# OPTIMIZE PROCESS EFFICIENCY IN THE LAB AND IN THE FIELD

The Measure of Confidence

## Agilent Natural Gas Analyzers

Global demand for clean energy has increased the need for efficient natural gas exploration and production. Natural gas – a naturally occurring mixture of gaseous hydrocarbons – consists primarily of methane; however, it can also include other hydrocarbons, along with small amounts of oxygen, nitrogen, and other impurities.

The composition and calorific value of natural gas determines its commercial value, so it is important to obtain fast, accurate compositional data in the field, during processing, through transportation, and prior to distribution. For shale gas, you must also identify natural gas fields during exploration, and monitor gas composition and purity during extraction.

### Measure to mitigate: monitor all aspects of the natural gas production workflow

To meet these challenges, Agilent provides Natural Gas Analyzers that allow your facility to confidently report, bill, and meet safety requirements immediately after installation. Each is factory pre-tested and pre-configured to deliver ready-to-go-methodology – allowing you to focus on performance verification and process monitoring.

### Agilent Natural Gas Analyzers reflect industry standards and a stringent quality control process. Each includes:

**Factory**

- System configuration and leak testing
- Instrument checkout
- Installation of appropriate column
- Factory-run chemical checkout using application specific checkout mix

**Delivery**

- Instrument manual for running the checkout method
- CD-ROM with method parameters and data files for easy out-of-the-box operation
- Consumables included – no separate ordering required
- Easy consumables re-ordering information

**Installation**

- Duplicate factory checkout with checkout sample on site
- Optional application startup assistance


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# Rapid, accurate analysis ensures safety and profitability at every step

## Exploration and mud logging

During exploration, outcroppings and rock formations give geologists clues to potential gas field locations. Onshore and offshore seismic monitors provide additional feedback related to sub-surface structures and potential gas deposits.

Exploration companies also use mud logging – the drilling of exploratory wells – to determine what lies beneath the surface. Mud logging data are used to create a lithography report of geological conditions, which helps the company make sound drilling decisions, including optimal drilling depth.

### Analyze field gas composition in just 30 seconds

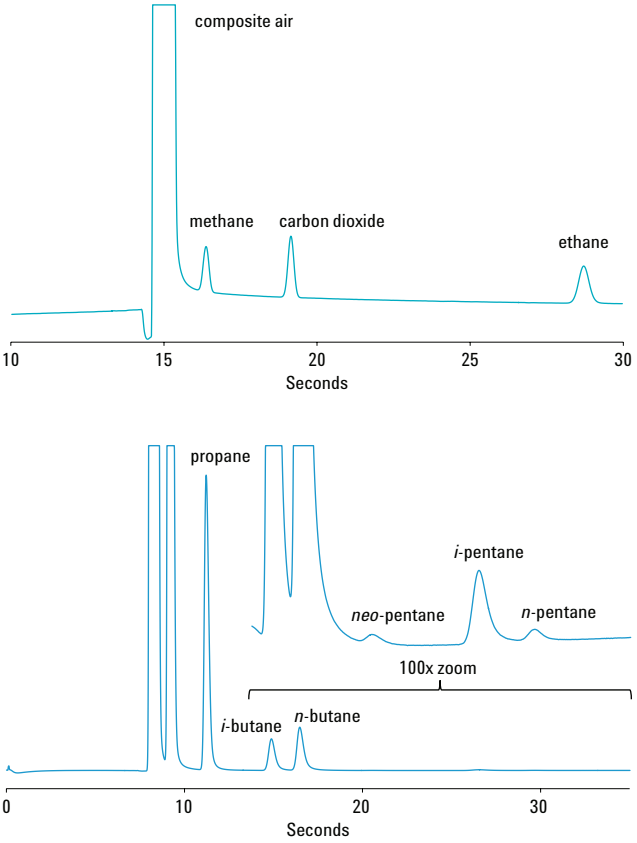
Built around Micro GC technology, **Agilent Mobile Analyzers** provide fast, reliable and near-real-time data about gases evolving from the mud around the drill hole. Applications include hydrocarbons from C1-C5 – with speciation of C4 and C5 components – and permanent gas analysis.

## Extraction

After locating a potential natural gas deposit, drilling experts bore to the depth determined during exploration and mud logging. If the new well yields natural gas, engineers evaluate its hydrocarbon composition and volume. Wells that yield a marketable quantity of natural gas undergo further development and production.

### Make confident decisions, quickly

The ability to determine gas composition and commercial value close to the source saves both time and money. **Agilent Micro GC Natural Gas Analyzers** provide fast, robust data about gas composition and impurity content during pilot drilling, or when monitoring calorific value of gas in the pipeline. So you can maximize yields by making informed judgments about the depth or angle of horizontal drilling activity.




