MSA Portable Gas Detection
Sensor Drift

Technical Bulletin

Portable gas detectors are designed to detect the presence of various combustible, flammable and toxic gases, and oxygen (O_2) levels within an area. When dangerous concentrations of gases or vapors are detected, portable gas detectors transmit audible and visual warning signals to warn workers that a leak is occurring, giving them the opportunity to safely exit the area. Unfortunately, detectors are sometimes subject to a gradual degradation of the sensor's output which can make readings unreliable—better known as "drift."

Sensor drift

All electrochemical sensors will eventually lose sensitivity over time with exposure to work conditions. Calibration is used to compensate for the loss of sensitivity and adjust the readings to the new sensitivity output level.

Drift is the amount that sensor output changes over time. All sensors experience drift. Once the sensitivity becomes too low, it becomes more difficult to assess exact differences in gas concentrations. Sensors typically have a fixed sensitivity limit assigned by the detector; once that limit is reached, they will not pass calibration.

Many environmental conditions can affect sensor readings and can often look like sensitivity drift, including gas interference and cross-sensitivity. For example, in O_2 sensors, sensitivity can be affected by transient changes in pressure. The sensors will equalize themselves but if the change in pressure is sufficiently large, it can cause a change in the display reading.

O_2 sensors can also be affected by changes in inert background gas other than the nitrogen (N_2) that they are calibrated in. Smaller molecules like helium and larger molecules like argon can change the flow rate of O_2 molecules into the sensors.

Other sensors, like carbon monoxide (CO), can experience cross-sensitivity which is a reaction to gases other than the target gas. For example, volatile organic compounds (VOCs) and alcohols can affect CO readings. Most CO sensors, therefore, have internal and/or external filters to reduce the exposure of the sensor to VOCs. Enough exposure will saturate this filter. It is not uncommon for a saturated filter to desorb over time into the sensor and look like sensor drift. In addition, most CO sensors are cross sensitive to Hydrogen (H_2) which is small enough to go through most filters. MSA's H_2 Resistant CO sensor has ten times the resistance to H_2 (<5% sensitivity) compared to other sensors on the market. .

MSA XCell Sensors have an expected life of more than four years which translates to fewer sensor replacements during the instrument's life and lower costs. MSA's gas detection instruments are designed to notify users as sensors reach end-of-life which ensures reliability of the instruments. In addition, MSA's advanced application-specific integrated circuit (ASIC) technology gives the XCell Sensors superior accuracy and provides higher performance than other sensors on the market.

MSA
The Safety Company

The Importance of Calibration and Bump Testing

It is vital to worker safety that portable gas detectors are maintained and calibrated properly. All sensors can eventually expire due to loss of sensitivity, slowed response time or both. Because of this, performance of a daily bump test is best practice because it is the only method by which the entire system: instrument, sensors, flow path, power source, alarms, and all electronics can be checked to ensure that it is functioning properly. That's why most manufacturer instructions recommend a daily bump test each day, prior to operation of gas detectors.

What is a Bump Test?

Bump tests are meant to verify that the sensors and the alarms function properly and that the sensors respond within acceptable margins. Gases or vapors must be able to reach the sensor. Bump tests confirm that gas flow paths to the sensor on the detector are clear and the sensor(s) are functioning from a qualitative standpoint. Bump testing will alert users if a gas inlet has become blocked, even if the blockage is not visible. The bump test, however, is not meant to adjust the device's accuracy.

What is Calibration?

A calibration check is what is used to test and verify the accuracy of the instrument. A calibration check is performed by exposing the monitor to a certified concentration of gas for a particular time to verify that it provides an accurate reading. Calibration is an adjustment of the sensor(s) output to match the known traceable calibration gas concentration. Full calibration ensures maximum accuracy of the instrument. Environmental conditions such as over-exposures, introduction of poisons, heavy impacts, or other extreme environmental changes can cause sensors to become less accurate. Calibration allows the instrument to manage these changes in sensitivity.

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