

Review of CEM 2004

6TH INTERNATIONAL CONFERENCE ON EMISSION MONITORING



CEM
2004

Milan, Italy

9-11 June 2004

CEM 2004 is the only international conference in Europe focusing on emission monitoring.

The Milan Conference is the 6th in a series; the two latest events took place in the Netherlands (April 2001) and in Denmark (September 2002). The conference aims to offer a highly qualified discussion forum for people dealing and operating with air emissions assessment and measurement and to support the process of standardisation throughout the whole world.

CEM 2004 is dedicated to:

- Manufacturers of measuring equipment
- Legislators and control Authorities managing air quality
- Owners and environmental managers of industrial plants
- Measuring companies

Session 4 -

Methods and Instrumentation for emission monitoring - Part 1

Many years of experience was present by the speakers of this session. Even though the presentations clearly showed that we still have a need for developing and improving the monitoring methods. This statement is valid for both manual sampling methods and for instrumental on-stack methods.

The session demonstrated severe problems for determination of formaldehyde using DNPLT-method, which is widely accepted through out Europe. Also NH₃ was investigated, with the conclusion that several rather different methods give comparable results, even if they are applied at different monitoring situations. It was also demonstrated how an on-stack instrument can be improved to have the possibility for easy control of zero and span values by use of gasses with known concentrations.

Finally the huge amount of information available on the internet was discussed. It seems as we have reached the stage where we need to target and focus the information. It is proposed to be done by expert/expert groups on dedicated web pages.

Peter Blinksbjerg

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Session 2 - Emission Inventories

M Woodfield

The CEM04 opening speaker, Giovanni De Santi of the European Commissions Joint Research Centre, emphasised the importance of using advanced monitoring techniques to improve emission inventories. These are required by a number of EU Directives - including the National Ceilings Directive, large Combustion Plant Directive, and the Integrated Pollution Prevention and Control Directive. They are also needed by policy members to understand and control public health problems arising from poor air quality.

Presentations were given on the development of local emission inventories in the Lombardy region and lower Austria. These explored various aspects of determining time resolved emissions from a local mix of sources. The storage, manipulation, and delivery, and delivery of information to scientists and policy specialists were also discussed. Inventories are also necessary for emissions trading. The Dutch Nox trading scheme was introduced and its inventory requirements were described.

Overall, the session highlighted the need for work to improve emission factors, particularly for the transport and small stationary sources that are so important at a local scale. The need to consolidate and share emission factor information between countries was also stressed.

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Session 3 - Uncertainty in emission monitoring

D. Munns-June 2004

Five papers were presented on the uncertainty of measuring emissions to air. The titles and authors were as follows:-

"Uncertainty budgeting for instrumental emissions methods-a practical approach for measuring institutes using EN/ISO 14956", by Peter Blinksbjerg.

"Uncertainty determination for electrochemical portable emission analysers using reference materials and stack in-situ validation (inter-collaborative test)", by Anxo Mourelle.

"Uncertainty budget and inter-laboratory field test in SO₂ and NO_x emission measurement", by Jean Poulleau.

"Measurement uncertainty - implications for the enforcement of emission limits", by Maciek Lewandowski.

"Uncertainty-implications for emissions trading", by Mike Woodfield.

Mr Blinksbjerg elucidated on the uses of EN/ISO 14956, and how the use of field data could be used to evaluate the suitability of a measurement method compared with a stated measurement uncertainty. Mr Poulleau elaborated on the use of GUM and EN/ISO 17025 and how they were interpreted to determine uncertainty budgets for both NO_x and SO₂ continuous monitors and high-lighted the many sources of uncertainty found. Mr Mourelle concentrated on his experiences with electrochemical sensors for the measurement of combustion gases from small boiler plant, and how the measurement uncertainty had been evaluated. Mr Woodfield, on behalf of Mr Lewandowski, explained about the implications of understanding uncertainty for the enforcement of emission limits. It was necessary to give the benefit of doubt to the operator of industrial plant for the uncertainty of the measurement method, when assessing whether emission limits had been met. Finally Mr Woodfield explained about the vast amount of work being done by a wide range of government and international bodies, on providing guidance on how to quantify annual releases of greenhouse gases(GHGs). Many of the methods would have varying degrees of uncertainty associated with them and require strict verification, for operators of the schemes to have sufficient confidence to make the schemes work effectively. One ultimate solution might be the use of fully validated time resolved mass emissions methodology.

Less than about 10 years ago, air measurement organisations, national standardisation bodies, regulators, and legislators, were aware of accuracy and precision, and possibly random and systematic error, but reference to this in standard methods was fairly spasmodic. However, since the publication in 1994 of GUM - The Guide to the estimation of Uncertainty in Measurement (ENV 13005), great strides have been made and European air emission standards have included guidance on the uncertainty of measurement in published standards.

