



Industrial emissions mapping

The EU's Industrial Emissions Directive, which aims to protect human health and the environment, requires pollution reporting from oil and gas plant operators against regulated emissions limits. Strict standards are being established for monitoring total plant emissions, but current measurement techniques lack the required accuracy to meet new lower emission limits. Optical measurement techniques can meet requirements, but to be authorised for use, must first be rigorously validated.

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

The EU's Industrial Emissions Directive now requires industrial polluters to monitor emissions from the entire industrial site, including leaks from tanks and pipes in addition to those from stacks to ensure these meet revised lower limits. This Directive sets the framework for operators to demonstrate compliance with mandatory emission limits and requires the use of Best Available Techniques, BAT, that are documented in normative standards. To address a shortfall in this area, the European Commission has mandated the relevant European Committee for Standardisation (CEN) to draft new standards for on-site monitoring.

Industrial emissions, such as those from oil refineries, create large sources of volatile organic compound pollution, major contributors to ozone depletion and greenhouse gas production. However, now the Directive requires all plant emissions to be monitored, requiring new methods for reliably assessing leaks from pipes and tanks in addition to conventional stack monitoring systems. Remotely operated optical spectrometry techniques, such as laser-based DIAL or sunlight using Solar Occultation Flux could offer a solution. These spectrometry-based techniques take advantage of the way different chemicals absorb specific light wavelengths leading to their detection. In this way it is possible to rapidly map all emissions across a site.

Before these optically-based techniques, can be considered for inclusion as a Best Available Technology and used on plant, a sound measurement procedure covered by a CEN standard to ensure its results are consistent and comparable is needed.

Solution

The EMRP project *Metrology to Underpin Future Regulation of Industrial Emissions* investigated and performance validated optical spectroscopy techniques including DIAL and Solar Occultation Flux using a controlled release facility that simulates plant emissions.

Well-characterised amounts of volatile organic compounds were released into the atmosphere at a redundant gas plant to enable performance confirmation for these optical techniques in the hard to reproduce air turbulence conditions frequently present during on-site measurements. Researchers used modelling and previous measurement data to improve understanding of how parameters such as wind affect measurements.

Through this work, the project established measurement best practice for optical emission assessment methods, that are being incorporated into a new CEN standard – a first step towards their inclusion as a Best Available Technology for regulatory compliance.

Impact

FluxSense AB is a Swedish SME spun out of Chalmers University, which manufactures innovative Solar Occultation Flux instruments and expects to be an early beneficiary of the need for increased plant monitoring required under the new Industrial Emissions Directive.

The company has developed these instruments for mapping and quantifying gas emissions from industrial facilities such as oil refineries, water treatment plant and product storage tanks. Solar Occultation Flux offers plant operators the opportunity to perform cost-effective seasonal surveys to better establish an annual emissions baseline that produces information on whether site leaks are increasing and enables evaluation of strategies to reduce overall emissions.

Accuracy for emissions monitoring

The EMRP project *Metrology to Underpin Future Regulation of Industrial Emissions* developed new reference materials and stack simulation facilities to aid calibration and assessment of plant emission measuring instrumentation. These were used to validate optical spectrometry-based techniques during site testing at a disused gas plant leading to the development of best measurement practice. This is being incorporated into a new EN standard and once published will enable the greater use of optical techniques for industrial plant emission monitoring – a first step towards adoption for regulatory compliance as a Best Available Technology.

The project also investigated sources of measurement uncertainty in continuous stack monitoring systems where variations in flow can have large effects on emission reporting. Using computational fluid dynamic modelling the project was able to suggest improvements to flow measurement regimes that will increase the overall accuracy for reporting averaged emissions.



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