SPECTRAL ENGINES

Hydrocarbon measurements in smart industry processes

Hydrocarbon measurement is a critical quality attribute in many smart industry processes

There is a high demand for knowing the total compositions of hydrocarbon gas mixtures in energy, power plants, natural gas and biogas industries. Natural gas production is expected to become the second-largest source of energy in the world by 2035. The smart industry needs innovative solutions to efficiently process gas reserves and capture valuable natural gas liquids. Biogas is produced from organic waste and can be used for energy production in similar ways as natural gas. Both energy production concepts are growing, thanks to the increasing need for new energy sources to replace the use of fossil fuels and nuclear power in the long run.

Hydrocarbons are critical compounds in various applications in energy industries. Composition analysis of C1–C5 alkane gases is important in applications of natural gas production, LNG stations, power plants and in many other oil & gas industry applications.

Advanced process control technologies provide fast and accurate feed and product analysis which are critical in optimizing efficiency and payback in various processing phases. Online and fast sensors are required to ensure optimum combustion efficiency and acceptable emission levels in power generation applications. In LNG transport applications, fast and easy-to-use analyzers are required to ensure quality at transfer points. Today, mainly very expensive Gas Chromatographs (GS) or Fourier Transform Infrared (FTIR) measurement systems are used for gas quality monitoring. However, both technologies are quite expensive, bulky and relatively slow. Another approach is to use fixed wavelength systems, such as Non-Dispersive Infrared (NDIR). NDIR sensors are cheap but they cannot separate differences from each other and the drift of sensors makes them quite unreliable for process quality monitoring.

Spectral Engines' solutions for hydrocarbon analysis

Spectral Engines' NIRONE™ Sensors offer a cost-efficient way to monitor hydrocarbon concentrations in many oil & gas or energy industry applications. Near-infrared (NIR) spectroscopy is a very fast method. It offers high sensitivity for low concentrations but also good selectivity to distinguish different alkanes. NIR spectroscopy is significantly cheaper than GCs of FTIRs. Spectral Engines' sensors are also compact and they enable building small sensor systems for industrial hydrocarbon measurement.

Benefits of Spectral Engines' sensors:

· Rapid and non-destructive analysis

· Measurement without sample preparation

· Cost-effective solutions for the energy industry

## Hydrocarbon sensors increase the quality of biogas production

The role of biogas production has been growing significantly in recent decades. Biogas is a renewable energy resource and it can be produced from various raw materials such as plant materials or agricultural, municipal and food waste. The main components of biogas are methane (CH4) and carbon dioxide (CO2), but there may be low concentrations of also hydrogen sulfide(H2S), moisture and siloxanes.

Biogas is a very clean fuel that does not create greenhouse gas emissions, and its production is a continuous process. A major challenge concerning its production is that it is highly fragmented. The quality of raw material and energy also varies a lot because of limited process control equipment. Methane and carbon dioxide measurements would help operators to better understand their production and also enable controlling the quality of energy. Furthermore, the price point of Spectral Engines' hydrocarbon sensor is much less than existing GCs or FTIR systems, which makes it possible to use them also in smaller biogas production plants without the need of sample preparations or any special maintenance.

New cost-efficient gas measurement technology for LNG applications

The LNG industry has generally focused on large baseload plants on land for many years. However, in recent years, smaller plants have received considerable investments including Floating Liquefied Natural Gas (FLNG) plants. In these plants, simple, low-cost and maintenance-free online analysis is required due to CAPEX/OPEX tradeoff shifts. In addition, some of these plants are built in areas where access is limited, making complex analyzer system support cost prohibitive.

There are multiple measurement points through the supply chain where gas composition and calorific value are sought, including gas pre-treatment facilities, export and import LNG locations, storage tank quality assessments, and vaporization/condensing facilities. The feedstock natural gas for the liquefaction plants may have different chemical compositions, yielding different calorific value of the output LNG. The decision to remove the heavier hydrocarbons depends on the market for byproducts (such as butane or propane) at the site of the liquefaction.
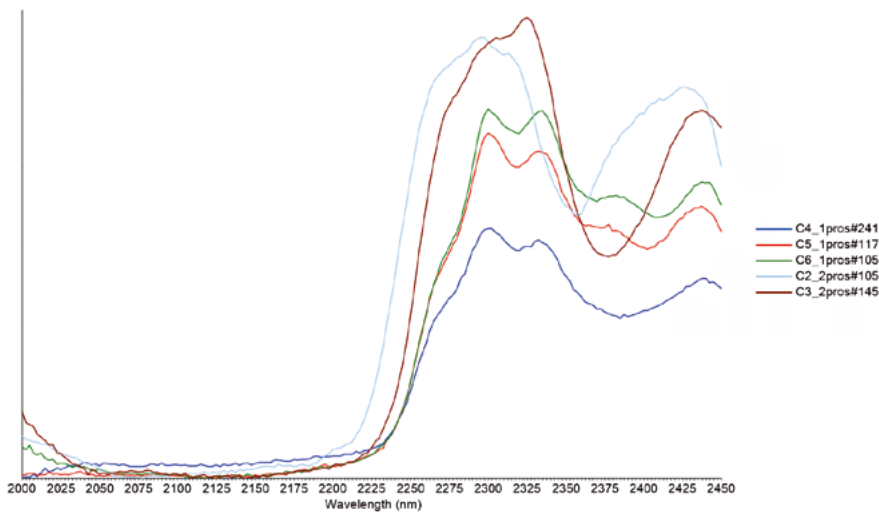
NIRONE Sensor 2.5 spectra of different n-alkanes, including ethane, propane, n-butane, n-pentane, and n-hexane, when measured in a 40 cm optical path length gas flow cell. The concentrations vary from 1 to 2 vol-% for these gases, which result in quite similar maximum absorptions. While the absorptions overlap heavily, there are clear differences in exact positions, shapes, and widths of the features for these different alkanes. These properties make it possible to differente the gases from one another, resulting in a multi-gas analysis from a single NIR spectrum..

Conclusion

Spectral Engines has developed affordable and fast NIR sensors for hydrocarbon measurements. Sensors are less expensive than existing GCs and FTIR instruments. Thanks to their compact size and modular structure, Spectral Engines' sensors are easy to integrate with commercial gas cells and optimize the sensitivity of the applications.

FOR MORE INFORMATION:

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