

Case study: Niobrara shale

Baker Hughes VAS identified high-productivity zones in Niobrara shale play

A customer producing from the Niobrara shale formation needed to identify the optimal landing targets for planned laterals to increase well production.

The customer had drilled several wells in the Niobrara C zone that were successful due to the zone's high mechanical rock strength. The Niobrara A and B zones were considered potential producers, but at a higher risk for hydraulic fracturing because of their perceived lower mechanical strength.

The customer needed to evaluate the producibility of both the A and B zones, but the cost of conventional core evaluation was considered uneconomical. Normal X-ray diffraction (XRD) analyses showed high clay content, which indicated high-risk, low-mechanical rock strength.

The **Volatiles Analysis Service (VAS) reservoir characterization** from Baker Hughes was used for evaluating "sealed-at-the-well" shale cuttings. The VAS provides a cost-effective, non-invasive formation evaluation log generated from drill cuttings or core plugs to identify pay intervals and

characterize hydrocarbon zones. The VAS has also proven to be a successful measurement for assessing the estimated ultimate recovery (EUR) of oil in the well.

The interval for cuttings samples was 10 ft (3 m). The controlled volume of samples was quickly and gently rinsed and discharged into the shaker box and sealed in VAS tubes in less than 1 minute. Samples were catalogued using logged-depth, not the averaged-depth typically collected by mud loggers. Averaged-depth samples lose oil from the shale cuttings when traveling across the shaker table and through the trough.

The VAS indicated a high rate of recoverable oil volumes and high mechanical rock strengths in both the A and B shale zones, resulting in a successfully landed two-mile lateral in the Niobrara B zone. Actual production data confirmed the VAS cuttings analyses predicted estimate of ultimate recovery (EUR) at 800,000 barrels (127,189 m³) of oil. The customer was able to increase production and avoid the higher cost of conventional core evaluation.

Challenges

- Assessment of higher-risk zones for additional production
- Conventional coring evaluation considered uneconomical
- Hydraulic fracturing risk due to perceived low mechanical rock strength

Results

- High-quality cuttings samples were successfully collected for the VAS without risk
- The VAS confirmed recoverable oil and suitable mechanical rock strength in the high-risk zones
- The customer increased production and avoided the higher cost of conventional core evaluation
- The VAS estimate of ultimate recovery matched the actual production data