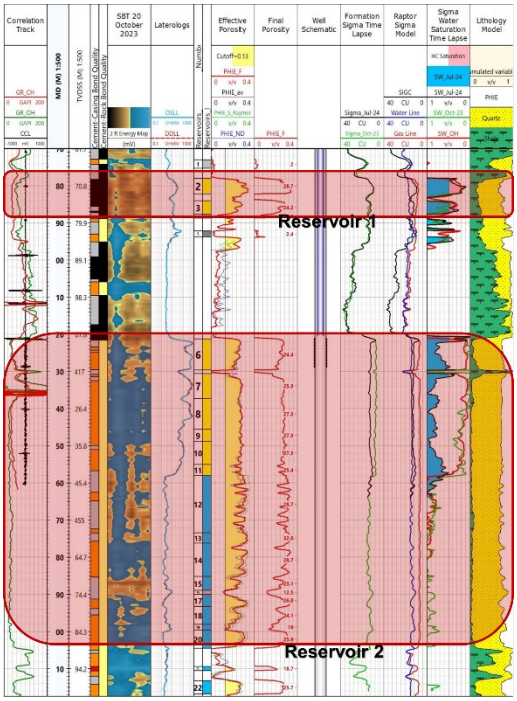
Raptor 2.0™ Cased-Hole Evaluation System, **IES Analysis** Enables Time-Lapse Monitoring of Fluid Contacts in Low Salinity Formation



The log plot of complex openhole petrophysical analysis and the time-lapsed cased-hole logs (captured by the Raptor 2.0 system) for monitoring the fluid contacts.

Objectives

- Quantify initial gas saturations through the open hole by performing a complex openhole petrophysical logging and analysis.
- Monitor fluid contacts over time through cased hole.
- Empower the operator to choose a proper production strategy and maximize total hydrocarbon recovery.

Our Approach

- After wireline field personnel deployed the openhole Compact™ quad-combo tools for accurate formation evaluation of sandstone reservoirs, the Weatherford Interpretation and Evaluation Services (IES) team performed a complex processing and interpretation of the data, locating two high porosity reservoirs (16-24 pu) “Reservoir 1” at xx78 to xx88 m and “Reservoir 2” at xx21 to xx04 m measured depth (MD). Within “Reservoir 2,” the highest gas saturation measured 89% and gas-water contact (GWC) was identified at xx58 m MD.

LOCATION
Ukraine, Dnieper-Donets Basin

WELL TYPE
Onshore, deviated gas producer

FORMATION
Sandstone

HOLE SIZE AND ANGLE
6 in., 24.3°

LINER SIZES
5 in., 21.4 lb/ft
2 7/8 in., 6.5 lb/ft tubing

TEMPERATURE
86°F (30°C)

PRESSURE
700 psi (4.8 MPa)

LOGGING INTERVAL
xx90 to xx15 m

OTHER
24kppm formation water salinity (low)

PRODUCTS/SERVICES
- Compact Quad-Combo openhole evaluation (gamma ray-resistivity-neutron-density-sonic)
- Raptor 2.0 cased-hole evaluation system
- Wireline services
- Interpretation and Evaluation Services

Weatherford®

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Our Approach (continued)

- Based on the formation evaluation, the operator's geoscience team opted to put "Reservoir 2" into production. The Weatherford wireline team deployed the Raptor 2.0 system in Sigma mode to quantify the accurate gas-water saturation behind the 5-in. liner.
- The cased-hole Sigma saturation data was benchmarked with the openhole saturation data to be used as a base log for the cased-hole time-lapse saturation and GWC monitoring within later well stages. A good quantitative correlation between the outputs was established and a laser clear GWC was confirmed at xx58 m MD, preserving the confidence in the provided interpretation. This was despite having a low 24 kppm formation water salinity across the zones of interest, a condition that often poses challenges within an openhole analysis.
- After nine months of production from the reservoir, an increased water-cut was observed. Weatherford experts recommended an additional Raptor 2.0 system run in Sigma mode to monitor the fluid contact.
- The newly acquired Sigma saturation data was compared with the base Sigma log and initial openhole saturation, and the team identified a GWC change at xx22 m. This confirmed the depletion level of the gas cap and corroborated with an increased water production from the reservoir.

Value to Customer

- Using the data obtained by the Raptor 2.0 system, the IES team further highlighted the depletion profile.
- The Weatherford solution enabled the IES and customer's geoscience teams to monitor fluid contacts over time and empowered the operator to plan further production strategies with plug-back perforation.