

Stepping on the Gas; a World of Applications for Gas Calibration Standards

Experts and companies from all over the world in the field of gas measurement, calibration gas mixtures and analysing equipment will gather in Rotterdam, the Netherlands, on 11 to 13 February 2009 for the Fifth International Gas Analysis Symposium and Exhibition, GAS2009.

The event will provide a unique opportunity to exchange knowledge and to collect information on market and research developments in the field of gas analysis. It is an exceptional event in the world of standardisation as it combines information on standards, on research related to standards, but also on new applications in relation to standards. The event is organised by NEN, the Dutch Standardisation Institute, and ISO/TC 158, the international standardisation committee on analysis of gases.

ISO/TC 158 benefits

The use of calibration gas mixtures is of extreme importance at situations in which small measurement deviations can have major consequences. Striking examples are control of alcohol abuse by breath analysers or CO₂ emission measurements of industrial plants. In the international natural gas market the calorific value should be known to the permillage, as it concerns large quantities in which a small deviation means millions of dollars. For all these applications ISO/TC 158 produces guidance documents for handling of the calibration gases and for determination of uncertainty budgets when measuring.

Appearances can be deceptive. Although at first glance, the scope of work of ISO/TC 158, Analysis of gases, appears restricted (preparation and use of calibration gas mixtures), on closer inspection, the standards it develops have a big impact on a wide range of applications where accurate knowledge of gas mixture composition is required:

- for demonstration of compliance with regulations, e.g., measurement of car emissions, alcohol tests, stack emissions, occupational exposure;
- for trade purposes, e.g., measurement of compositions of natural gases, refinery gases, coke oven gases, measurements of air pollutant emission levels for the purpose of emission trading;
- for industrial purposes, e.g., purity analysis of industrial gases, verification and certification of gas mixture compositions;
- for environmental purposes, e.g., monitoring of greenhouse gases, stratospheric ozone scavengers, tropospheric ozone precursors.

Our work is mainly concerned with the calibration of gases and gas mixtures; our market is limited specifically to the calibration of gas market, although the direct influence of what we do affects the whole gas market. All gas analysing equipment needs calibration: the use of calibration of gas mixtures is of extreme importance in situations in which even the smallest deviations in measurements can have major consequences. In the international natural gas market, the calorific value needs to be known to the permillage, as it concerns major quantities in which a small deviation may involve millions of dollars.

Ensuring reliable worldwide transactions in industrial gases

Back in 1994, ISO/TC 158 set out upon its work programme under new Dutch chairmanship. For all the applications highlighted above, ISO/TC 158 has meanwhile produced guidance standards to describe generic methods for preparation of calibration gas mixtures and ways of calculating gas composition and the determination of uncertainty when measuring.

For over 10 years, the market lacked an international set of standards describing all the actual methods of producing calibration gases. The most prominent is ISO 6143, the gravimetric preparation method. But a total of twelve production methods are at this stage described. Now, updating them to the market needs will remain important in the future. For calibration gas mixtures a broader field of use and new markets will become available. Sensory analysis and electronics production require lower and lower detection limits. But also in common analysis as those of natural gas or organic chemicals have stricter needs than before.

Over the years of ISO work, four standards dealing with outdated preparation methods were withdrawn, and some others transposed to ISO/TC 193, Natural gas. Moreover, the gas analysis vocabulary (ISO 7504) has been updated. Additional standards have been published, focusing on quality control of gas analysis and handling of gas cylinders and appendices, aimed at supporting the production of reliable gas composition data and, thereby, at promoting a smooth and reliable worldwide transaction of industrial and other gases.

Furthermore, our work on quality control within the gas analysis field, improves the global understanding of uncertainty basics and increase the trade between a diversity of countries. These standards introduce unambiguous ordering of the right calibration gas bottles, for instance through a standard form. Improving gas calibration and correct deliverance of gases will in its turn improve safety in the medical field, precision in transactions and regulatory and environmental measurements. The standards serve test houses involved in metrological testing in the accreditation process and enable laboratories to present their customers with reliable measurement results which are traceable up to the primary standards and have an acceptable uncertainty.

