

Speeding Up Your Natural Gas Analysis Using a Micro GC Natural Gas Analyzer

Remko van Loon and Coen Duvetkot, Micro GC Product Marketing, Agilent Technologies, Middelburg, the Netherlands

PITTCON[®]
CONFERENCE & EXPO

Agilent Technologies

Poster # 240-8P

Introduction

This poster shows fast analysis of natural gas using the Micro GC based Natural Gas Analyzer (Figure 1). The Micro GC can be equipped with one to four independent column channels. Each column channel is a complete, miniaturized GC with electronic carrier gas control, micro-machined injector, narrow-bore analytical column and micro thermal conductivity detector (μ TCD).

Micro GC Natural Gas Analyzers

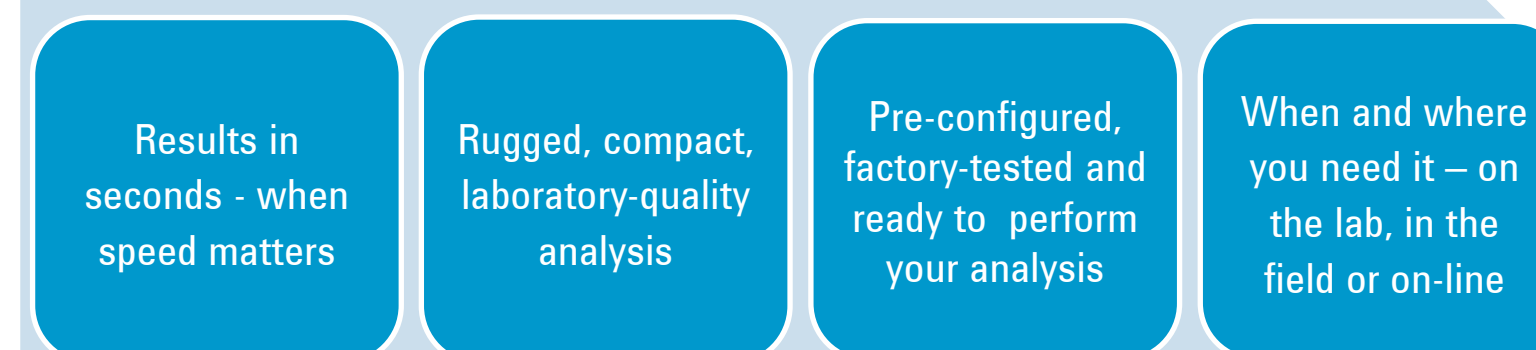


Figure 1. Micro GC based Natural Gas Analyzers.

Instrument Setup

In total, four analyzer configurations are available for the analysis of natural gas. Setup of these analyzers depends on analysis requirements; column choice and analysis characteristics are shown in table below. For this poster the Natural Gas Analyzer B and B Extended were used. Additionally, a micro gasifier accessory was used to expand the application range to liquefied natural gas (LNG).

Natural Gas Analyzer characteristics	Analyzer A	Analyzer A Extended	Analyzer B	Analyzer B Extended
Column channels installed	• HayeSep A • CP-Sil 5 CB, 6m	• HayeSep A • CP-Sil 5 CB, 4m • CP-Sil 5 CB, 8m	• PoraPLOT U • CP-Sil 5 CB, 6m	• CP-MolSieve 5A • PoraPLOT U • CP-Sil 5 CB, 6m
Hydrocarbons	✓ (up to C9)	✓ (up to C12)	✓ (up to C9)	✓ (up to C9)
Carbon dioxide	✓	✓	✓	✓
Hydrogen sulfide			✓	✓
Composite air	✓	✓	✓	✓
Permanent gases (N ₂ , O ₂ , He & H ₂)				✓
Typical analysis time	100 s (up to C7) 200 s (up to C8) 400 s (up to C9)	100 s (up to C7) 200 s (up to C8) 240 s (up to C12)	75 s (up to C7) 200 s (up to C8) 400 s (up to C9)	75 s (up to C7) 200 s (up to C8) 400 s (up to C9)

Results and Discussion – Natural Gas Analysis

PLOT U column for methane – air separation

The first column channel is equipped with a PoraPLOT U analytical column for the separation of methane from the composite air peak and show also baseline separation for carbon dioxide, ethane, hydrogen sulfide and propane (Figure 2).

Inert sample path for hydrogen sulfide analysis

The sample inlet of the Micro GC have been treated with a metal surface deactivation process (UltiMetal), which results in an inert sample flow path and excellent peak shape for hydrogen sulfide (Figure 2), even at low concentrations.

