Source Testing Association sub groups – A collaborative effort between regulators, accredited test laboratories, process operators and instrument suppliers.

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In the last 25 Years the testing standards, quality of testing, analysis and reporting, CEMS equipment and support have improved significantly, aided by collaborative work at the STA, with input from process operators, regulators, equipment suppliers and test laboratories.

In recent Years with the release of a number of Industrial Emissions Directive, Best Available Techniques (BAT) Reference Documents, a significant number of emission limits, associated with BAT are now getting close to or undercutting measurement uncertainty – unrealistic emission limit values presents a significant risk and disproportionate challenge for both operators and regulators, especially when in some instances current technology does not exist to demonstrate that compliance is being maintained and this remains a current and present day problem.

Lower emission limits not only present a significant measurement challenge, with new lower emission limit values, they also present a significant risk to EN 14181 calibrations, increasing the risk of failure. Both Hydrogen Chloride (HCI) and Particulate Matter (PM) are two components that are currently causing concern to regulators, test organisations, process operators and equipment suppliers.

Hydrogen chloride is well known to be a difficult gas to measure accurately, primarily because it is difficult to transport through sample lines. The Source Testing Association has also received feedback that the EN 14181 calibration of CEM systems for HCI has been problematic. Experience from a number of operator sites and test houses has shown an unexpected high failure rate for both QAL2's and AST's and the generation of poor calibration functions and low R2 values. Where a system passes the requirements of a QAL2, calibration functions have been seen to vary from 0.25 to 1.8. This suggests a variance well beyond the defined allowable uncertainty of 40% for HCI.

Faced with the issues and challenges around HCI, the STA have set up a sub group with the aim to provide solutions, guidance and best practice.

HCI measurement challenges include cold spots in sampling systems, contamination of sampling systems, pacification of sampling systems, Continuous Emission Monitor (CEM) Interferences. On top of this there is also an issue with the reliability of the Standard Reference Method (SRM). However there is limited information available as anecdotal information suggests that there can be poor agreement between the wet chemistry based SRM (EN 1911) and CEMS results. In particular, agreement appears to be poor where ammonia injection is used for SNCR NOx control by the site.

Additional investigative work is required on the comparison of SRM and FTIR on a variety of processes including with and without ammonia injection, assessing the effect of filters, probe types and materials of construction which could lead to losses of HCI during sampling. Looking into the issues surrounding ammonium chloride salts and quantify the effect of cold areas on HCI concentrations at the analyser.

Following completion of the above investigative work, the sub group aims to produce best practice for CEMS HCI installations and guidance for test houses on the use of transportable CEMS.

Special thanks go to Andy Tiffen, who has collated and generated the guidance document as it stands.

Another area with a lot of focus in recent years and again with the onset of the lower emission limit values is CEM total particulate matter (TPM) measurements and calibrations.

For CEMS to measure dust concentrations, the correlation between the CEM measurement principle and the actual dust concentration in the duct must be established. For this purpose, the dust concentration must be determined by means of a gravimetric measurement. This statement is taken from the operating manual from an MCERT approved CEM and holds true for all of the MCERT approved particulate analysers currently on the market, regardless of manufacturer or measurement principle.

For sites that fall under the Industrial Emissions Directive (IED) EN 13284-2, in conjunction with EN 14181 is the mandatory standard for particulate calibrations. This European Standard specifies requirements for the calibration and validation (QAL2), the ongoing quality assurance during operation (QAL3) and the Annual Surveillance Test (AST) of Automated Measuring Systems (AMS) used for monitoring dust emissions from stationary sources to demonstrate compliance with Emission Limit Values (ELV).

The EN 13284-2 standard was originally written to demonstrate compliance with Emission Limit Values (ELV) below 50 mg/m^3, which presents the crux of the problem faced when trying to calibrate any particulate CEM. Ideally the calibration line would be made up of low, medium and higher level clusters, something that just isn't possible with low level particulate emissions. Even more so with emission limit values at 10mg/Nm^3 or lower and without the possibility of using surrogates to extend the valid calibration range.

To compound this issue further, measurements of very low levels of particulate concentrations using EN 13284-1 Standard Reference Method (SRM) can have a very high level of uncertainty. This uncertainty may result in the calibration of Continuous Emissions Monitors (CEM's) being inaccurate and well outside the acceptable tolerance.

The EA's Technical Guidance Note M20 (TGN) sets out a process for "Indicatively monitoring" the particulate emissions when it is not possible to achieve compliant calibration of Continuous Emissions Monitors (CEMs) – that is, calibration within the specified levels of uncertainty.

Faced with low level particulate clusters and low ELV's, indicative monitoring is the most effective option for Process Operators. This has been widely adopted and is the preferred method by The Mineral Product Association (MPA) Cement Members. In this process the raw values from the CEM are tracked on control charts and upper and lower margins of tolerance are set to allow for random, but acceptable variations in the outputs of the CEM. Action is taken following the same principles of EN 14181 QAL 3, if the output from the CEM changes and rises above the upper margin of error then the process operator takes immediate steps to investigate the cause of the change, and then takes the appropriate action to ensure that the readings return to within the margins of tolerance as quickly as practicable.

When reporting emissions for annual emissions inventories and when the indicative monitoring approach is applicable, Process Operator may apply two approaches, the first using an average based on the results of periodic monitoring, or alternatively reporting a result which states that the emissions are not more than a result based on the allowable uncertainty of the daily average ELV expressed as a 95% confidence interval.

The HCI guidance and best practise along with the indicative monitoring approach are two examples of the excellent collaborative work between the STA, Regulators, Process Operators and Testing Organisations.