Rapid, Well-Side Mud Logging of Hydrocarbons, Using the Syft Mudlogger Solution

The sensitivity, selectivity, and high-speed analysis provided by Syft Technologies' Mudlogger SIFT-MS solution provides fast, reliable, and economic analysis of drilling mud at the well site.

Key Benefits

- Instantaneous quantitation of C_1 to C_{14} hydrocarbons, aromatic hydrocarbons, and other VOCs
- Differentiation of linear and branched alkanes, cyclics, and aromatics
- Fast time resolution (<15 s) for unparalleled depth resolution
- No cold trap or sample preparation necessary
- Robust field-deployable solution
- Live data streaming
- Remote and automatic operation

High-penetration-rate drilling technologies present a challenge to current mud-gas analysis techniques: they are either too slow (gas chromatography (GC)), or do not quantify a complete range of compounds (photometric and electrochemical techniques). Selected ion flow tube mass spectrometry (SIFT-MS) overcomes these limitations, identifying and quantifying volatile organic compounds (VOCs) directly from mud-tank headspace gas in real time to the mid-part-per-billion (ppb) concentration range. Hence SIFT-MS makes real-time hydrocarbon analysis viable in high penetration rate drilling operations.

In this application note, C_1 – C_{11} data are presented that were acquired in a field test of the Syft Technologies Mudlogger solution. Total gas concentration versus depth is shown in Figure 1, with GC data from the dried sample stream shown for comparison. The concentration of linear, branched and cyclic hydrocarbons are shown in Figures 2 to 5. Figure 6 shows detection of several aromatic compounds. Note that all analytes at each data point shown in Figures 1 to 6 have been acquired simultaneously with a 12-second cycle time. As the rate of penetration is always less than 300 feet per hour, more than 1 data point will be averaged at each foot of depth.

The results presented here demonstrate that the Syft Mudlogger solution can quantify the volatile organics present in drilling mud, including the heavier hydrocarbon fractions. Connected to an appropriate sampling manifold, the high time resolution allows gas in / gas out measurements of the drilling mud, providing easy identification of hydrocarbon recirculation. Moreover, SIFT-MS minimizes both sample pretreatment and calibration requirements. The Syft Mudlogger provides the ultimate solution for rapid, broad-spectrum hydrocarbon analysis at the well-side.

SIFT-MS Analysis

Instrument	Syft *Mudlogger*
Carrier gas	Nitrogen
Sample flow	25 sccm
Data output	WITS, XML, CSV
Analysis type	Selected Ion Mode (SIM)
Reagent ions	H_3O^+, NO^+, O_2^+
Compounds	C_1 to C_{14} linear, branched and cyclic hydrocarbons; aromatic hydrocarbons
Analysis time	<15 seconds
Typical LOQ	250 ppbv; methane 5 ppmv

Experimental Method

Sample	Mud Gas
Accessories	In-line dilution apparatus (part of the Mudlogger solution)[1]
	Nitrogen generator (high-purity model)

1. Mud gas is diluted in line with nitrogen, which also serves to dry the gas.

Further Reading

Syft Brochure *Petrochemical Industry Solutions*

Syft Datasheet *Syft Mudlogger*

Syft Whitepaper *GeoVOC: Rapid detection of light hydrocarbons from oil and natural gas fields*

B.J. Prince, D.B. Milligan, M.J. McEwan (2010), *Application of [SIFT-MS] to real-time atmospheric monitoring* Rapid Commun. Mass Spectrom. 24, 1763.

G.J. Francis, P.F. Wilson, D.B. Milligan, V.S. Langford, M.J. McEwan (2007). *GeoVOC: A SIFT-MS method for the analysis of small linear hydrocarbons of relevance to oil exploration*, International Journal of Mass Spectrometry, 268, 38-46.

Figure 1: Total gas concentration vs drill depth

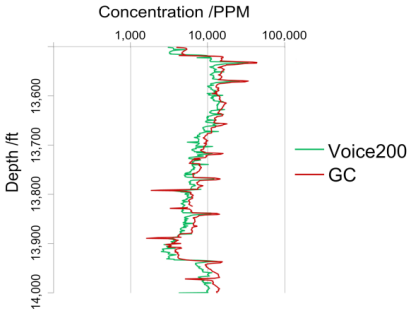


Figure 2: C_1-C_5 hydrocarbon concentration vs depth

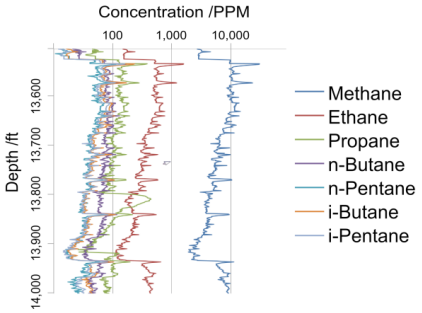


Figure 3: Linear C_6 –C_{11} hydrocarbon concentration vs depth

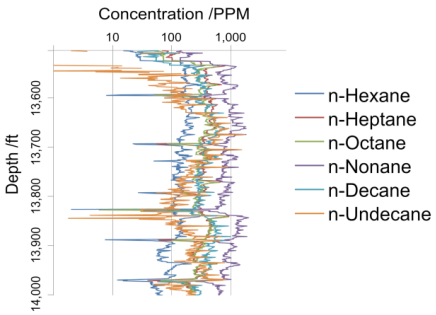


Figure 4: Branched C_6 – C_{11} hydrocarbon concentration vs depth

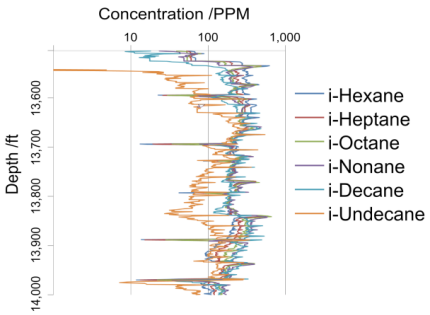


Figure 5: Cyclic hydrocarbon concentration vs depth

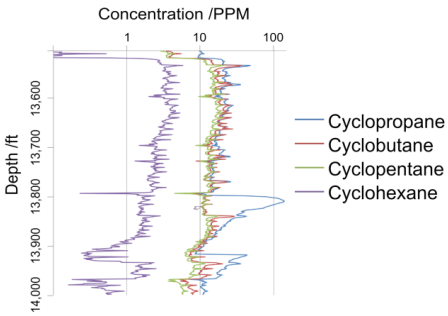
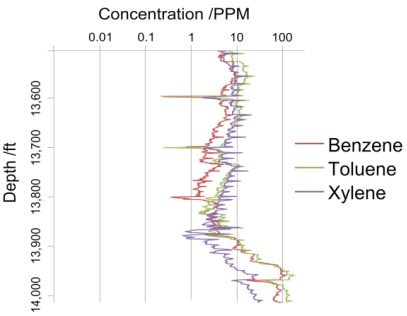


Figure 6: Aromatics concentration vs depth



Syft Technologies Limited

3 Craft Place Middleton
PO Box 28149
Christchurch
New Zealand

Phone +64 3 338 6701
Fax +64 3 338 6704
Email sales@syft.com
Website **www.syft.com**