Direct LNG composition measurement with Raman spectroscopy

Endress+Hauser Raman technology helps simplify LNG analysis by measuring composition directly in the liquid phase, reducing system complexity and supporting faster process insight

Benefits at a glance

- Measures LNG composition directly in the liquid phase without requiring vaporization
- Reduces system complexity by eliminating the need for a vaporizer, carrier gases and extensive sample conditioning
- Supports real-time measurement of methane and other LNG components used to calculate heating value, density and Wobbe Index
- Improves visibility during dynamic loading, unloading, truck loading and bunkering operations
- Helps reduce maintenance requirements and potential sources of measurement uncertainty

Aerial view of LNG facility

Summary Liquefied natural gas (LNG) producers, terminal operators and custody transfer stakeholders require accurate, reliable composition measurement to support energy calculations, product quality verification and commercial transactions. Because LNG is stored and transported at approximately -260 °F (-162 °C), traditional analysis methods typically require the liquid sample to be vaporized before measurement. This adds complexity, maintenance requirements and potential measurement uncertainty.

Endress+Hauser Raman spectroscopy provides a modern alternative by measuring LNG composition directly in the liquid phase, helping simplify analytical systems while supporting real-time process insight.

Challenge LNG is composed primarily of methane, with smaller amounts of ethane, propane, butane, pentane and

Endress+Hauser

People for Process Automation

nitrogen. Its composition directly impacts heating value, density, Wobbe Index and overall commercial value, making accurate methane and hydrocarbon measurement essential for custody transfer and quality control.

As global LNG demand has increased, the United States has become the world's leading LNG exporter, with large export terminals along the Gulf Coast supplying customers across Europe, Asia and South America. This growth has increased the need for dependable analytical technologies that can support custody transfer, product quality and operational efficiency.

Conventional LNG analysis often relies on vaporizer and gas chromatograph systems. Before entering a gas chromatograph, the LNG sample must be converted from liquid to gas. This vaporization step can increase system complexity, introduce additional maintenance requirements and become a significant source of measurement uncertainty.

For operations such as LNG loading, unloading, truck loading and bunkering, frequent process starts and stops can create additional challenges. Analytical systems must respond quickly, stabilize efficiently and deliver reliable composition data without excessive sample conditioning or manual intervention.

Solution Endress+Hauser Raman spectroscopy uses a laser to interact with molecules and measure. Each molecule produces a distinct spectral fingerprint, allowing the analyzer to identify and quantify components within the process stream. In LNG applications, Raman technology can measure methane and other LNG components in real time and provide composition data that can be used to calculate key values such as heating value, density and Wobbe Index.

Unlike traditional systems that require vaporization before analysis, Endress+Hauser Raman technology measures LNG directly in the liquid phase. A cryogenic Raman probe can be installed in the LNG process pipeline or fast loop, enabling continuous in-situ measurement without a vaporizer, sample transport system, carrier gases or extensive sample conditioning equipment.

This direct measurement approach helps reduce installation complexity and removes many common sources of measurement error. Because the analyzer remains connected to the process, it can provide continuous composition measurements with faster response to changing

Raman Rxn-41 cryogenic probe with pigtail

process conditions.

Endress+Hauser Raman analyzers are designed for continuous process measurement and can support demanding natural gas and LNG applications, including custody transfer and LNG bunkering. The technology offers a smaller footprint and simplified operation compared with conventional vaporizer and gas chromatograph systems.

Results By measuring LNG composition directly in the liquid phase, Endress+Hauser Raman spectroscopy helps operators simplify analytical infrastructure, reduce maintenance requirements and improve measurement reliability. Eliminating the vaporizer reduces system complexity and removes a major potential source of uncertainty in traditional LNG analysis.

The faster response time of Raman analyzers can provide improved visibility during dynamic operations such as loading, unloading and bunkering. With minimal stabilization time, measurement can resume quickly when flow returns, helping operators maintain more consistent composition data during start-stop processes.

The technology also supports continuous measurement of LNG components used to calculate heating value, density and Wobbe Index, giving stakeholders the data needed for custody transfer, product quality verification and operational decision-making.

With no vaporizer required, faster cycle times, reduced maintenance needs and proven applicability in LNG measurement, Endress+Hauser Raman spectroscopy offers a practical solution for improving the reliability and efficiency of LNG composition analysis.

Raman Rxn-41 cryogenic probe

www.addresses.endress.com

AI01457A/24/EN/01.26-00

Endress+Hauser

People for Process Automation