

Poster 10

Real-time formation evaluation from reliable, repeatable gas in mud analysis

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Real-time Surface Monitoring of the Gas in drilling mud is a common practice throughout the Upstream Petroleum Industry and has been used for generations in the oil industry. Typically, hydrocarbon gas monitoring was measured with the primary objective of indicating, in real-time, hydrocarbon bearing formations, and as a safety factor to assist the companyman to make real-time decision making related to the rig operations and downhole reservoir conditions. Several criteria related to the inefficient degassing of the drilling mud, did not encourage any objective, quantitative measurement and analysis of the acquired real-time gas in mud data, and was rarely used for formation evaluation.

Recent improvements in the design and operation of the real-time degassing and gas detection systems have significantly improved the quality of the real-time gas in mud data acquisition, which is then available for real-time analysis. These technical improvements of the mudlogging degassing and gas detection system include:

- Mud Suction Probe design to allow sampling of drilling fluid very close to the bell-nipple.
- True constant volume, constant mud rate GAS TRAP, unaffected by mudflow variations in the well.
- Efficient transport gasline from the Gas Trap to the mudlogging gas detection system.

- High Accuracy, High Sensitivity and fast computation of the gas composition (C1 to nC5).
- Independent determination of total hydrocarbon gas and its individual components.
- Ability to detect recycled hydrocarbon gases pumped down back into the hole, with a second independent gas trap located in the pump suction mud tank. And constantly correct the drilled gas results, from the recycled, injected gas.
- Real-time Integration of all available data acquired whilst drilling, allowing the detection, processing, analysis and evaluation of gas measurements related to any drilling actions or reservoir event.

These practical technical improvements allow the geologist and reservoir engineer, real-time quantitative, detection and analysis of the gases released by the formations during the drilling operations. Further near real-time analysis of the gas data at the rigsite, often provide determination of specific reservoir characteristics, which are critical to the decision making process during drilling operations, and enhance the reservoir modelling characteristics. Recent examples of successful use of these modern mudlogging mud degassing and detection systems include:

- Successful characterisation and identification of *In-situ* Reservoir Fluid Composition in real-time, during drilling when using Synthetic-Oil Based Mud (SOBM). Including condensate-rich or oil bearing zones, dry gas bearing zones, depleted (water swept) zones, water bearing zones.
- Optimisation of future well operations (logging, testing, perforations, etc.)
- Better integration of while drilling data to the well evaluation process
- Significant improvement in early formation evaluation and reservoir studies — especially where traditional log analysis often remains inconclusive.
- Successful indication of lithology changes, seal depth, thickness, porosity variations, permeability barriers.
- Characterisation of biodegradation.
- Geosteering applications in horizontal wells.

This poster presentation highlights these technical improvements, and shows several interesting examples of what this data may provide.