Fast and Accurate Continuous Analysis of Natural Gas Impurities Using Rosemount Quantum Cascade Laser (QCL) Gas Analyzers

Process Overview

Natural gas is principally composed of methane but also includes amounts of higher value hydrocarbons, additional gases, water and other impurities. The identification and removal of impurities is critical as contaminants can degrade process efficiency, cause corrosion and equipment damage and increase financial and safety risks.

Measurement Challenges

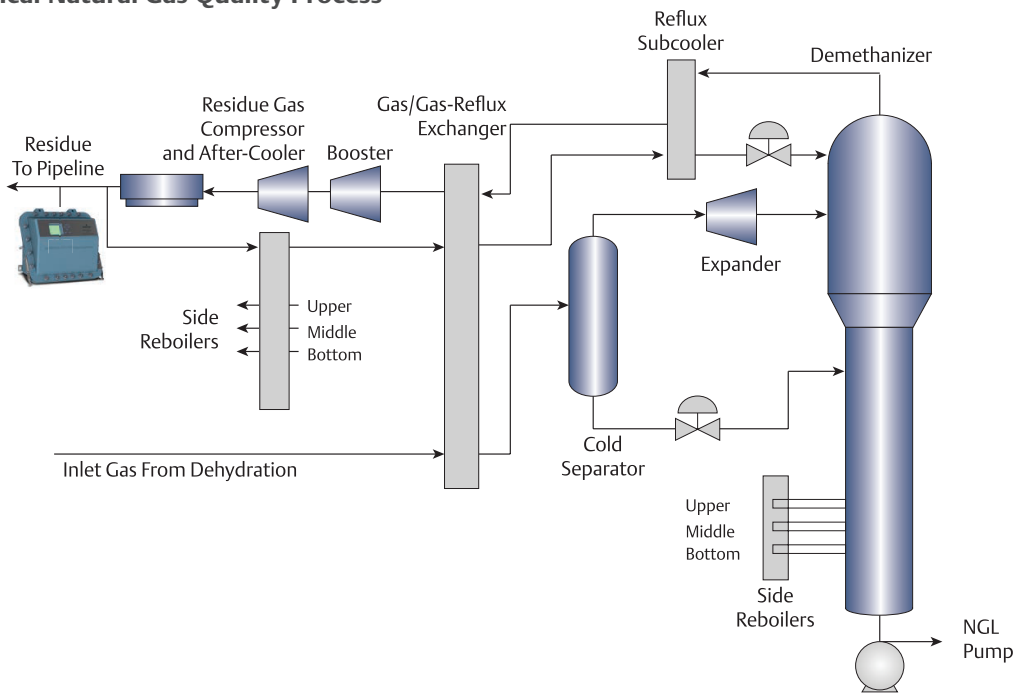
As sources of natural gas become more diversified, including LNG, shale gas and renewable natural gas (often called RNG or biomethane in reference to biogas that has been upgraded for use in place of conventional natural gas), operators must be able to ensure the composition of the gas delivered – and received – is of sufficient quality per contractual fiscal agreements and pipeline quality and safety requirements. The increasing variability of the gas quality means that there is a greater need to measure the gas contaminants fast and accurately, often in remote locations without on-site operators or maintenance personnel.

The Emerson Solution

Laser Absorption Spectroscopy is a gas analysis method used to detect gas molecules and identify their concentrations. Rosemount™ Quantum Cascade Laser (QCL) Analyzers are continuous gas analyzers that utilize a unique hybrid laser spectroscopy technology which combines Quantum Cascade Lasers (QCL) with Tunable Diode Lasers (TDL) to provide fast, direct, and highly selective measurement of natural gas impurities.

Combining QCL with TDL spectroscopy in a single instrument enables Rosemount Quantum Cascade Laser Gas Analyzers to broaden insight and monitor both the near and mid-infrared range of spectroscopic light. This hybrid approach uses QCLs to detect and identify gas molecules in the mid-infrared wavelength range, allowing the strongest absorption lines and highest sensitivities, in addition to TDLs which work in the near-infrared spectral region where laser sources exhibit higher performance. The results of this hybrid approach are a highly selective identification of the desired molecules and high-resolution measurements with very fast response times.

Figure 1 - Typical Natural Gas Quality Process



Implementing the Rosemount CT5800 Continuous Gas Analyzer to monitor the quality of natural gas enables accurate and sensitive measurement of very low concentrations of impurities in real time. The device minimizes costs because it can house up to six Quantum Cascade Lasers, enabling measurement of multiple gas components simultaneously in a single analyzer. It is also equipped with automated validation diagnostics to ensure reliable measurement performance.

The Rosemount CT5800 Continuous Gas Analyzer features a flameproof enclosure designed for hazardous areas and includes an intuitive local operator interface for easy access to all instrument functions. It is designed to meet the demands of various natural gas quality analysis applications, including offshore/onshore production sites, gas processing, custody transfer points, storage facilities and distribution networks.

Table 1 - Typical Measurement Ranges in Natural Gas

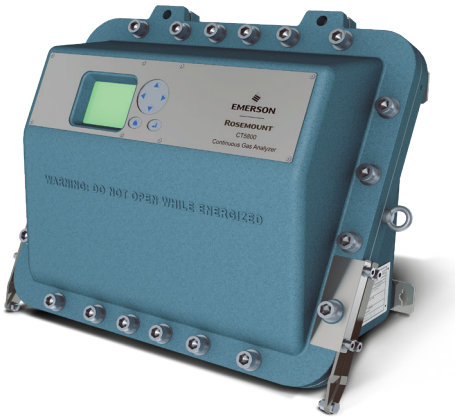
	Measurement Range		
Component	**Range**	**LOD**	**Repeatability***
H_2O	**Low Range:** 0 – 100 ppm	0.2 ppm	±1 %
	High Range: 0 – 2500 ppm	5.0 ppm	±1 %
CO_2	**Low Range:** 0 – 1000 ppm	2 ppm	±1 %
	High Range: 0 – 20 %	0.04 %	±1 %

**Repeatability is ±1 % of reading or the Limit of Detection (LOD), whichever is greater. Other ranges/gases are available. Please consult an Emerson application specialist.*

Benefits of the Hybrid QCL/TDL Gas Analysis Technology

As the world's only hybrid QCL and TDL analyzers, Rosemount Quantum Cascade Laser Gas Analyzers deliver the most sophisticated industrial gas sensing and analysis, enabling operators increased process control and minimized operational cost. Benefits of the Rosemount QCL technology include:

- Multiple QCL/TDL lasers in a single analyzer for fast detection and analysis of impurities, such as CO_2 and H_2O in natural gas streams
- Update time of <1 second delivers critical monitoring of gas quality to mitigate problems within the process or downstream
- High sensitivity and selectivity allow the detection of multiple components and trace impurities simultaneously, even in complex mixtures and while remaining immune to cross-interference effects
- Patented laser chirp technique analyses the gas continuously down to sub-ppm concentrations, enabling sub-second measurements in real time
- No in-field enclosure or shelters and reduced consumables and calibration minimize cost and maintenance
- Interchangeable modular configuration of up to six lasers simplify field service and upgrades
- Easy-to-install instrumentation and fast technician training



Designed for hazardous areas, the Rosemount CT5800 Continuous Gas Analyzer features an IP66 field flameproof enclosure ATEX II 2G Exd IIB + H2 T4 for ambient temperature from -20 to +55°C.

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