These results were produced in 30 seconds or less using Agilent mobile analyzers.

With Agilent Micro GC Natural Gas Analyzers, you can quickly and reliably monitor well efficiency during drilling.

## Production

Natural gas is widely used for heating buildings, generating electricity, and providing needed power for industrial processes. Before it is sold, however, natural gas must meet strict specifications for calorific value and purity. For example, production by-products – such as ethane, propane, butanes, pentanes, and hydrogen sulfide – must be characterized prior to use in downstream processes.

### Increase efficiency and profits by accurately determining composition yields

You can quickly and reliably monitor production processes and verify product quality with **Agilent 7890 GC and 490 Micro GC Systems**. They are factory-configured and chemically tested to help you:

- Determine composition in detail – including routine hydrocarbon analysis (C1-C4 chain length hydrocarbons with C6+ as backflush), impurity analysis ($O_2$, $N_2$, $CO_2$, $H_2$, He, and sulfur-containing hydrocarbons), and expanded hydrocarbon analysis (to C14).
- Monitor process efficiency using pre-configured workflow solutions that deliver precise, reproducible, reliable data.
- Adapt the analyzer to meet your specific monitoring requirements, such as liquefied/gaseous samples or extended hydrocarbons.
- Generate data for compliance and control.

## Transportation and distribution

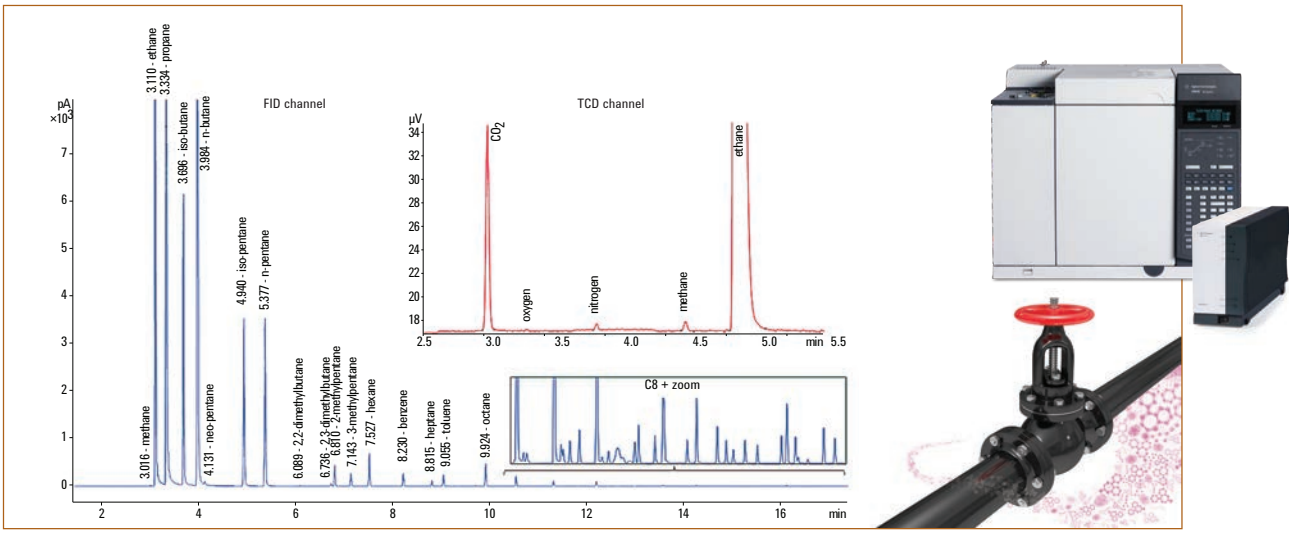
Identifying corrosive sour gas prior to pipeline distribution (or liquefaction and transport in large LNG vessels) helps protect resources from damage. Typically, producers determine calorific value of processed gas at the distribution head. For final delivery, finished gas is transported through lower-volume pipelines to homes and industries.

Because natural gas is colorless and odorless, low levels of sulfur-based odorants are added to ensure fast leak detection. Subsequently, natural gas distributors must monitor odorant concentrations throughout transportation and distribution.

Additionally, through our vacuum division, Agilent Technologies provides natural gas producers with the technology needed to evacuate shipping containers and pressurize gas for liquefaction. This service includes providing valves, pumps, and leak detection systems that, when coupled to the mobile analytical systems, allow your team to monitor the efficiency of the process. This way your operation can confidently process and report calorific value for gas prepared for transport.

