



# VisiTrak service provided accurate oil/water contact information in a complex environment

The Troll field off the shore of Norway is one of the largest natural gas and oil fields in the Norwegian sector of the North Sea, holding 40% of Norway's gas. The area west of the field also possesses significant quantities of oil in thin zones under the gas cap.

The reservoir is located in three eastward-tilted fault blocks 4,921 ft (1500 m) below sea level. It consists of cyclic sandstones from the Fensfjord, middle Heather, Sognefjord, and upper Heather formations in the Jurassic Viking group, and is overlaid by Upper Jurassic to Paleocene clays.

A major operator drilling in the Troll field selected Baker Hughes, a GE company (BHGE), to drill an 8-½-in. horizontal section within 3 ft (1 m) of the oil/water contact while maximizing unconsolidated sand intervals and avoiding exiting the reservoir.

BHGE used its advanced logging-while-drilling (LWD) suite of services, including the **VisiTrak™ reservoir navigation and analysis service**, the **AziTrak™ deep azimuthal resistivity service**, and the **LithoTrak™ advanced LWD porosity service**, to map the oil/water contact in real time and deliver a full geological interpretation.

The VisiTrak service's multicomponent, real-time drilling inversion software mapped the top of the Sognefjord formation initially at 39 ft (12 m) above the well path while drilling in the low-resistivity micaceous sand, and continuously mapped the oil/water contact.

The BHGE Reservoir Navigation Services™ interactive software, in conjunction with the inversion modeling software, provided an enhanced understanding of the reservoir and the oil/water contact.

Based on the inversion mapping results, the operator decided to drill into water across a major faulted area to avoid drilling into the Draupper/Heather shale. This maneuver increased the wellpath exposure in the saturated oil reservoir more than 984 ft (300 m) after the faulted interval, maximizing unconsolidated sand exposure.

The ability to map reservoir architecture and keep a safe standoff to the oil/water contact revealed that the unconsolidated sand was thinner than expected towards the toe, enabling the operator to redesign the completion solution.

The use of the VisiTrak service, in conjunction with other BHGE services in the LWD suite, proved to be a successful combination in this complex, cyclic, shallow marine reservoir.

## Challenges

- Previous production branches were cut short after exiting the Sognefjord reservoir
- A heterolithic reservoir consisting of alternating micaceous sands and unconsolidated sands
- Micaceous sands had poorer reservoir quality and different resistivity when compared with unconsolidated sands
- Oil/water contact varied considerably in the reservoir

## Results

- Monitored the oil/water contact continuously and kept the wellbore at desired standoff
- Identified the top of the Sognefjord using real-time inversion up to 39 ft above the wellbore
- Gained more than 984 ft of saturated oil reservoir after drilling strategically into a water zone
- Successfully drilled an 11,237-ft (3425-m) horizontal section with an average ROP of 128 ft/hr (39 m/hr) while using proactive reservoir navigation techniques

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