Back flush to speed up analysis time

Hydrocarbons above propane, present in natural gas, were back flushed to improve analysis time. A back flush Micro GC channel consists of a pre-column and an analytical column; the two columns are coupled at a pressure point. This setup enables the possibility to invert the carrier gas flow direction through the pre-column at any time. As a result the undesired compounds will not enter the analytical column and send to vent.

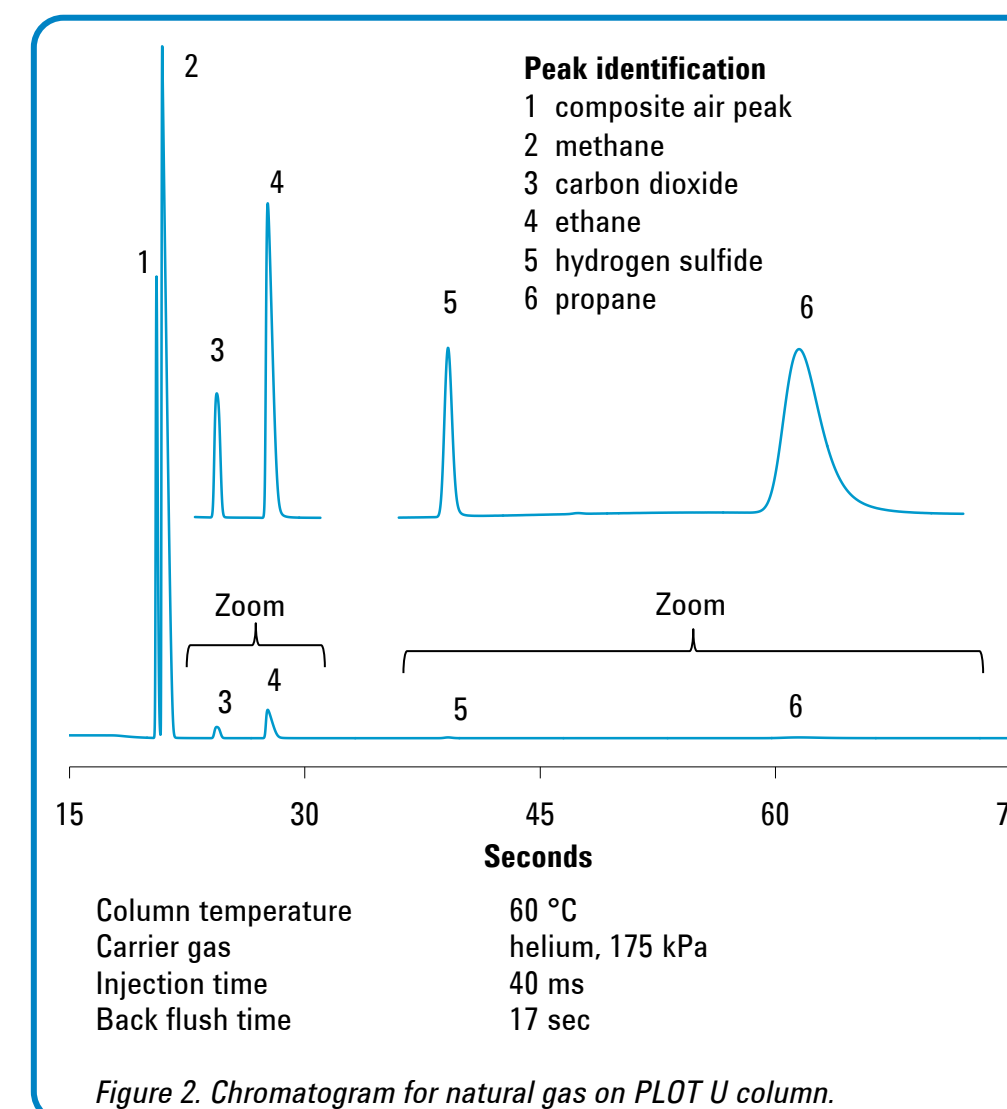


Figure 2. Chromatogram for natural gas on PLOT U column.

C4+ hydrocarbons analyzed on a second column channel

Simultaneously, butanes and higher hydrocarbons are analyzed on a second column channel equipped with a 6 meter CP-Sil 5 CB column. Analysis up to C8 is done was done in just over 3 minutes as depicted in Figure 3.