Nowadays, ISO/TC 158's "library" consists of 20 standards and technical reports on gas preparation, on handling of calibration gases, certificates and bias, and on quality assurance. Almost all of them have been adopted by the European Standards Comite, CEN, for European wide use. At its recent meeting in Paris, ISO/TC 158 decided to update 4 of its standards and define additional explanatory documents to the application of two of them. So the work has still not ended. Input from market parties, mostly gathered at the GAS events or via calibration gas producers is incorporated in the work.



Setting up an important forum of discussion

All new developments and ideas, and the sharing of its expertise is accumulated by GAS, ISO/TC 158's regularly organised International Gas Analysis Symposium and Exhibition. This has become an event, unique in the gas and calibration world where researchers, industrials, laboratory workers and calibration gas users meet each other with a focus on international standardisation. The event is also used to test new standardisation ideas in and to extract new directions for standardisation from the work field.

At GAS2004, Mr. Rein Willems, president of Shell Netherlands, congratulated the ISO experts in his opening speech on the fact that they were able to detect one droplet of mercury in a 70.000 tonnes LNG tanker. He also sketched the future with an increasing use of natural gas. Used as LNG cargo or intermediate, as fuel for vehicle propulsion, as

output from biomass gasification processes or as input for hydrogen production. This emphasised the need for our standards that allow very low detection limits and very pure gasses. GAS2007 entertained an extensive discussion on the use and content of the calibration gas certificates, which ultimately led to a user's request to the accreditation bodies. Apart from being an industry spokesmen, GAS2007 also gave handy information on uncertainty calculations in natural gas and introduced many new analytical techniques measuring down to the ppb level.

The next event, GAS2009, is where the international calibration gas world will re-assemble to discuss natural gas, process analysis, sampling, trace contamination and their related metrological items. We will also see the return of a full session on environmental and health analysis. Plus an extended lecture session on metrology and a new one on hydrogen. The opening lecture will be done by Prof. L. Reinders, environmental professor from Amsterdam.

GAS has become a two-yearly event, unique in the gas and calibration world, where researchers, industrials, laboratory workers and calibration gas users meet each other with a focus on international standardisation. The event is also used to test new standardisation ideas in – and to extract new directions for standardisation from – the work field. At the symposium, experts from all over the world assemble to exchange knowledge on the latest developments. All this will be used to formulate the standardisation programme for ISO.

Looking ahead

ISO/TC 158 work in the future is likely to be mainly in producing technically updated specifications and informative standards, to act as a generic starting point for the development of more specific, compound-oriented methods for gas analysis. Obviously, ISO/TC 158 offers its support to others dealing with analyses of gases and gas mixtures.

ISO/TC 158 forms the supply-basis for analytical standards and expertise. It therefore offers its expertise in uncertainty calculations to general ISO committees and in other committees. However, having identified new possible work in, for instance, liquefied gasses, hydrogen and gas components, it is also developer of new standardised techniques for the benefit of the calibration gas producer. Another new field of attention is the use (and production) of calibration gases in the field, especially in various environment in the upstream area (platforms, desert, arctic). By producing technical specifications and informative documents, ISO/TC 158 is the springboard to further development of production methods.

The principle objective of our technical committee is to produce standards as tools for the production of calibration gases and gas mixtures. Furthermore, it provides standards which will enhance quality control and handling of products and proper determination of uncertainty, avoid the risks of producing quality data that are not sound and harmonised worldwide, and ascertain a smooth and reliable worldwide transaction of petroleum, industrial and other gases.



AUTHOR DETAILS

Ortwin Costenoble,
Secretary ISO/TC 158
NEN Energy Resources
PO Box 5059
NL 2600 GB
tel.: +31 (0) 15 2690 330
fax: +31 (0) 15 2690 207
e-mail: energy@nen.nl