

Middle East

Digital Rock Analysis optimizes landing zone selection in heterogeneous unconventional resource play

A tailored core-log integrated program reduced uncertainty in unconventional resource characterization and empowered data-led decisions to help reduce development risk

CHALLENGE

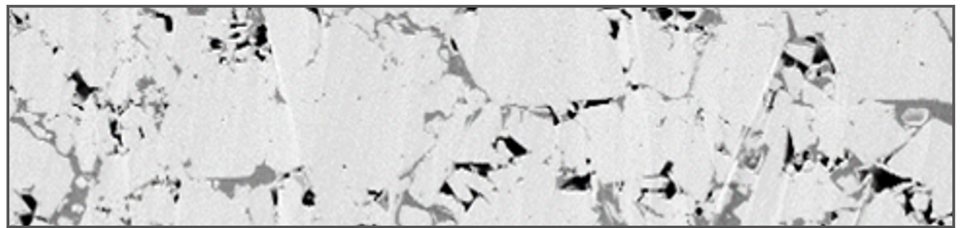
- Geologically complex and highly heterogeneous source rock posed challenges to formation characterization
- Limited well log and core analysis data impacted the ability to identify optimal landing depths

SOLUTION

- Tailored core analysis program to complement customer's limited dataset
- Featured petrophysical and geochemical laboratory testing combined with digital core analysis

RESULT

- Delivered ranked zonal evaluation based on production potential and fracability for landing depth selection
- Complemented customer's limited data set with tailored core analysis, which improved formation characterization



Digital core imaging and analysis of tight rock samples offer unique insights into organic porosity—an indicator of production potential in organic source rocks.

Overview

A local operator in the western Middle East collaborated with Halliburton to assess a highly heterogeneous unconventional play within the Shilaif Formation. Historically, operators underexplored the formation due to its tight matrix and low permeability. The formation extends across a broad area and varies in thickness from 100 to 400 ft, which highlights its significant resource potential.

However, limited well and core data, coupled with the complexity introduced by its depositional, structural, and post-depositional history, posed challenges for accurate petrophysical interpretation. To address this, Halliburton implemented an integrated workflow that combined digital and physical core analysis to optimize landing zone selection and reduce uncertainty in development planning.

Challenge

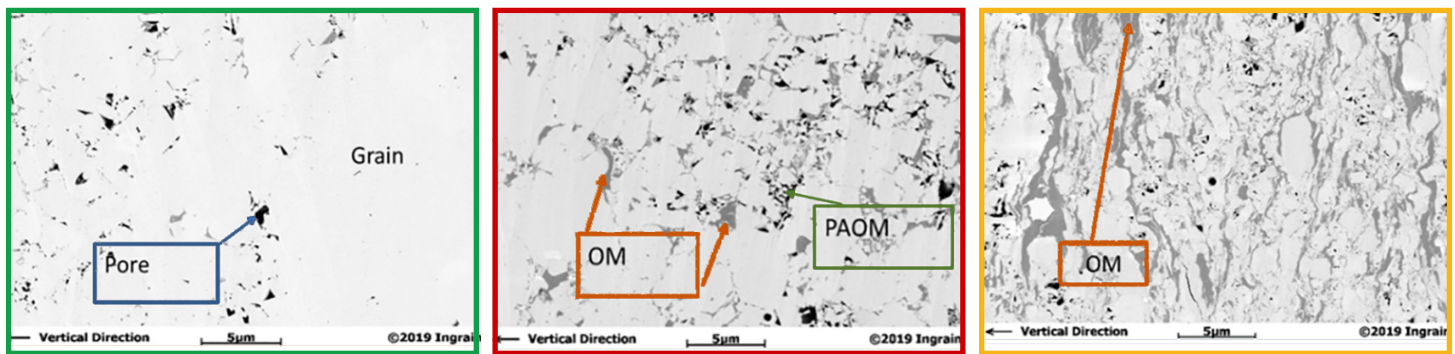
The operator faced two major obstacles in evaluating the Shilaif Formation. First, the reservoir's heterogeneity and limited historical data of this play made it difficult to characterize the formation with confidence. Second, insufficient core and well data hindered the operator's ability to identify optimal landing zones and assess source rock quality. These challenges increased the risk of suboptimal well placement and inefficient resource recovery.

Solution

Halliburton implemented a four-stage formation evaluation workflow that combined digital rock analysis with conventional core and log data. The process began with core characterization that used dual-energy CT scanning and spectral gamma-ray analysis. Next, the team conducted petrophysical and geochemical testing in the laboratory to assess mineralogy, porosity, and organic content. They used high-resolution 2D SEM imaging and digital segmentation to characterize pore structures and their relationship to organic matter, an important indicator of source rock potential. Finally, the team integrated results from both digital and physical analyses with wireline log data to understand findings and evaluate the formation at a reservoir scale. This comprehensive approach allowed for rapid, cost-effective zonal evaluation and source rock quality ranking.

Result

The integrated analysis identified and ranked three distinct intervals within the formation. The team identified a primary landing zone at intermediate depth, which offered favorable organic porosity, richness, and mineralogy. Higher clay content affected the secondary interval, although it showed potential. The team deemed the third zone to have poor hydrocarbon potential. Because of the combination of digital and conventional core analysis with wireline data, the operator identified the most viable zone for development.



DESCRIPTION	VOL %	DESCRIPTION	VOL %	DESCRIPTION	VOL %
2D SEM total porosity	3.08	2D SEM total porosity	3.20	2D SEM total porosity	3.54
2D SEM effective porosity	3.08	2D SEM effective porosity	3.20	2D SEM effective porosity	2.83
2D SEM organic matter	1.22	2D SEM organic matter	7.75	2D SEM organic matter	19.09
2D SEM porosity in OM	0.11	2D SEM porosity in OM	2.43	2D SEM porosity in OM	1.52

Scanning Electron Microscope (SEM) images from each ranked interval are shown, which highlight microstructural differences across the formation. Centered is an image from the primary landing target, which exhibits favorable organic porosity and a mineralogical composition well-suited for hydraulic fracturing.

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com

Sales of Halliburton products and services will be in accord solely with the terms and conditions contained in the contract between Halliburton and the customer that is applicable to the sale.

H015099 04/26 © 2026 Halliburton. All Rights Reserved.