

Tracing the Accuracy of Calibration Gases

Regardless of how you use specialty gas mixtures to calibrate a laboratory instrument or monitor, the most important thing you can do to ensure the accuracy of your measurements is to ensure the accuracy of your gas mixture.

Gas mixture accuracy, in turn, is largely dependent upon its analytical traceability to a reference material. For analytical traceability to exist, there must be an unbroken link of comparison between the measured value of the gas mixture and a reference that is recognized in the national or international measurement system as being a true value. Thus, analytical traceability is the link between the analyzed concentration and the true concentration of a gas mixture. The National Institute of Standards and Technology (NIST) provides Standard Reference Materials (SRMs) for this purpose. Another such metrological organization, the Netherlands Measurement Institute (NMI), provides Primary Reference Materials (PRMs).

Analytical traceability is achieved by laboratory analysis of a mixture using an instrument that has been directly calibrated using either an SRM or a PRM. A mixture analyzed in this manner is said to be "directly traceable." SRMs and PRMs are at the top of the traceability hierarchy and add the least amount of uncertainty to a mixture analysis because they are individually analyzed and certified by NIST or NMI laboratories.

Since 1995, NIST and NMI have maintained an equivalence agreement in those cases where comparative analyses have been completed by the two labs. Because of this NIST/NMI equivalency, traceability to a PRM is considered the legal equivalent of an SRM.

Direct analytical traceability can also be established using what are known as NIST Traceable Reference Materials (NTRMs). NTRMs are produced by gas suppliers and then batch analyzed and audited by NIST against the same internal standards as SRMs. NTRM

values are assigned by NIST and offer nearly the same accuracy confidence level as SRMs and PRMs in most cases.

The high cost of producing SRMs and PRMs make it economical for some specialty gas suppliers to blend intermediate standards called Gas Manufacturer Intermediate Standards (GMISs). Though they are analyzed against existing SRMs, they are at the bottom of the traceability hierarchy. A GMIS introduces more uncertainty because more steps are involved and because NIST is not involved in either their analysis or certification. The gas supplier is responsible for assigning the concentration and accuracy, based solely on their analysis.

Gas mixtures that are produced using GMISs do not provide direct NIST-traceability, and so may not be suitable for some applications. For example, the EPA requires that a Continuous Emission Monitor be calibrated using a protocol that is at least as accurate to within $\pm 2\%$. Use of a protocol that was prepared using a GMIS may not guarantee such accuracy.

When selecting any specialty gas mixture, be sure you know what type of standard the mixture you are purchasing will be analyzed against. To ensure accuracy, insist on traceability to an SRM, PRM or NTRM. Also remember that, as in the case of emission monitoring, traceability and subsequent accuracy may be governed by law.

You can ensure the integrity of your laboratory calibrations by obtaining gas mixtures from reliable companies such as Scott Specialty Gas, which has been the leading supplier of precursor standards for NIST SRMs for more than 25 years, Praxair, the second largest supplier of industrial and specialty gases to chemical companies worldwide, and Airgas, which offers an extensive line of high purity specialty gases as well as a full range of specialty gas equipment specifically designed for use with highest purity gases and high tolerance gas mixtures. Your dedication to accurate calibrations will be rewarded many times over in the precision of your measurements, and thus the quality of your products, which can only make your customers smile.

For more information about EPA protocol gas accuracy, download a copy of Accuracy Counts from www.scottgas.com.