FLAIR Fluid Facies Analysis Enhances Geosteering in Horizontal Well

Real-time quantitative assessment of formation fluid eliminates resistivity measurement uncertainty

**CHALLENGE**
Maintain the well path within the reservoir despite inconclusive resistivity measurements in a horizontal well offshore UK.

**SOLUTION**
Determine reservoir fluid compositions through FLAIR* fluid logging and analysis in real time.

**RESULTS**
Provided positive confirmation of well trajectory through a fluid facies log, eliminating concerns about a premature exit from the zone of interest and helping to steer the well.

**Low resistivity creates geosteering uncertainty**
Hess Corporation and their partners had planned an appraisal well offshore UK to confirm the volume of hydrocarbons in place within the main reservoir and to investigate neighboring formations. After the pilot hole, a sidetrack was drilled and the well was landed horizontally in the main reservoir target interval, designated S3. As drilling progressed the LWD log showed a decrease in resistivity, raising concerns about an impending roof or base exit from the zone of interest.

**Real-time formation fluid analysis provides solution**
FLAIR fluid logging and analysis in real time was used to identify formation fluids and thereby monitor well trajectory. The service continuously analyzes gas extracted from hydrocarbons in the drilling mud returns at surface, providing a unique, quantitative analysis of C₁–C₅ and qualitative information on the C₆–C₈ components (including methylcyclohexane) and light aromatics. The FLAIR fluid signature is analogous to the downhole fluid composition in the C₁–C₅ range. Because formation fluids are continuously mixed with the drilling mud, accurate gas fraction analysis, or fluid logging, can access the hydrocarbon composition directly and continuously.

**FLAIR service enables planned well trajectory**
The fluid facies analysis performed in real time showed no change in the formation fluid despite the decrease in resistivity, confirming that the well had not exited the oil zone. The change in resistivity was attributed to increasing irreducible water saturation. FLAIR measurements helped to steer the well through the target zone and also enabled the customer to optimize subsequent logging and completion programs.

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*Schematic with the well (pilot and sidetrack) profiles.*
CASE STUDY: Real-time quantitative assessment of formation fluid eliminates resistivity measurement uncertainty

During drilling through the reservoir section, FLAIR gas analysis (Track 3) helped to ease concerns about a decrease in resistivity. FLAIR analysis confirmed that the well had not exited the reservoir zone.