

LithoFact® Rock Analysis Service

WHOLE-ROCK ANALYSIS FOR RESERVOIR INSIGHT, PRECISE STRATIGRAPHIC PLACEMENT, AND MAXIMUM RESERVOIR CONTACT

OVERVIEW

Knowing the details of the reservoir's rock and minerals is critical when evaluating the formation and planning to drill a well. LithoFact™ rock analysis service provides the technology and expert interpretation to enhance reservoir understanding by fully exploiting the information from the elemental, mineralogical, and organic carbon data in the drill cuttings. This complete evaluation of the formation enhances reservoir insight and understanding to make optimal field development decisions.

LithoFact service can also help operators drill to produce by accurately placing the wellbore in the reservoir target zone or sweet spot. Trace and major elemental ratios are available for precise stratigraphic placement, resulting in maximum reservoir contact and greater production. To maximize barrels produced, LithoFact service can be combined with FracInsight® analysis to determine “where to frac” based on the reservoir fluid properties and rock types. LithoFact service can be a cost-effective alternative solution for formation evaluation data in a wide range of drilling environments, such as unconventional.

FEATURES

- » X-ray fluorescence (XRF) analysis for elemental composition
- » X-ray diffraction (XRD) analysis for mineralogical composition and clay typing
- » Scanning electron microscopy (SEM) analysis, along with energy dispersive X-ray (EDX) analysis, for mineralogy, clay typing, porosity, and cementation
- » Pyrolysis for total organic content, S-peaks, and T-max
- » Pyrolytic oil-productivity index for fluid and organic phase composition
- » With the powerful DecisionSpace® software from Landmark, receive a more concise answer for your first look at your reservoir with interactive analysis of the lithological results combined with gas analysis

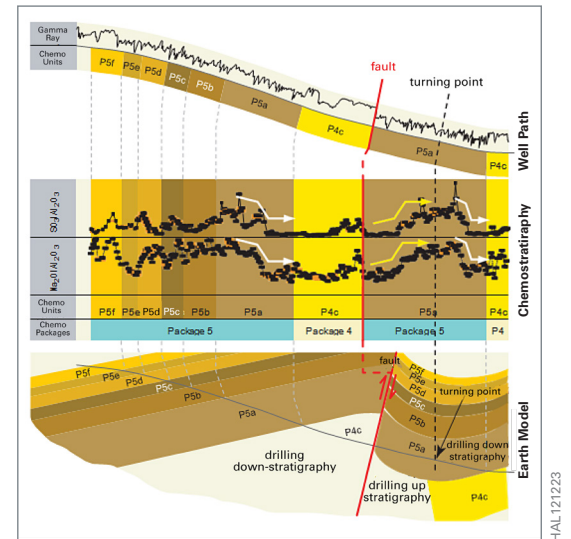
BENEFITS

Enhance Reservoir Understanding

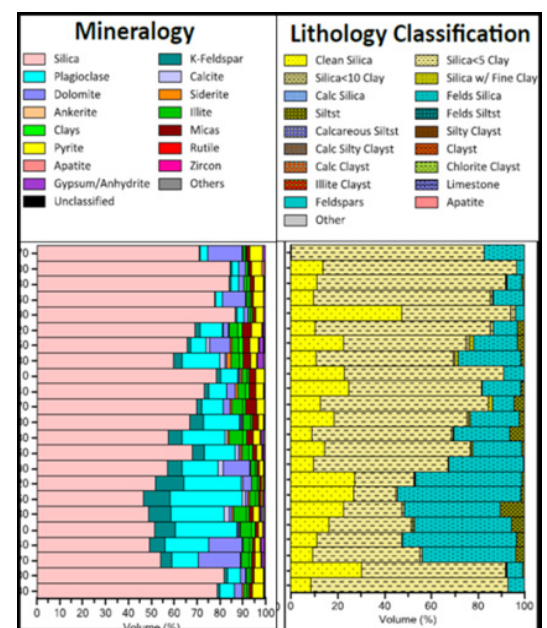
- » Enables optimal field development decisions by directly measuring the rock and fluid properties
- » Maximizes production with FracInsight® analysis for frac optimization
- » Provides geochemical analysis of the reservoir by trained and experienced specialists who can effectively and competently utilize the equipment and systems
- » Overcomes deficiencies and limitations of conventional rock analysis

Drill to Produce

- » Enables operators to stay in the reservoir target and to maximize reservoir contact by quantitatively determining formational changes and trace mineral variations



The LithoFact service can be used to determine a fault offset. A subhorizontal well encountered a fault with unknown displacement. The LithoFact service identified the offset from unit P4c into P5a with subsequent drilling up stratigraphy. This was interpreted as folding with the fault movement, which was later confirmed through modeling software.