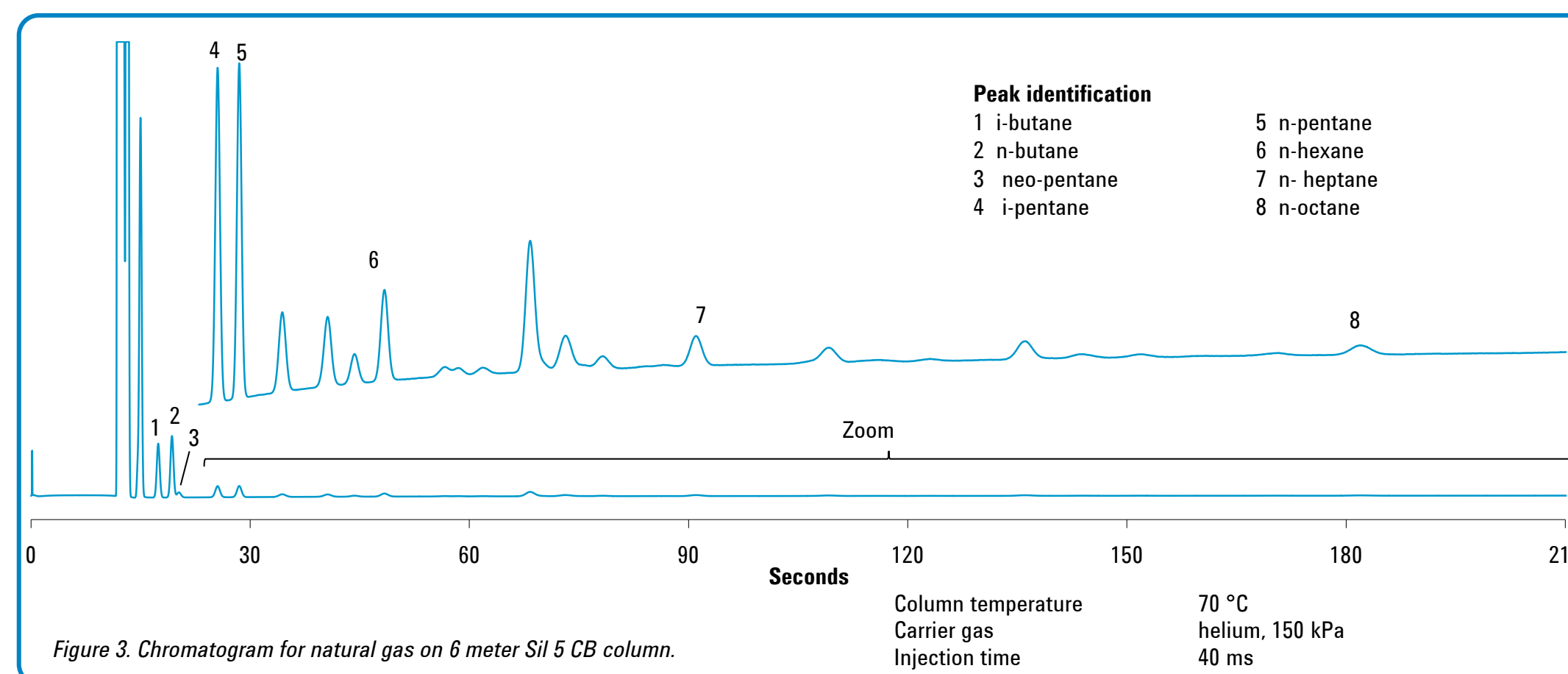


Figure 3. Chromatogram for natural gas on 6 meter Sil 5 CB column.

Results and Discussion – Extended Analysis

Molecular Sieve column for permanent gas analysis

The Extended Natural Gas Analyzer, equipped with an additional column channel containing a molecular sieves, is used when detailed information about the permanent gases in natural is needed. Figure 4 shows the chromatogram for this channel using argon carrier gas.

Back flush to protect analytical column

Moisture and carbon dioxide tend to adsorb quickly to the molsieve stationary phase and change its chromatographic properties. This would results, over time, in retention shifts and loss of separation; to maintain the separation efficiency of this column, these compounds are back flushed.

Reporting tools for physical properties

Physical properties, such as heating value and wobbe index, are calculated conform official methods from American Society of Testing and Materials (ASTM), Gas Processors Association (GPA) and International Standards Organization (ISO).

