AirTest™
Sensors That Make Buildings Smart!

Background on Carbon Monoxide Sensing Technologies for Parking Garages

Overview

Using carbon monoxide sensors to control ventilation fans in enclosed parking garages is a widely recognized method of reducing energy usage by activating fans only when automobile exhaust is present.

There are two types of sensor technologies that are typically applied to this application, solid-state sensors (also called MOS sensors) and electrochemical sensors. AirTest offers both types of sensing technology. This bulletin outlines the differences between these two primary use technologies.

Solid-State Sensors

Also called Metal Oxide Semiconductors (MOS), these types of sensors are based on the principal that metal oxide surfaces will change conductivity based on their exposure to various types of gases.

With the appropriate electronics and calibration, the non-linear change in conductivity of the sensor can then be translated into an analog or relay signal, indicating gas concentrations.

These types of sensors are sensitive to a wide variety of gases but can be tuned to have preference for certain gases, although this does not completely eliminate the issue of cross interference of other gases.

The accuracy of measurement of these devices can be significantly affected by changes in temperature and humidity.

All solid-state sensors have short-term drift (typically ±20%) and long-term drift (varies with manufacturer) that have dictated industry practice of checking calibration on an annual basis when applied in garage applications.

Sensors typically have a life of 2 to 10 years depending on the manufacturer.

This is the type of sensor most commonly used in residential CO detectors where the alarm limit typically corresponds to detecting a gas concentration of 100 ppm for over 90 minutes.

In contrast, parking garage applications typically need to measure 35 or 50 ppm concentrations that occur within a few minutes. As a result, the levels typically measured in parking garages are at the low end of the sensitivity range of this type of sensor.

AirTest offers solid-state technology products, however the performance, economics, and reliability of the advanced electrochemical sensor is today's state-of-art technology.

Electrochemical Sensors

Electrochemical sensors are small devices that generate a voltage, based on a reaction between a specific target gas and a chemical mixture in the sensor.

These sensors can be highly specific to the gas measured and highly accurate (better than ± 1 ppm at concentrations under 50 ppm). Accuracy is not significantly affected by humidity and temperature.

Power requirements are also very low, because the chemical reaction of the sensor generates the sensor output, making it ideal for battery powered applications like portable units or wireless devices.

The sensor life and calibration is affected by the depletion of the reacting chemical in the sensor

and is directly related to the duration and level of exposure to the target gas being measured.

Sensor life can vary from 18 months to 5 years depending on gas measured and manufacturer.
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AirTest's Offering: AirTest offers a unique electrochemical CO sensor. The sensor itself is rated for 5 years of operation and can easily be replaced with a plug-in replacement sensor.

The base level model called the TR 2000 is a loop-powered transmitter (current output) that provides a linear signal corresponding to CO concentrations. It is often used when directly connecting to a building control system that will control CO concentrations.

AirTest provides a battery powered wireless control system using the TR2000 to reduce the high costs related to installing conduit in parking garage applications.

The TR2000 Transmitter

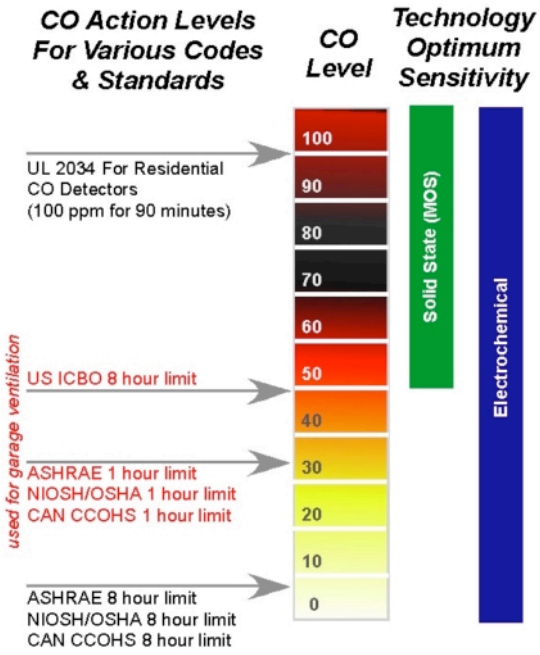
Choosing the Right Technology

Until recently, cost was a major factor in deciding which technology to use. Electrochemical has many advantages over solid state technology, but was often two to three times the price.

As a result, solid state sensors have often been used where cost and basic functionality is more important than performance.

Electrochemical sensors have tended to be installed in high end or owner operated applications where accuracy, specificity of measurement and performance is important.
However, the TR2000 sensor advanced technology has reduced the cost difference between the solid state and electrochemical sensors to less than 20%.

The TR2000 is the first long life, electrochemical to be offered at a solid-state price.



Sensors Should be Calibrated Annually

All gas sensing technology drifts, although there are methods that allow for automatic calibration of the sensor's element. Industry practice dictates that all sensors be checked on an annual basis to ensure that the system is working properly.

This is a simple process, which can be performed by facility personnel or a sensor installation and service company. Often a need for calibration or system check may be indicated by a significant change in the operating hours of garage exhaust fans.