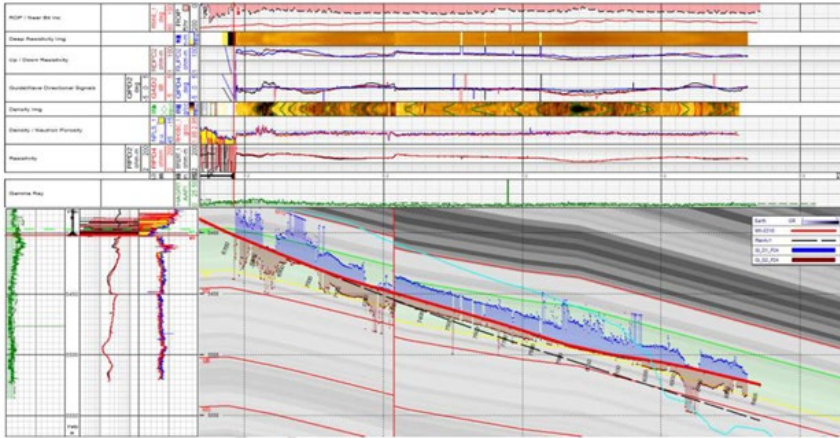


Hexa-Combo LWD BHA Delivered Detailed Reservoir Characterization, Multistage Hydraulic Fracturing Planning, and Optimized Well Placement



Density image and azimuthal resistivity abrupt variations indicate a down-thrown fault presence with around 8 ft (2.4 m) TVD throw.

LOCATION

Kuwait

WELL TYPE

Oil producer

FORMATION

Carbonate reservoir

HOLE SIZE AND ANGLE

6-1/8 in., 86°

DEPTH

2,000 ft (609 m)

PRODUCTS/SERVICES

- LWD services
- PressureWave™ formation tester
- SineWave™ microimager
- CrossWave™ azimuthal sonic tool
- NDT™ neutron density tool
- GuideWave® azimuthal resistivity tool
- HAGR™ high-temperature azimuthal gamma ray sensor

Objectives

- Identify the boundaries of the target zone in order to drill a horizontal section.
- Obtain data to build an accurate geological model of the drilling zone to perform multistage fracturing operations.

Our Approach

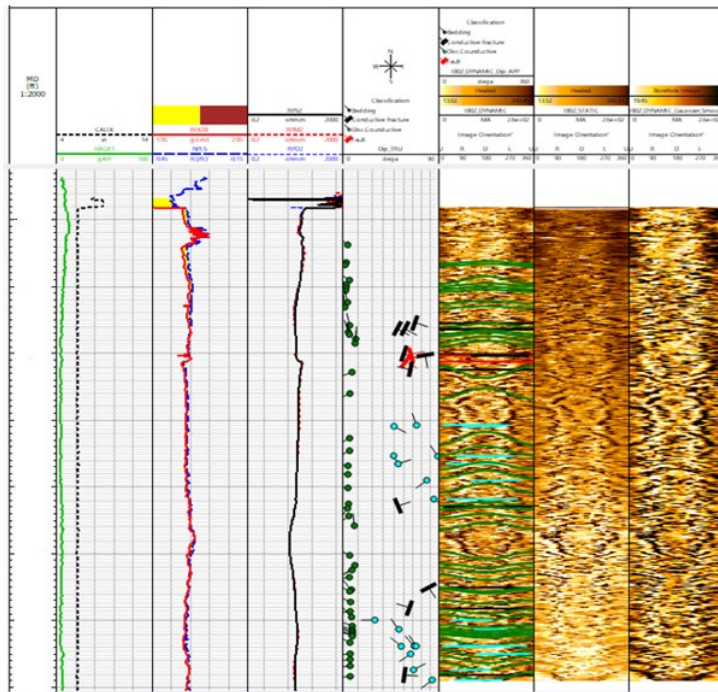
- Weatherford experts suggested the hexa-combo logging-while-drilling (LWD) bottomhole assembly (BHA), with the distance-to-bed inversion combined with the azimuthal density images, to help locate the target zone boundaries and formation dipping.
- These services—including deep azimuthal resistivity with boundary mapping inversion, azimuthal sonic, nuclear density, and neutron porosity as well as micro-resistivity imaging—would enable the customer to perform accurate stratigraphic interpretation and ensure proactive well placement, maintaining the well trajectory within planned limits.
- Micro-resistivity images, recorded while drilling and processed after the tools reached the surface, helped to detect clear geological features, especially fractures and faults, as well as their direction and position.
- Azimuthal sonic measurements provided information about formation geomechanical properties and stress regime, which gave the basis for the multi-stage fracturing planning.



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Value to Customer

- By using the Weatherford combination of LWD measurements, the operator selected the optimal well path positioning, fractured zones assessment, and fractures type determination.
- The high-resolution images, delivered while drilling, helped to identify the zones of high production potential and improved reservoir characterization.
- With the help of the azimuthal density image and bed boundary mapping from resistivity, a precise placement of the well was performed.
- The addition of the azimuthal sonic measurements provided information for the customer to successfully design a multistage fracturing program.



Micro-resistivity image interpretation showing fracture, bed boundary, and faults encountered.