### Quickly and reliably determine calorific value

**Lab-based Natural Gas Analyzers** from Agilent let you perform in-depth analysis of gas composition and purity. Our **Mobile Analyzers** address the need for portside or on-board measurement of natural gas composition prior to export. Agilent can also help you conform to requirements for transfer of ownership, billing, and reporting of calorific value and gas volume.




Full analysis of permanent gases and extended hydrocarbons in less than 16 minutes using the Agilent 7890B.

## Agilent Natural Gas Analyzer Portfolio

| System Description | Configured per Method | Sample Types | Target Analytes |
|---|---|---|---|
| Natural Gas Analyzer | ASTM D1945, GPA 2261 | Natural gas and similar gaseous mixtures | $C_1$-$C_5$ (methane, ethane, propane, iso-butane, n-butane, iso-pentane, and n-pentane), $C_{6+}$ as backflush, $O_2$, $N_2$, $CO_2$, and CO |
| Sour Natural Gas Analyzer | ASTM D1945, GPA 2261 | Natural gas and similar gaseous mixtures | $C_1$-$C_5$ (methane, ethane, propane, iso-butane, n-butane, iso-pentane, and n-pentane), $C_{6+}$ as backflush, $O_2$, $N_2$, $CO_2$, and CO |
| Natural Gas Analyzer with $H_2$ and He | ASTM D1945, GPA 2261 | Natural gas and similar gaseous mixtures | $H_2$, He, $H_2S$, $C_1$-$C_5$, $C_6$+, $O_2$, $N_2$, $CO_2$, and CO |
| Single Valve Natural Gas Analyzer | GPA 2261 | Natural gas and similar gaseous mixtures | $C_1$-$C_5$ (methane, ethane, propane, iso-butane, n-butane, iso-pentane, and n-pentane), $C_{6+}$ as backflush, Air Composite, and $CO_2$ |
| Liquefied Natural Gas Analyzer | GPA 2177 | Natural gas and similar gaseous mixtures | $C_1$-$C_5$, $C_6$+ as backflush, $O_2$, $N_2$, $CO_2$, and CO |
| Natural Gas Analyzer with Enhanced Hydrocarbon Detection | ASTM D1945, GPA 2261 | Natural gas and similar gaseous mixtures | $C_1$-$C_5$, $C_6$+, $H_2$, He, $O_2$, $N_2$, $CO_2$, and CO |
| Extended Natural Gas Analyzer (to C12) | GPA 2286 | Natural gas and similar gaseous mixtures | $C_1$-$C_5$, $C_{12}$, $O_2$, $N_2$, $CO_2$, and CO |
| Extended Natural Gas Analyzer (to C14) | GPA 2286 | Natural gas and similar gaseous mixtures | $C_1$-$C_5$, $C_{14}$, $O_2$, $N_2$, $CO_2$, and CO |
| Extended Liquefied Natural Gas Analyzer | GPA 2186 | Liquefied natural gas | $C_1$-$C_{14}$, Air, and $CO_2$ |
| Extended Natural Gas Analyzer (with $H_2S$) | GPA 2286 | Natural gas and similar gaseous mixtures | $C_1$-$C_{14}$, Ar, $O_2$, $N_2$, $CO_2$, and $H_2S$ |
| Light Hydrocarbons Analyzer | | Natural gas and similar gaseous mixtures | |
| Natural Gas Analyzer with $H_2$, He, and % level $H_2S$ | | Natural gas and similar gaseous mixtures | |
| Natural Gas Analyzer A: 2-Channel Micro GC | ASTM D3588-98, GPA 2177, GPA 2172, ISO 6974-6 | Natural gas and liquefied natural gas | $C_1$-$C_9$, Air, and $CO_2$ |
| Natural Gas Analyzer A Extended: 3-Channel Micro GC | ASTM D3588-98, GPA 2177, GPA 2172, ISO 6974-6 | Natural gas and liquefied natural gas | $C_1$-$C_{12}$, Air, and $CO_2$ |
| Natural Gas Analyzer B with $H_2S$: 2-Channel Micro GC | ASTM D3588-98, GPA 2177, GPA 2172, ISO 6974-6 | Natural gas and liquefied natural gas | $H_2S$, $C_1$-$C_9$, Air, and $CO_2$ |
| Natural Gas Analyzer B Extended with $H_2S$: 3-Channel Micro GC | ASTM D3588-98, GPA 2177, GPA 2172, ISO 6974-6 | Natural gas and liquefied natural gas | $C_1$-$C_9$, $H_2S$, $O_2$, $N_2$, He, $H_2$, $CO_2$, and CO |

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