On-site Rapid Analyses of Well Gases for Mud Logging Applications using Micro Gas Chromatography

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Introduction

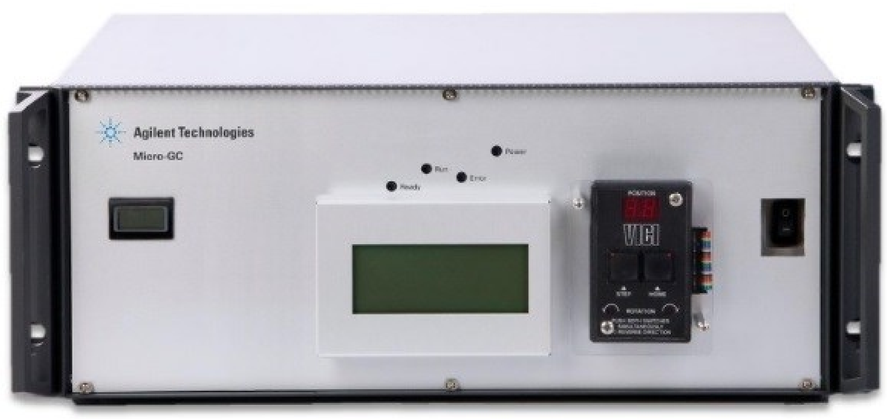
Oil and gas exploration require real-time analysis of dissolved natural gas in mud samples from the well within short run cycles. This posters highlights the use of a Micro GC for rapid and accurate mud logging analysis.

Micro gas chromatography has proven to be an accurate and sensitive technique for the characterization of individual hydrocarbon gases to combine in lithology reports for the mud logging field. Critical information was obtained for making decisions on additional drilling or production of the well.

Miniaturization has resulted in a small, shoe-box size, instrument dimensions and low consumption of power and operating gases. This facilitates easy integration into on-site control cabins or explosion proof enclosures. In addition, industry standard 19-inch rack configuration (dual channel) further simplifies integration into mud logging operations.

Using a Micro GC, the sample is distributed over multiple channels; running an isothermal analysis in parallel. Each column channel is a complete GC containing an electronic carrier gas control, micro-machined injector, narrow-bore analytical column and micro thermal conductivity detector (µTCD).

System setup



Agilent 490 Micro GC in 19”rack housing

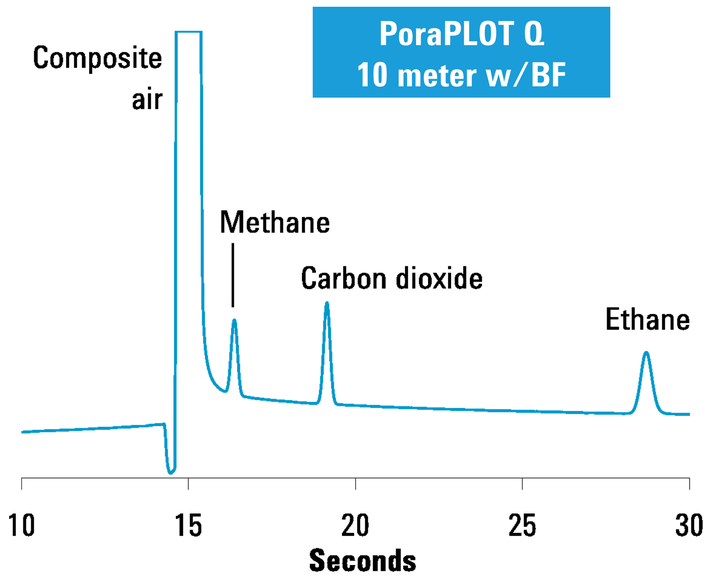
Prior to analysis by Micro GC, the dissolved gases are collected from the drilling fluid typically using semipermeable membranes or vacuum extraction technologies.

A system equipped with two analytical channels analyses mud gases up to C5 in 30 seconds. In that same time a 4 channel system is able to analyze up to C10, including BTEX components.

What can you do in 30 seconds?

Analysis up to n-pentane

PoraPLOT Q
10 meter w/BF

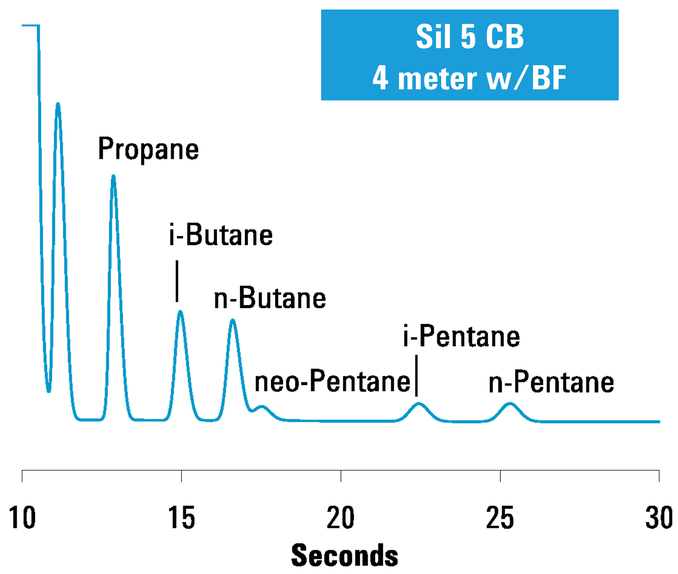


The first column channel, equipped with a 10 meter PoraPLOT Q column, separates methane, ethane and carbon dioxide from the composite peak in just 30 seconds.

