BAKER HUGHES
a GE company

VisiTrak service navigated 2,838 feet of pay sand without pilot hole

An operator drilling in the Carapebus reservoir off the shore of Brazil requested that Baker Hughes, a GE company (BHGE), drill an 8-½-in., 3,340-ft (1,018-m) horizontal section in the reservoir's facies 1 sand. The heel of the well was in an area below seismic resolution.

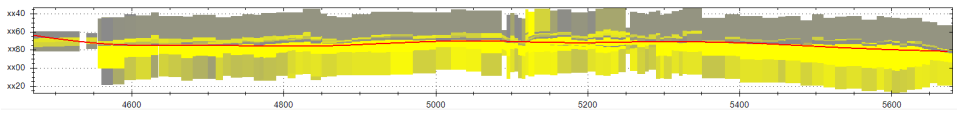
The Carapebus reservoir is a series of gravity flow channel deposits on the continental slope margin of the Campos Basin. The reservoir is subdivided into 3 facies types, with facies 1 being the only productive sand type. The thickness and distribution of the facies 1 sand within the reservoir was poorly known.

The plan was to drill a 12-¼-in. hole to the top of the Carapebus reservoir and set 9-⅝-in. casing. The well inclination would then be built to land at 90° and maintain position in the target zone before drilling into the lower sand.

Total depth was at the start of a deep channel that cut across the well trajectory. The minimum net sand interval was set at 984 ft (300 m) with a KPI minimum of 1,509 ft (460 m).

BHGE used a logging-while-drilling (LWD) suite of services, including its **VisiTrak™ reservoir navigation and analysis service**, **AziTrak™ deep azimuthal resistivity service**, and **LithoTrak™ advanced LWD porosity service**, to detect, measure, and visualize the reservoir. Inversion modeling software was also used for real-time of multiple bed boundaries.

Density and gamma ray images from the LithoTrak and AziTrak services also provided real-time dip measurements to help geosteer through the well. Two nearby horizontal offset wells, each targeting separate sands, were used for the pre-well modeling.



Inversion modeling results based on measurements obtained by the AziTrak, LithoTrak, and VisiTrak services enabled proactive geosteering to maintain position.

Challenges

- Two horizontal offset wells available for pre-well modeling
- Sand distribution in well landing area was unclear due to seismic interpretation limitations
- Total planned length of horizontal section was 3,340 ft, with a minimum required net sand of 984.3 ft

Results

- Drilled horizontal well successfully without a pilot hole
- Mapped target sand thickness while following the upper surface of the sand
- Mapped correct reservoir using real-time inversion results after crossing faults
- Drilled 75% net-to-gross sand along a 3,343.2-ft (1,019-m) horizontal section

The data gathered was seamlessly incorporated and the model was adjusted in real-time using the BHGE **Reservoir Navigation Services™ interactive software** in combination with the real-time inversion modeling software.

With the information gathered, BHGE was confident it could steer the well without having to drill a pilot hole.

The sand was 33 to 46 ft (10 to 14 m) true vertical thickness at the heel of the well. After crossing the crest into the lower channel, the thickness increased to 33 to 82 ft (10 to 25 m). The well followed the upper surface of the sands at a distance of 7 to 10 ft (2 to 3 m).

When faults and channel margins were crossed, inversion modeling results were used to target the correct reservoir sands. A total net sand length of 2,838 ft (865 m) was drilled, which equates to a 75% net-to-gross.

The use of the BHGE Reservoir Navigation Services in conjunction with the LWD suite of services proved to be a successful combination for drilling in this complex, subseismic environment.

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