

GeoFracture Identifies Open Fractures in Real-Time using Advanced Mud Flow Measurements



Client

Repsol
Margarita Field, Onshore, Bolivia

Challenge

Identifying natural fractures in the reservoir in rugose borehole sections that had previously been impossible to characterize with down hole wireline tools.

Solution

Utilize high resolution return mud flow measurements whilst drilling to identify micro-losses. This data is then integrated with hydrocarbon analyses to interpret the presence of open micro-fractures and improve reservoir modelling.

Results

Micro-fractures were identified in real-time while drilling. Additionally, natural large aperture open fractures and drilling induced open fractures were also identified whilst drilling.

Value

Previously undetectable, micro-fractures were confirmed to be the source of hydrocarbon shows, indicating that fracture permeability is the main driver in production variation within this tight sandstone.

Services used



Understanding different types of fracture sets and frequency of occurrence

In the Margarita field, the Huamampampa formation is a characteristic, low porosity quartzitic sandstone, with multi-scale natural fractures that can be well connected and allow fluid production. Understanding the fracture network will help identify reservoir quality and help with reservoir modeling.

Real-Time analysis of down hole fractures

A new method was proposed to identify open fractures through the detection of micro-losses from continuous monitoring of the mud flow out. To detect micro-losses a high resolution and rapidly responding electromagnetic flow meter was provided that was able to measure flow rates with an accuracy of 10 l/min. This was sufficient to identify subtle losses to the formations, indicative of fracturing.

Micro-fractures were identified, along with large aperture and drilling induced fractures. Hydrocarbon responses were correlated with fractures for improved understanding of the reservoir quality. Wireline imaging tools were also run to confirm the large aperture fractures. Unfortunately, due to the poor hole conditions, the quality of wireline image logs was badly affected to the point that the primary means to identify fractures fell upon the GeoFracture service.

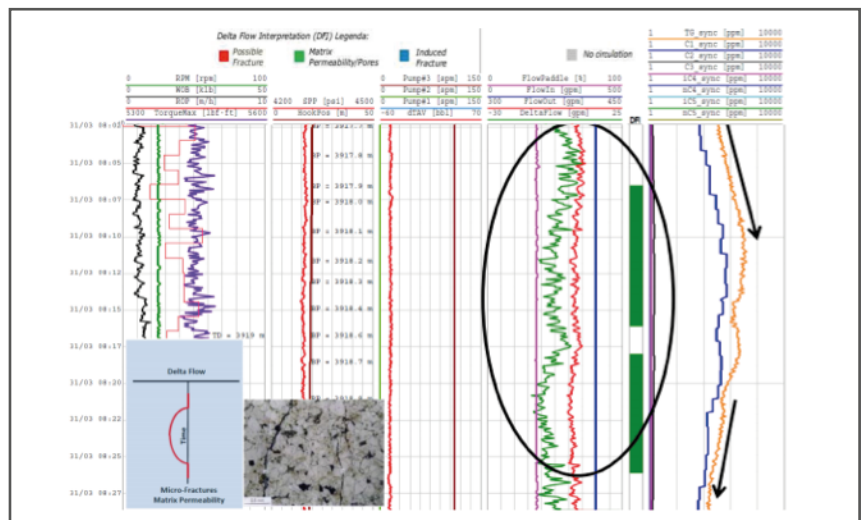


Figure 1. Detection of micro-fractured zone using advanced flow monitoring data

Contact Sales & Marketing for more information at marketing@geolog.com

Technical Paper References

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

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)

