GeoFracture

Real-Time Fracture Characterization

GeoFracture identifies open fractures including hard to detect micro-fractures, in real-time. GEOLOG specialists identify changes in matrix permeability, open fractures, and drilling induced fractures through the accurate surface measurement of flow IN and flow OUT with high resolution flowmeters. This, combined with gas interpretation support specialists provides enhanced formation evaluation to better characterize reservoir properties.

Benefits

- Real-time detection of open fractures while drilling
- Identification of micro-fracture zones
- Ability to differentiate between induced and naturally occurring fractures
- Obtain fracture density for optimizing testing and completion program
- Surface logging solution with no associated downhole tool risk
- Correlate gas associated with fractures
- Enhanced Early Kick/Losses Detection as sensitive as 10 l/min

Challenges and Solutions

Detecting open fractures with wireline tools can be difficult in the presence of oil based muds, heavy mud weights and wells with high rugosity. Under these conditions downhole tools are unable to differentiate naturally occurring open, healed, micro-fractures and drilling induced fractures. Seismic logs are also unable to provide the detail required to evaluate these fractures.

The solution is to detect micro-losses at surface using highly accurate Coriolis or Electromagnetic flowmeters; detecting changes as small as 10 l/min. These micro-losses can be evaluated in real-time against the GEOLOG fracture model to characterize fractures as natural open, drilling induced, micro-fractures, and permeability changes regardless of the their aperture and the borehole geometry. GeoFracture is unaffected by mud properties and borehole conditions, thereby providing consistent and accurate results with no down hole risk.

Applications

GeoFracture can be used onshore and offshore on jack up, fixed platform and floating rigs. The service is compatible with both oil based and water based mud systems.

Suitable for exploration and appraisal projects where identifying fractures helps with reservoir assessment. In development wells GeoFracture analysis is vital to optimize the completion program while minimizing evaluation costs.

"With no wireline logs and working purely from the microlosses recorded while drilling we were able to set our packers to isolate each fracture zone for individual testing." Petroceltic

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Case History

Identify Open Fractures in Real-Time Using Surface Measurements

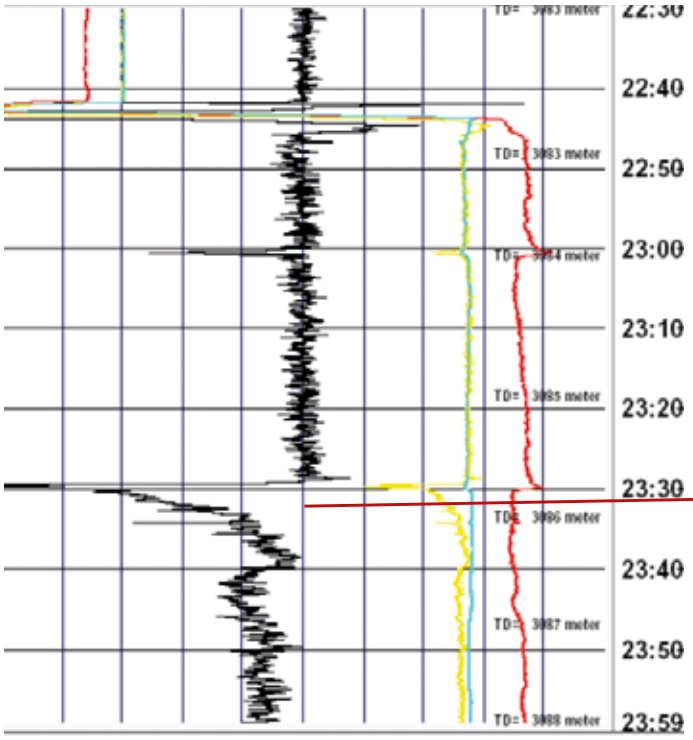

Figure 1. The curve in black is the Delta Flow which matches the signature of a natural open fracture in Figure 3.

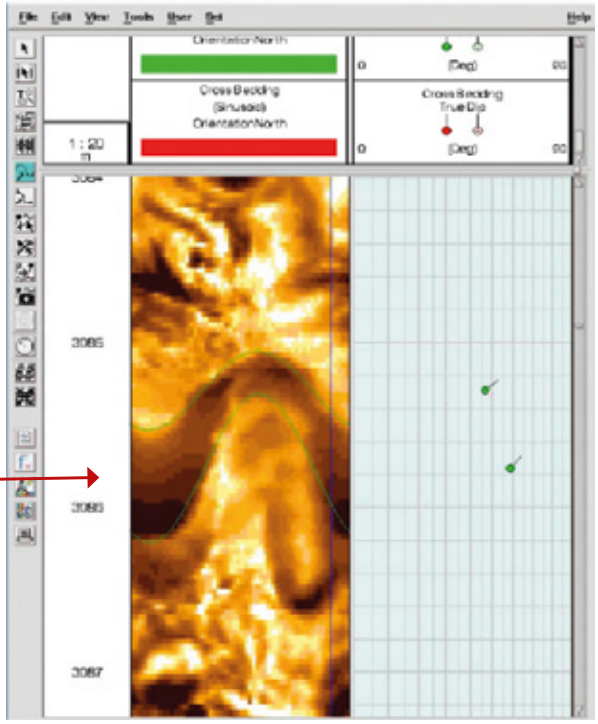

Figure 2. Imaging log confirming a large open fracture .

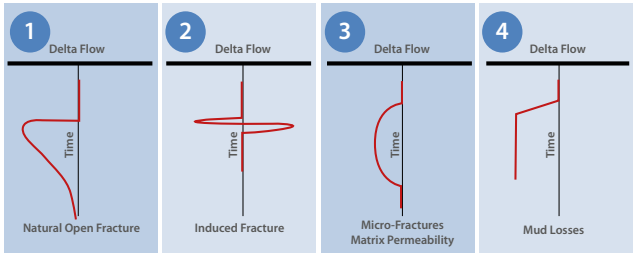

Figure 3. Fracture models used to compare responses in Delta Flow.

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An open fracture was detected at 3086 m while drilling a carbonate reservoir section. Fracture signature in the black DeltaFlow curve (Figure 1) matches the characteristics of a natural open fracture (Figure 3).

The presence of the fracture was confirmed through the Image Log recorded at the end of the section as shown in Figure 2.

Specifications

Measurement Mud flow l/min	0 - 10,000 l/min
Resolution Accuracy	10 l/min 1% of flow reading

GEOLOG around the World

Technical Paper References

Evaluation of a Fractured Tight Reservoir in Real-Time: The importance of Detecting Open Fractures While Drilling With Accurate Mud Flow Measurement. Search and Discovery Article #41632 (AAPG, Denver, May 2015)

Real Time Advanced Surface Flow Analysis for Detection of Open Fractures. SPE-154927 (EAGE, Copenhagen, June 2012)

GEOLOG

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