Graphical representation of mineralogy and lithology by scanning electron microscopy (SEM) analysis

IMPLEMENTATION

LithoFact service has a fleet of portable trailers/cabins that can be mobilized to any land or offshore locations. Our dedicated team of specialists can tie into any necessary data collection systems or provide its own systems for accurate tracking of cuttings returns to ensure proper downhole correlations. The cuttings can either be analyzed on location with the correct mix of analytical instruments based on local lithology needs or be prepped and shipped to either a local “spoke” lab or “hub” lab for more detailed analysis. In either case, we deliver engineered solutions to ensure rapid turnarounds of results.

LithoFact service offers X-ray fluorescence (XRF) for elemental analysis with X-ray diffraction (XRD) and scanning electron microscopy with energy dispersive X-ray (SEM/EDX) for mineralogical analysis. This combination of elemental and mineralogical analyses is the key to the cuttings workflow – precise wellbore locations can be determined and a robust mineralogy can be developed that are independent of normal optical microscopy interpretations. Additional reservoir understanding includes a relative brittleness index, bulk density, lithology, fractional and textural relationships, a total organic carbon (TOC) proxy, and a new porosity index. Hydrocarbon typing, producible hydrocarbons, TOC, and total inorganic carbon (TIC) within each sample can also be established by adding cuttings pyrolysis. To fully understand organic fluids and solids in the pore spaces, a pyrolytic oil-productivity index (POPI) is utilized to determine the percentage of oil, bitumen, pyro-bitumen, and kerogen in the cuttings.

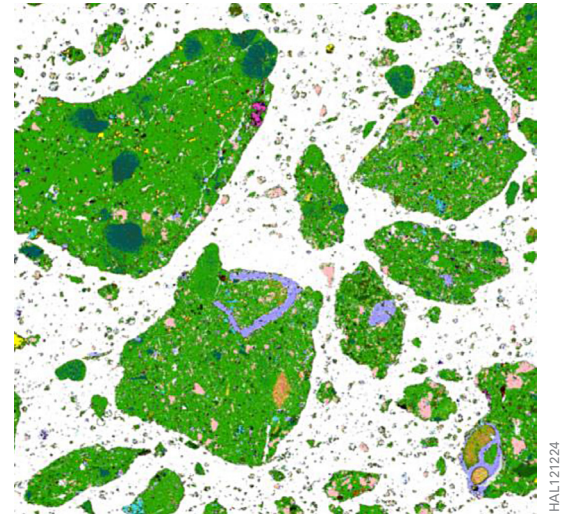
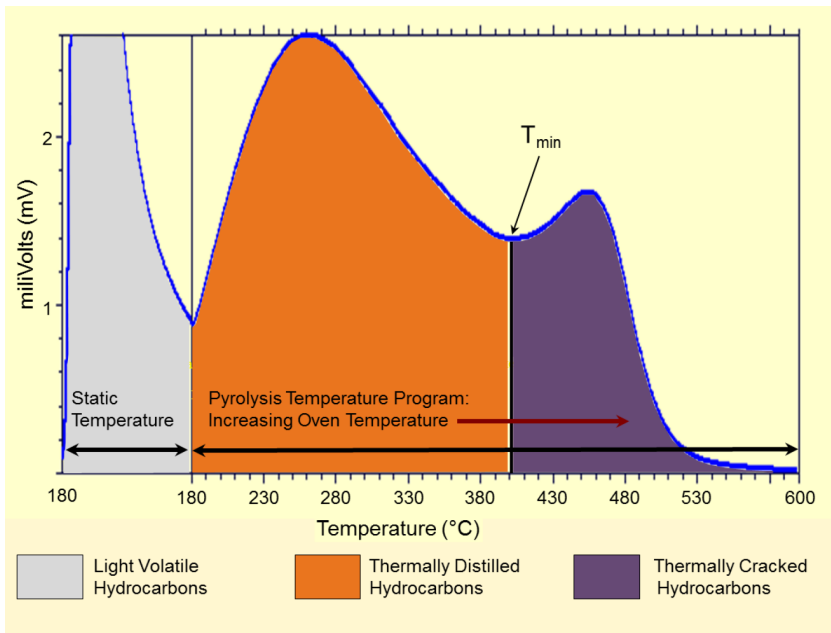


Illustration of 2D false-color depiction of cuttings indicating grain mineralogy and microstructure



Three-peak pyrogram analysis indicating hydrocarbons that can be volatilized, desorbed, and detected

For more information about technical specifications, contact your local Halliburton representative, visit us on the web at www.halliburton.com, or email sperry@halliburton.com

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