The back flush capability ensure venting off late eluting compounds preventing them to interfere in succeeding analysis.

A second, independently controlled, 4 meter CP-Sil 5 CB column channel analyses propane to C5 hydrocarbons. Conventional GC normally requires about 10 minute run time for this application. Miniaturization has dramatically reduced this to just over 30 seconds. Isothermal analysis as, performed on the Micro GC, eliminates column cool-down instrument stabilization each run. This results in very fast run-to-run times.

Sil 5 CB
4 meter w/BF

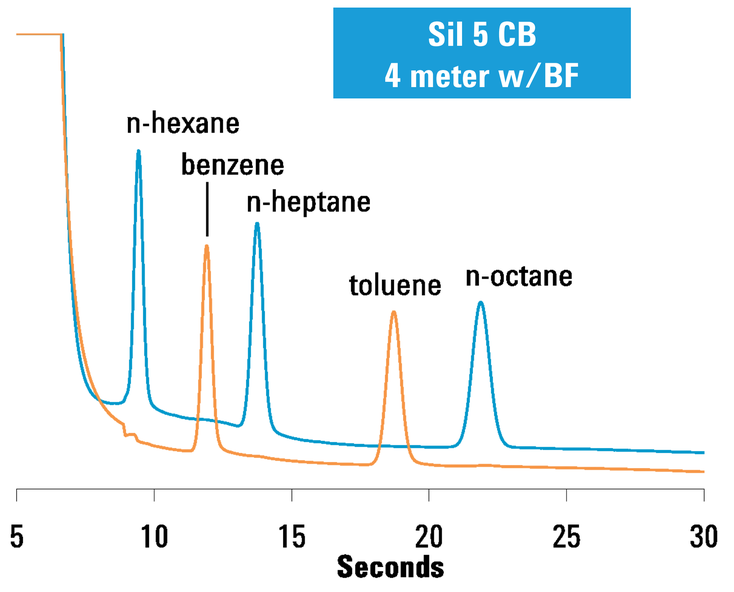


Same speed, more information

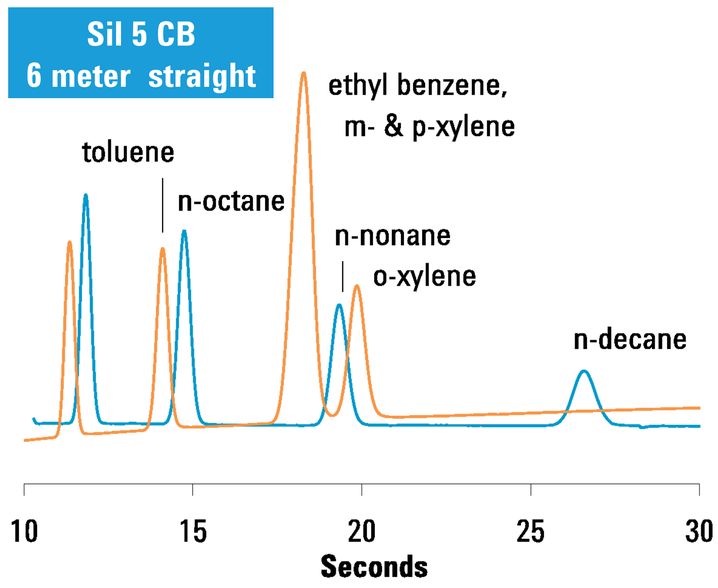
A larger component range (higher hydrocarbons and aromatics) can be analyzed using the same column set, however this will increase total analysis time. To keep the 30 seconds run time, additional columns channels can be added.

Benzene, toluene, n-hexane, n-heptane and n-octane are analyzed on a third channel, equipped with a 4 meter Sil 5 CB column.

Sil 5 CB
4 meter w/BF



Sil 5 CB
6 meter straight



Similar to the first two channels, later eluting compounds are back flushed to vent to prevent interfering in the next run.

A CP-Sil 5 CB column channel with a 6 meter column and without back flush is used for analysis up to n-decane. It also determines the amount of ethyl benzene, p- & m-xylene as a composite peak.

For process applications, the 490-PRO does not require a local operator and runs standalone. On-board data handling and built-in result generation takes over the complete operation. Results and instrument information are automatically passed on to external systems using industry standard protocols.

In contrast to a FID, the µTCD does not require additional or flammable operational gases. This results in an ideal solution to use in on-site control cabinets or explosion proof housings.

Summary

- Full characterization of the well gases is done in 30 seconds, resulting in near real-time monitoring.
- Multiple Micro GC setups are available for mud logging analysis, depending on component range and required total run time.
- Miniaturization of the injector, detector & connections, together with isothermal operation mode contributes to fast run-to-run times.
- The instrument dimensions, small operation gas consumption, on-board data handling & result generation and industry standard 19” rack simplifies integration in process and x-proof cabinets.

For more information

www.agilent.com/chem/microgc

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