

Tecpetrol Optimizes Location of Fracturing Zones and Lateral Placement Using LithoFlex Service

Shale-cuttings evaluation-while-drilling service accurately evaluates rock heterogeneity to identify productive zones, Neuquén, Argentina

CHALLENGE

Characterize rock heterogeneity in a vertical well to optimize location of fracturing zones and lateral placement.

SOLUTION

- Identify lithology, mineralogy, and geochemical footprint using the high-resolution digital microscopy (HRDM), X-ray fluorescence (XRF), and diffuse reflectance infrared Fourier transform spectroscopy (DRIFTS) components of the LithoFlex* multifactor shale-cuttings evaluation-while-drilling service.
- Use characterization data to design a multistage fracturing completion.
- Compare production results of fractured zones to optimize lateral placement.

RESULTS

The LithoFlex service accurately:

- Identified productive zones, optimizing lateral placement.
- Correlated production decline in one zone with high concentration of smectite.



Optimize drilling and completion strategy with cost-efficient solution

The Vaca Muerta Formation in Neuquén, Argentina, contains complex Mesozoic shales and is rich in tight oil and gas but requires multiple data sets to understand production potential. Tecpetrol needed to evaluate production potential in a vertical well in the formation to optimize drilling and completion design; however, well conditions precluded running wireline. Tecpetrol sought a cost-efficient solution that would provide an accurate evaluation of rock heterogeneity to assess production potential, support hydraulic fracturing operations, and help place the lateral.

Evaluate rock heterogeneity from cuttings

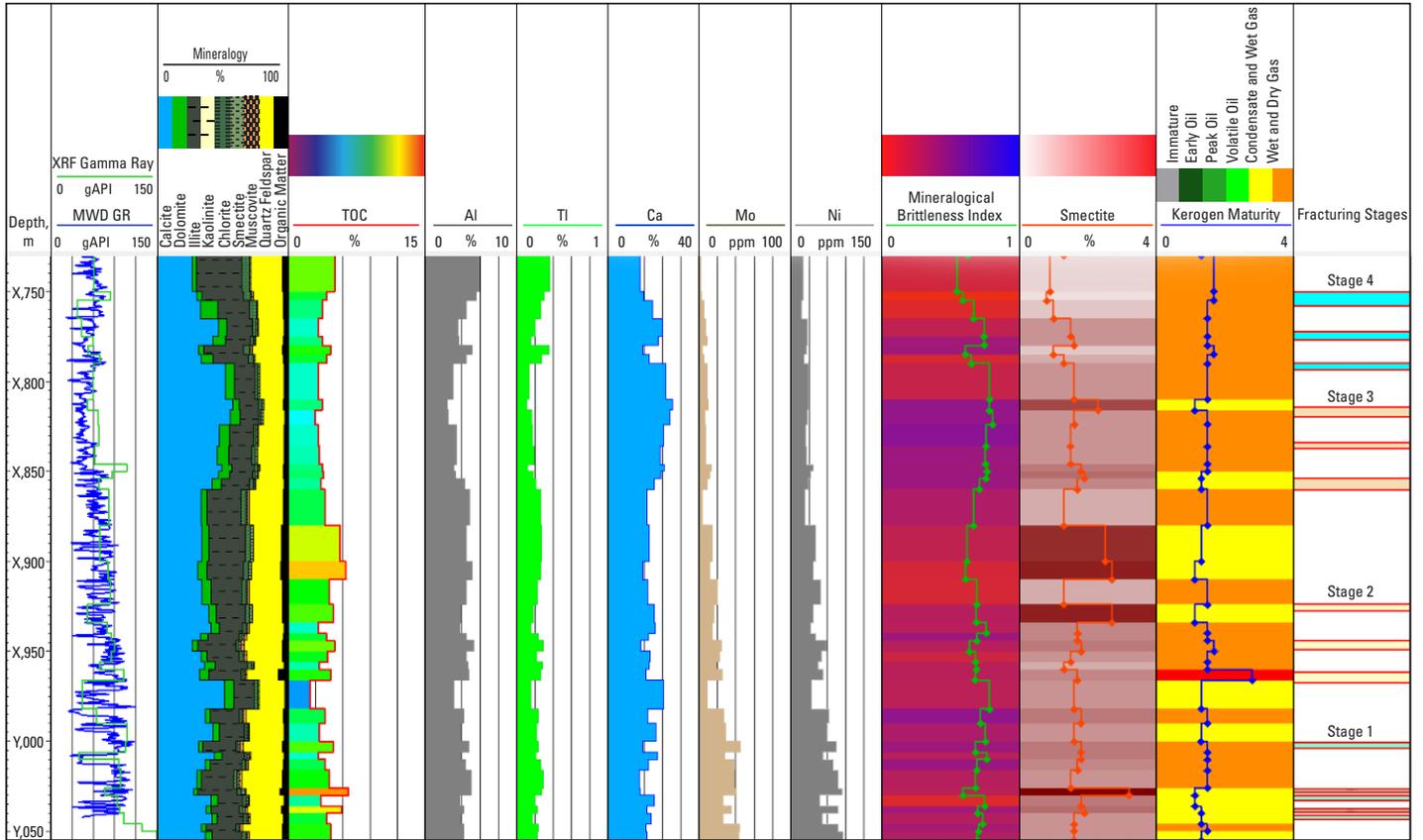
Schlumberger recommended using the LithoFlex service to provide a cost-efficient near-real-time formation evaluation using the HRDM, XRF, and DRIFTS components. Together, these components provide accurate and comprehensive measurements of lithology, mineralogy, and elemental composition from cuttings, enabling a well-informed comparison of rock heterogeneity. By accurately capturing the geochemical fingerprint in the vertical well, fracturing operations can be optimized, and the best productive intervals can be used to guide lateral placement.

Accurately characterized formation to identify productive zones

The LithoFlex evaluation-while-drilling service quantified both organic and inorganic matter and identified shale lithofacies to help optimize the number and location of fracturing stages in the vertical section. The well was fractured in four stages, and the production results from each stage correlated with the formation evaluation provided by the LithoFlex service. For example, the first stage provided initially good production flow with a fast decline. The LithoFlex service identified a high concentration of clays, particularly smectite, and trace elements such as nickel and molybdenum, which correspond with a highly reductive environment. Highly reductive environments induce a better preservation of organic matter however lead to potential instability in geomechanical and production efficiency.

The LithoFlex service identified the best productive intervals by obtaining measurements of preserved organic matter and total organic carbon (TOC). These key measurements correlated with good production rates in the second and fourth fracturing stages and enabled Tecpetrol to determine the optimal depth to place the lateral.

CASE STUDY: Tecpetrol optimizes fracturing design and lateral placement, Neuquén, Argentina



This log from the LithoFlex service compares rock heterogeneity to optimize location of fracturing zones in a vertical well. The high concentration of TOC in stages two and four correlated with good production rates, guiding lateral placement.