The papers presented, showed how important the understanding of measurement uncertainty had become. This was no longer only in the realm of the statisticians. Analysts, and regulators alike have to deal in sometimes complex methodology to ensure that measurements are understood. The expert presentations explained the importance of establishing an uncertainty budget, i.e. an assessment of the complete measurement system to determine the major sources of uncertainty, starting at sampling through to final analysis.

The principle lesson learnt was, that if one conducted an estimation and evaluation of an uncertainty budget for a measurement method, whether it be periodic or continuous, then this was the start of a long learning process which should allow improvements in the method to be made. For anyone using a particular standard, if they could identify the principle areas of uncertainty and concentrate on making improvements to those, then not only should the accuracy of the results improve, but better methods should result.

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Session 5 – Plant experiences

11.50 a.m./1.10 p.m. - Session chair: Wolfgang Jockel, TUV, Germany

- **"Emission monitoring in peak heat production plants"**

J. Cretnik, RACI, Slovenia

Jurij Cretnik reported first about the environmental legislation in Slovenia and its back-ground in EU Directives. The objective of the project was the realization of a suitable automated emission monitoring system for SO_x and NO_x including data acquisition and evaluation. There was a special demand generated by several peak-heat production plants. The specific solutions found was in accordance with the legal requirements and could be realized also in an economic manner.

- **"Toxic emissions from solid fuel combustion in small residential appliances"**

P. Dilara, JRC IES, EU

Penny Dilara presented a research study focussed on organic emissions, e.g. TOC, VOC, PAH, PCDD/PCDF from small residential areas. Those pollutants are influenced by the combustion technology and the types of fuel (e.g. coal, wood). It could be shown that small combustion installations typically used in residential areas have a high emission potential and significant impact on ambient air quality. The need for further systematic investigations is evident.

- **"On line monitoring of particulate matter in stack emissions"**

A. Rivas, Atlantic Copper, Spain

Ana Rivas explained in her presentation the introduction and execution of a particulate emission monitor at a copper production plant in Huelva/Spain. The selected monitor is working on the principle of scintillation and installed in the stack of a mineral concentrate dryer behind ESP. The different calibration curves could clearly demonstrate the effects of different particle sizes under varying ESP conditions. In this first step the set up and the stability of the monitor could be shown and the desired targets were reached.

- **"Real time measurement of particulate at low concentration from the emission of stationary source in the steel industry"**

E. C. Burgher, Rupprecht & Patashnick Company, USA

First Ed Burgher informed about the technical background of the TEOM Series 7000. Some case studies from US field tests were shown in order to demonstrate the comparison to US-EPA methods. In further applications could be clarified the importance of stratification analysis.

In the second part of the presentation Gilles Gonnet explained the results of several comparison tests between TEOM and LECES (a French Test House) executed in iron and steel industry. In all tests a high repeatability of the two TEOM monitors could be reached as well as the validation of this principle compared with reference methods.

Session 6A - Dv L. Sloss

Mercury CEMs are becoming increasingly necessary in response to tightening environmental legislation. Clearly the calibration of these instruments is critical for their application. Until recently, there were no gaseous mercury reference standards available for calibration. Steve Mandel described the work of Spectra Gases to produce the first NIST Certified standard for elemental mercury, available from March 2004. Work is continuing to produce a similarly certified gas standard for oxidised mercury.

Many CEM systems for mercury face major challenges when used to speciate mercury at sources such as coal-fired power plants. Ambient monitors for mercury are more reliable and accurate but cannot cope with the complex gases released from combustion sources. Win Lee described a dilution-based system which can be used to treat five gases such that they can be analysed with ambient monitors such as the Tekran. Work on a pilot-scale dilution system has proven successful and the technique will soon be tested on a pilot-scale coal-fired unit and then in full-scale field trials.

H. Paur of FSK discussed the development of mercury CEMs. These systems have been proven to be very reliable on municipal waste incinerators. However, tests on cement kilns have been less successful. Since many cement kilns use waste materials as fuel, mercury emissions may be significant. Existing control technologies for mercury are not readily applicable to cement kilns. This is clearly an area requiring future research.

Many different commercial systems for particulate monitoring are available in the market-place. R. Zepeck of Durag emphasised that each of these systems has its own advantages and disadvantages for example, tribo-electric monitors are excellent for most particulate measurements but cannot be used on plants with ESP (electrostatic precipitator) without problems. Similarly, optical methods can be very sensitive to changes in particle characteristics (size & density) and would therefore need recalibration after any major process changes (such as fuel). The choice of particulate monitor should always be made by a qualified expert who fully understands the process conditions.

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The next CEM Conference and Exhibition will take place in Spring 2006. If you would like more information please email us today for exhibiting and visiting CEM@iet-pub.com