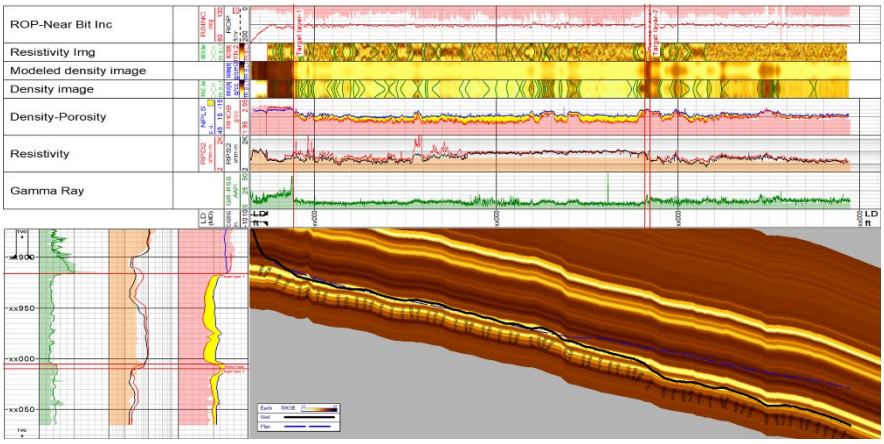
Real-Time SineWave™ Image Data Optimizes Decision Making While Drilling, Ensures Precise Well Placement in Horizontal Extended-Reach Well



The image shows the curtain section along the horizontal trajectory through the reservoir. The real-time SineWave and density image, dip picking results, and positioning of the well trajectory within the target.

Objectives

- Drill 16,000 ft (4,876 m) of an extended-reach (ERD) horizontal section within tightly defined porous layers separated by a dense layer.
- Maintain the trajectory within tight dogleg severity (DLS) limits for smooth completion operations.
- Identify fractures and faults in the horizontal section to optimize completion design.

Our Approach

- Weatherford proposed an advanced suite of tools including Revolution® rotary steerable system (RSS) fitted with near-bit gamma ray sensor, AZD azimuthal density sensor, TNP neutron porosity sensor, a MFR resistivity tool, as well as SineWave micro-resistivity high resolution image, supported by InZone well placement service.
- The BHA was designed to achieve a precise structural interpretation in conjunction with fractured zones evaluation and ensure proactive well placement, keeping the well trajectory within planned parameters.
- Weatherford experts landed the well precisely inside the target layer, avoiding any bounce from the dense formation in the base.
- The structural dip estimation from the density image was validated with the use of the SineWave image provided in real time, enabling effective well placement within the thin reservoir.

LOCATION
Middle East

WELL TYPE
Onshore, horizontal

FORMATION
Sandstone

HOLE SIZE AND ANGLE
6 in., 90°

HORIZONTAL SECTION LENGTH
16,037 ft (4,888 m)

PRODUCTS/SERVICES
- InZone™ well placement service
- Revolution RSS
- HAGR™ high-temperature azimuthal gamma ray tool
- MFR™ resistivity tool
- NDT™ neutron density tool
- SineWave microimager
- HEL™ hostile-environment-logging measurement-while-drilling system
- AZD™ azimuthal density sensor
- TNP™ thermal neutron porosity sensor

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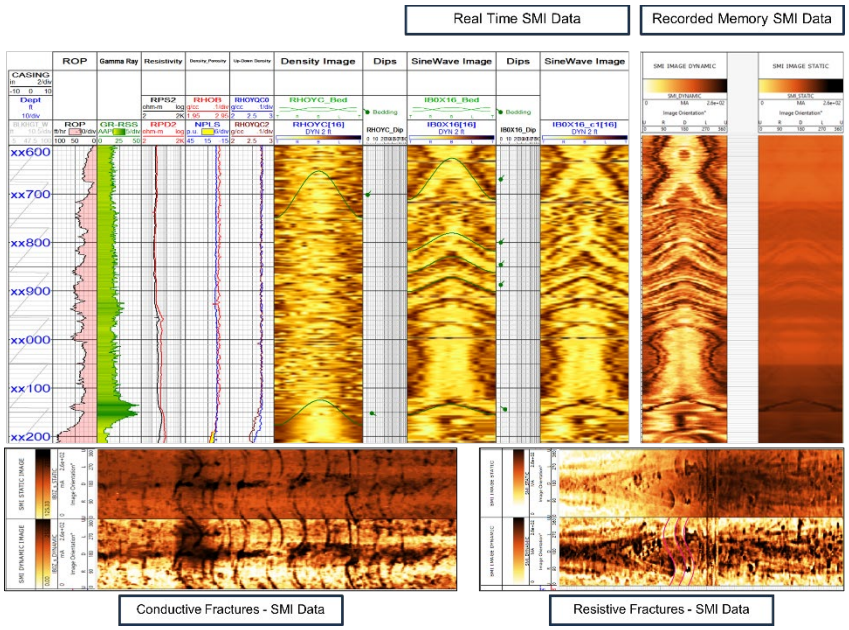
Our Approach, Continued

- The high-resolution micro-resistivity image recorded in the SineWave tool memory facilitated the identification of distinct geological features, particularly naturally occurring fractures (conductive or resistive), induced fractures, stylolites, and vugs.

Value to Customer

- The Well Placement services empowered the operator to drill the ultra-long horizontal well within a tightly defined target interval despite challenging geological conditions. Two target layers were accessed: 60% of the lateral was placed in the first target, and, after a dense divider crossing, the remainder drilled in the second target.
- Seismic analysis identified four discontinuity zones along the trajectory. The real-time SineWave data interpretation found no fault indication within the well. The interpreted structural changes enabled the operator to maintain a smooth trajectory and avoid high DLS.
- This was the first-ever ERD well drilled by the rig, and the operator communicated the appreciation of the work done by the Weatherford specialists.



This figure shows the examples of beddings interpreted using real-time SineWave images, a comparison with RM SMI data, and the fractures as interpreted using a SineWave image.

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