



## Improved air pollution monitoring

Air pollution, such as that generated by road vehicles, is known to harm public health, damage biodiversity and contribute to climate change. In response, the EU has made air pollution one of its main concerns and developed an extensive body of legislation to improve human health and environmental quality. Central to this regulatory framework is the European Air Quality Directive (2008/50/EC), which establishes limit values for major air pollutants such as NO<sub>2</sub> and particulate matter.

### Europe's National Measurement Institutes working together

The European Metrology Research Programme (EMRP) brings together National Measurement Institutes in 23 countries to address key measurement challenges at a European level. It supports collaborative research to ensure that measurement science meets the future needs of industry and wider society.

# Challenge

Pollution from road vehicles is regulated to protect ambient air quality and new passenger cars must meet the Euro emissions standards before they can be approved for sale in the EU. However, congested areas such as city centres still suffer from elevated levels of certain pollutants - in particular NO<sub>2</sub>, which is associated with adverse effects on health including reduced life expectancy. More accurate real-time roadside measurements are required to enable vulnerable members of the public to minimise health risks by, for example, avoiding cycling on congested city centre roads.

The introduction of new gas micro-sensor technology promises to significantly increase the capacity of NO<sub>2</sub> monitoring networks within our cities. Micro-sensors provide real-time measurements, which indicate changes in pollution levels rather than absolute levels, offering the potential to rapidly disseminate pollution warnings to vulnerable city dwellers. The Air Quality Directive permits the use of these indicative NO<sub>2</sub> measurements, provided a link is made to the high-accuracy reference instruments maintained by national air monitoring networks.

# Solution

The EMRP project *Metrology for Chemical Pollutants in Air* (MacPoll) developed a test protocol for micro-sensors using a specially-designed chamber at JRC Ispra, enabling micro-sensor measurements to be linked to the traceable reference instrumentation operated by national air monitoring networks. The facility can be used to evaluate sensor performance at pollutant levels specified in the Air Quality Directive, under typical field conditions, where variations in temperature, humidity and gas composition can easily effect measurements.

# Impact

Through participation in the project Alphasense, a developer and manufacturer of gas sensors, has revised and improved its innovative NO<sub>2</sub> micro-sensors for roadside monitoring measurement platforms.

Tests carried out within the project using the facility at JRC Ispra indicated that micro-sensor measurements of NO<sub>2</sub> at the levels typically encountered in the environment are affected by ozone. Nevertheless, Alphasense's new sensor has the sensitivity, selectivity and stability needed to reliably measure NO<sub>2</sub> pollution in the presence of ozone at typical monitoring conditions. Using Bluetooth or SIM card technology, the new sensors can relay high-accuracy data to air quality monitoring databases in near real time, providing a cost-effective method of implementing a traceable pollution monitoring network.

Alphasense's new product will help to improve monitoring of air pollution by enabling the use of cheaper indicative sensors, traceable to national standards, at numerous roadside locations. Sales of around 5,000 are anticipated in the first year, with this figure expected to rise to 20,000 over the next three years, as demand for indicative measurements in support of the Air Quality Directive increases.

By establishing traceability to national standards, this project has enabled micro-sensors such as Alphasense's to be used in support of the Air Quality Directive, validating their use as a robust yet cost-effective technology for real-time air pollution monitoring. This confidence is crucial to the expansion of Europe's air monitoring networks, and an important step towards more comprehensive pollution monitoring and the effective protection of our citizens.

## Metrology for chemical pollutants in air

Reliable indoor and outdoor measurements of chemical pollutants in air are required to underpin and implement European air quality legislation designed to protect human health and the environment. The EMRP project *Metrology for chemical pollutants in air* (MacPoll) made a significant contribution to fulfilling the data quality objectives of European legislation by establishing the metrological infrastructure needed to produce accurate measurements for robust short- and long-term assessment of a range of indoor and outdoor pollutants.



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## EMRP

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[www.euramet.org/project-ENV01](http://www.euramet.org/project-ENV01)

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