

SPECIALTY GASES OFFER A GREENER FUTURE

Stephen B. Harrison, from sbh4, discusses the role of specialty gases for instrument calibration in environmental applications, and shows how calibration gas mixtures from Coregas can be used in emissions testing analysers and process control instrumentation

Bob Brown, the Australian politician once said: “The future will either be green or not at all.” As we seek to maintain our industrialised way of life in a sustainable way, the use of clean technologies and specialty gases for the calibration of process control instrumentation has become essential to minimise pollutant gas emissions.

Specialty gases and analytical instrumentation such as FTIR and chemiluminescence analysers all have a critical role to play in environmental protection and process control. From the use of oxygen or synthetic air in the analysis of TOC in sewage water treatment to the use of high purity argon in ICP instrumentation for drinking water purity assay in environmental contract laboratories, specialty gases are used daily.

In addition to the scientists in contract laboratories using high purity gases, there are millions of instrumentation engineers and quality control technicians in a range of industrial sectors who are intensive users of calibration gas mixtures for testing of their process control analysers. As this instrumentation evolves to become more precise and environmental legislation develops to require measurement of chemical species at ever lower concentrations, keeping abreast of the requirements of these end users is a dynamic challenge for specialty gases production teams.

For factory smoke stack emissions monitoring, traceable measurements of pollutant gas emissions are often required. This can be achieved with ISO 17025 or ISO 17034:2016 accredited calibration gas mixtures. Coregas, in Australia, is active in this area and has developed its NATA accreditation scope to serve the demanding needs of this application. They are now one of the few specialty gases companies globally to offer accredited calibration gas mixtures containing the main pollutant gases NO, SO₂, CO and CO₂ in the same cylinder. These accredited multi-component gas mixtures are ideal for CEMS calibration applications and avoid the need for users to purchase and handle multiple cylinders, thereby saving time and money in logistics and procurement. Furthermore, a single calibration event using a multi-component gas mixture is much more productive than repetition of the



calibration with three or four separate calibration gas mixture cylinders. Coupled with high purity nitrogen grade 5.0 as a purge gas, these multi-component accredited calibration gas mixtures combine to make a great solution for the calibration of FTIR instrumentation which is commonly used in CEMS applications.

Victor Chim, business development manager for Coregas, said: “Our multi-component calibration gas mixtures are manufactured by choosing the most suitable materials for the cylinder and valve and then employing the utmost discipline in our cylinder preparation, filling and analytical techniques. We customise our process according to the components used in each mixture to ensure optimal results. After all, the calibration accuracy can never be better than the accuracy of the calibration gas mixture, so our customers rely on us to get this right every time.”

Stack emissions monitoring is the final stage in the environmental management

In many glass factories, natural gas is burned to melt sand, which means analytical instrumentation is required to measure NOx and ammonia emissions

In addition to the scientists in contract laboratories using high purity gases, there are millions of instrumentation engineers using calibration gas mixtures to test their process control analysers (Image courtesy of Coregas)



process and only reflects what has gone on before. The foundation of “Clean-Tech” lies in unit operations that reduce the levels of pollutant gas emissions. And, each of these unit operations requires rigorous process control to ensure that they are doing the job that they have been installed for. As an example, in many glass factories, natural gas is burned to melt sand. It is the preferred heating fuel due to its cleanliness and the ability for precise temperature and thermal control. Despite its generally clean burning characteristics, natural gas is burned with air and therefore NOx emissions are inevitable.

To knock down the NOx levels to those required by local environmental legislation the flue gases are often processed using selective catalytic reduction (SCR). Urea is added to the SCR system and decomposes at the high temperatures in the flue gas to form ammonia which produces the right chemical conditions to reduce the NOx back to nitrogen. To dose the appropriate level of urea it is necessary to measure the NOx levels (typically with a chemiluminescence analyser) and adjust the urea addition accordingly. But, having solved the NOx emissions problem, it is of course not acceptable to create an ammonia emissions problem, so fine tuning of the process control is achieved with ammonia slip measurement in the gas emitted from the SCR.

Continuous measurement of ammonia is a sample handling challenge and for the best results, the instrumentation must measure ‘hot-wet’ samples directly in the smoke stack. Selection of analytical instrumentation for this application is not simple and it is only in recent years that various laser based measurement techniques have proven themselves reliable enough for this application.

Unlike the gas mixtures used for calibration of legislative emissions testing analysers, the mixes used for calibration of process control instrumentation are not generally required to be accredited, nor must they be traceable to national standards. This does open the sourcing options to a wider range of certification levels. Chim added: “If our customers can use a regular certified calibration gas mixture they will indeed save some money compared to an accredited gas mix. However, it is interesting that after an initial conversation about the price, what really matters most to our customers is the knowledge that they will receive their gas mixtures at the required quality and that it will be delivered quickly and on-time.”

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