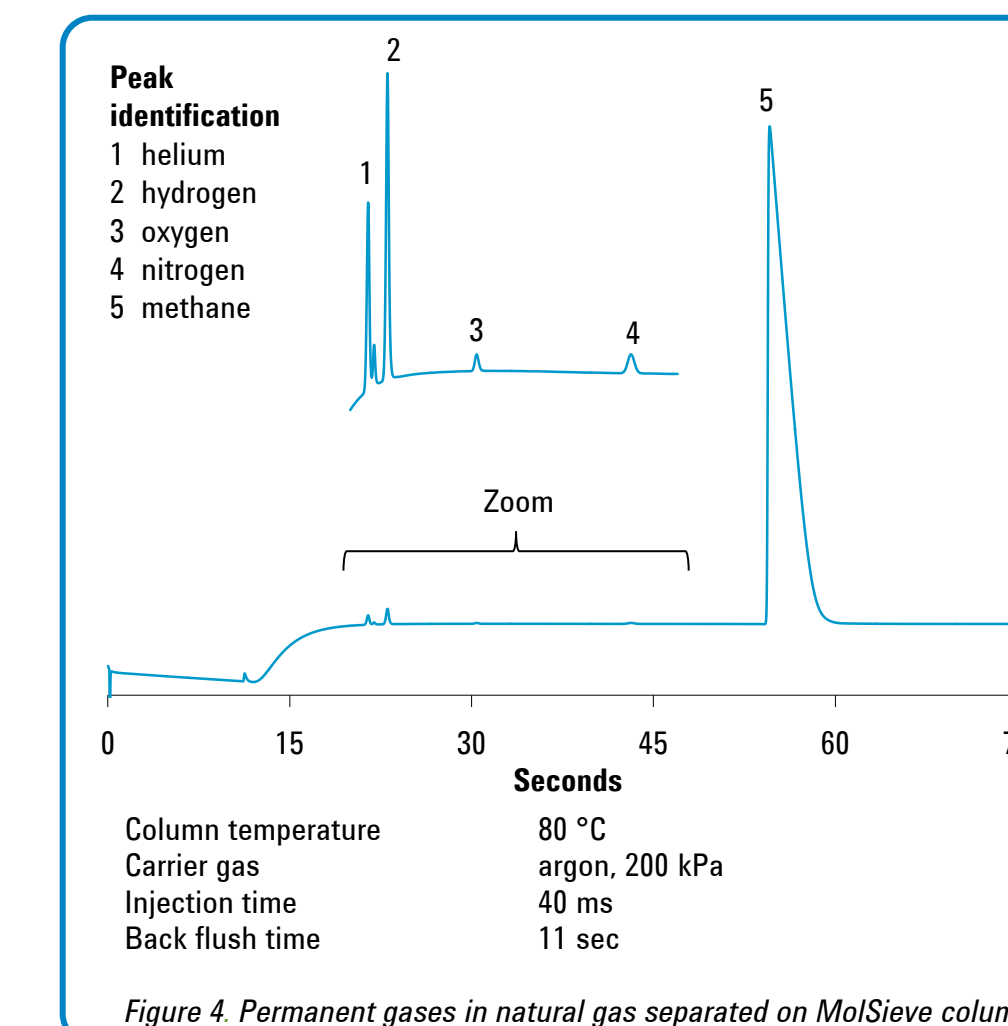


Figure 4. Permanent gases in natural gas separated on MolSieve column.

Conclusions

- Micro GC based analyzer can be used for fast and accurate analysis of natural gas and related streams; baseline separation for all compounds of interest is obtained.
- Micro GC Natural Gas Analyzers are shipped as a total solution, including reporting tools for calorific value calculations.
- Fast analysis of natural gas is achieved on two channel Micro GC containing a PLOT U and CP-Sil 5 column; typical analysis time up to n-C8 is 200 seconds.
- Additional information about the permanent gases is obtained by an optional third channel with a MolSieve 5A column.
- The back flush functionality ensures that the undesired compounds will not enter the analytical column, which results in the protection of the column and shorter analysis times.
- Metal surface deactivation (UltiMetal) of Micro GCs' sample inlet results in excellent peak shape for hydrogen sulfide.

References

To learn more about the Agilent 490 Micro GC Natural Gas Analyzer visit www.agilent.com/chem/microgc

- [1] 5991-0275EN; Application Note – Fast Analysis of Natural Gas Using the Agilent Natural Gas Analyzer; 2012.
- [2] 5991-0301EN; Data Sheet – Agilent 490 Micro GC Natural Gas Analyzers; 2012.
- [3] 5991-1093EN; Brochure – Agilent Analyzers and Application Kits; October 2012.

Leave your business card for a reprint of this poster. Open a QR code application on your smart phone a scan for more info.

