oil/water ratio and GOR show better dynamics than other nearby wells.

This new well design saved Lukoil USD 6.8 million by eliminating the need to drill an additional well to keep developing the field. Because of the well's success in increasing oil production and delaying production decline, Schlumberger has secured at least seven more jobs in the North Caspian.

The intelligent completion string incorporated the RapidX junction to give Lukoil the flexibility to develop this challenging oil rim reservoir in an efficient way.

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