Real-Time Raman Gas Composition Sensor

Motivation/Challenges

Industries that utilize natural gas, gasifier syngas, biogas, landfill gas, or any type of fuel gas can benefit from knowing the composition of that mixture in real-time for feed-forward control of combustion or other processes. Various components can affect the BTU content, flame speed, and other properties of the fuel. Thus, there is a need for a sensing system that is able to quickly and reliably identify, characterize, and determine the concentration of various gases in such a gas mixture.

Technology/Capability Overview

The NETL Real-time Raman Gas Composition Analyzer determines the composition of a flowing gaseous sample in real-time and provides the concentration of each gas in that sample.

- Simultaneously measures CH_4 – C_4H_{10}, CO, CO_2, H_2, N_2, O_2, H_2O, and others
- 1 second measurement time with better than 1% accuracy
- High pressure operation (up to 800 psi)
- Applicable to process control in power generation, chemical and other industries

Industry Significance

The sensor is ideal for conducting quick continuous measurements of gaseous streams in a pipeline or industrial facility:

- Faster and at a lower cost than mass spectrometry and gas chromatography.
- Real-time capability enables turbine operators to switch from one fuel to another with continuous adjustment of the fuel/air ratio for optimum operation efficiency, decreased emissions, andflameout prevention.
- No need to recalibrate or to purchase gas-standards
- Enables feed-forward control based on gas composition

Benefits to Partner

- Testing partners would have the opportunity to evaluate the performance of the prototype system, implement new feed-forward controls, and may help shape the commercial product configuration
- This sensor will greatly benefit the power industry, as well as other industries utilizing gaseous input or output streams by enabling smarter control to increase process efficiency and reduce emissions

Opportunity

- We are seeking opportunities to field test the prototype instruments in power and industrial applications, as well as partnering to develop novel power-system control schemes

Development Status

US Patent Application number 13300988

Licensed to Kaiser Optical Instruments

Industrial prototypes currently available for testing.

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