

## Gasmeter™ in research – applications:

# Engine Emissions Measurements

### Combustion Engine development

A combustion engine exhaust gas is a complex mixture of gases and particulate matter that changes in composition very rapidly. Multicomponent analysis of exhaust gases can be performed with a **Gasmeter™** FTIR analyser with a response time ( $T_{90}$ ) of one second. This is achieved with the combination of a small volume sample cell, powerful sample pump and fast liquid nitrogen cooled detector. The analyser, sampling system and computer can be assembled on a cart for use in a dynamometer laboratory, or the portable version can be used for roadside tests.

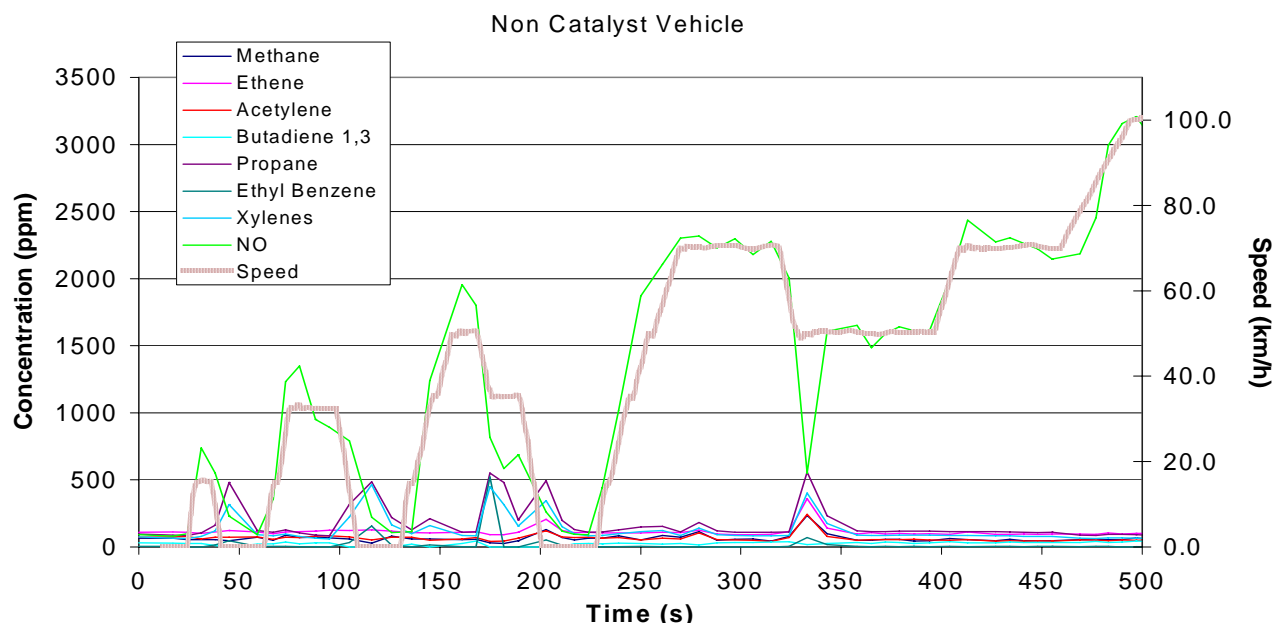
Typical analysed components (up to 50) include:

- $H_2O$ , CO,  $CO_2$ , speciated  $NO_x$ ,  $SO_2$ , HCl,  $NH_3$ , HNCO
- speciated hydrocarbons up to  $C_8$
- speciated BTEX (Benzene, Toluene, Ethylbenzene, Xylenes)
- other VOC's such as alcohols, aldehydes, MTBE

The analysis software is capable of incorporating up to 8 analog input signals such as vehicle speed, engine rpm, and various temperatures to the analysis results.

**Typical Application:** Diesel or Gasoline internal combustion engine, on-board measurement in moving vehicle or in a research facility on dynamometer rolls.

**Results of interest:** NO,  $NO_2$ ,  $NH_3$ , hydrocarbons and VOC's as separate components



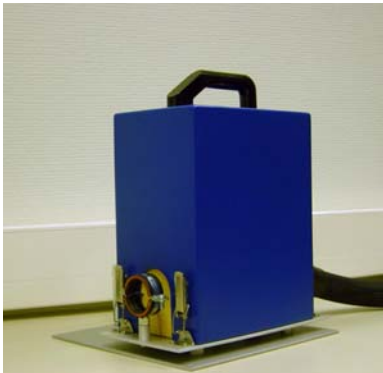
**Figure 1.** Nitrogen Oxide, Hydrocarbons and Aromatics from a moving vehicle together with vehicle speed.

## Typical System Configurations

### Stationary Engine Exhaust Analysis System

- **Gasmeter™** Cr-2000 gas analyzer with LN<sub>2</sub> detector and fast response sample cell
- **Gasmeter™** Sampling System
- Heated Filter Unit
- **Gasmeter™** Industrial Computer

Engine exhaust can contain fine particles and unburned fuel. Heated (up to 320 °C) glass wool filter is used to remove particles and prevent condensation. All parts in contact with the sample gas are heated to at least 180°C. The sampling system has a powerful sample pump (15 l/min) and a heated back-up filter. The system is fully automated and suitable for continuous measurement. It is also equipped with several safety features to prevent sample condensation inside the cell.



### Portable Engine Exhaust Analysis System

- **Gasmeter™** DX-4000 portable gas analyzer with MCTP detector
- **Gasmeter™** Portable Sampling System
- Heated Filter Unit
- Laptop PC



The portable system is a light-weight version of the stationary system. The main difference is a slightly longer response time due to smaller pump and Peltier cooled MCT detector instead of the LN<sub>2</sub> cooled detector, which is used in **Gasmeter™** Cr-2000. Response time ( $T_{90}$ ) for this system is around 10 seconds. Analog input signals and digital output signals are supported with a laptop computer that is equipped with PCMCIA cards. In addition, result output in MODBUS format is also supported.