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Technology for Productivity

Application Note

5 Hz Automobile, Diesel and Catalyst Emissions Measurements

INDUSTRY PROBLEM

The automotive, diesel and catalyst manufacturers need to monitor traditional (CO, CO_2, NO, NO_2, SO_2, O_2, HC, and H_2O) and non-traditional (NH_3 & N_2O) combustion gases in less than a second. Currently, there are limited analytical techniques available that can monitor these species in this time frame and at the level necessary to be useful.

BACKGROUND

New emissions regulations promulgated by the Federal Government for calendar years 2007 and 2010 are forcing auto, diesel and catalyst manufacturers to better understand their combustion and emission reduction processes.

New chemistries and methodologies used to meet these new federal standards such as Low NOx Traps require the collection of sub second analytical data to optimize these processes. Also, these new processes generate species such as NH_3 and N_2O that are not currently monitored by traditional analyzers. Many of the traditional gases can now be done at 5 Hz using traditional type CEM analyzers. However, gases such as N_2O and NH_3 still require new methodologies. So, these companies are pushing analytical instrumentation manufacturers to create and provide analytical equipment that can monitor both the traditional and non-traditional gases at frequencies as high as 5 Hz.

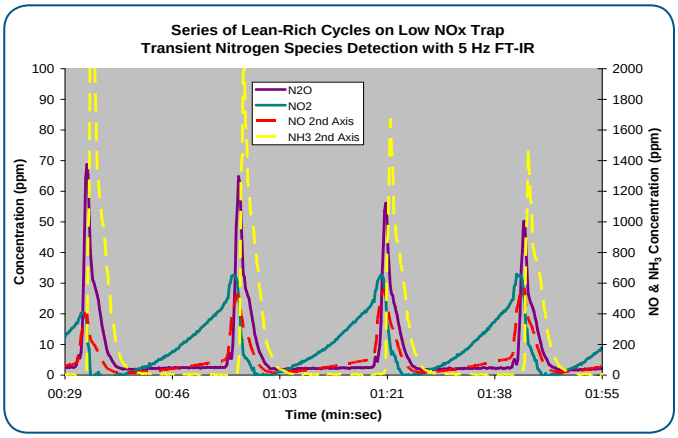
FTIR analyzers are a potential solution to this problem since it can measure most gases generated by combustion processes. Historically, however they were not fast or sensitive enough to measure at these timescales. Advances in computer technology, software, instrument calibration, electronics, and FTIR instrument design now available make this an excellent solution for the non-traditional gases and a feasible alternative for traditional gases.

SOLUTION

The MKS MultiGas™ 2030 *HS* has been designed to measure both traditional and non-traditional combustion emissions gases at 5 Hz. The system incorporates a patented fast scanning FTIR capable of providing high resolution (0.5 cm^{-1}) data at 5 Hz frequencies. The system was also configured to allow combustion exhaust to flow through the 200 mL gas cell at rates up to an above 100 L/min to prevent diffusion and measurement delay. The software and computer hardware provided with each system are optimized to allow for 20 + gases to be quantified simultaneously and reported at 5 Hz.

SOLUTION (CONT'D)

The MultiGas™ 2030 *HS* is supplied complete with high speed computer, software, installation, training and calibrations at both 150° and 191°C for the traditional and non-traditional gases. The detection limit for most gases is below 1 ppm at the 5 Hz measurement frequency.



The figure to the left shows the variability of the nitrogen combustion components during an open Lean-Rich Combustion cycle through a Low NOx Trap.

INSTALLATION AND TRAINING

The MultiGas™ 2030 *HS* is normally installed and personnel trained to utilize the analyzer in one to two days at the customer site. Additional higher level operational and maintenance training is provided at no charge at the MKS training facility after the user has utilized the analyzer for a few months.

BENEFITS

- Single analyzer monitoring most combustion species at 5 Hz sampling frequencies
- Greater process knowledge
- Reduced equipment requirements
- Reduced maintenance and cost of ownership
- Expandable to future gases
- No calibration drift
- Diagnostics to monitor health and calibration
- Complete package from analyzer hardware, software, calibration, training and installation
- Phone support for data analysis and instrument service questions
- Large library of additional compounds for future use
- Numerous communications protocols between analyzer and emissions software

REFERENCE MATERIAL

MKS Publication:
MultiGas™ 2030*HS* datasheet

For further information, call your local MKS Sales Engineer or contact the MKS Applications Engineering Group at 800.227.8766.
MultiGas™ is a trademark of MKS Instruments, Inc., Andover, MA.

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