



Overview

This paper will explain what information a BAPI Volatile Organic Compound (VOC) sensor can and cannot provide. BAPI's white paper "Using the BAPI VOC sensor for Demand Controlled Ventilation" already proves that BAPI's VOC sensor is an accurate and reliable way to incorporate Demand-Controlled Ventilation (DCV) into a building. It also shows that the VOC sensor is as good as a CO₂ sensor at indicating occupancy in a room and meets ASHRAE Standard 62.1. The VOC sensor has the added benefit of recognizing other air contaminants that affect human comfort and health so that they can be ventilated away as well.

BAPI VOC Sensor Capabilities

A VOC sensor informed ventilation system can optimize indoor air quality while minimizing energy use. There are over 5,000 VOCs that are expelled by breathing, cooking, bodily functions, perfumes, deodorants, paint, cleaners, cigarettes, office supplies, etc. BAPI's VOC sensor monitors these gases and provides a CO₂ equivalent ppm (parts per million) output which is then input to a DCV system.

The VOC sensor eliminates the need for frequent manual calibration by providing a relative measurement and using an Automatic Baseline Correction (ABC) logic algorithm. With ABC self-correction, the sensor constantly adjusts the 450 ppm baseline (outside air) to eliminate any sensor drift. The logic drives the sensor to quickly reduce the baseline when a time of low measurement is sensed.

The VOC sensor directly measures ambient concentrations of a broad range of "reducing gases" associated with bad air quality. Examples are: alcohols, aldehydes, ketones, organic acids, amines, organic chloramines, aliphatic and aromatic hydrocarbons. These gases all burn and cause the VOC sensor ppm output to increase.

Opposite examples are sulfuric acid, nitric acid and ozone. These three are "oxidizing gases" (rather than "reducing gases") and will NOT cause the VOC sensor ppm output to increase. OSHA has set an exposure limit for sulfuric acid of 1 mg/m³ TWA (time weighted average); however, a BAPI VOC sensor is not the appropriate tool to monitor sulfuric acid or any other "oxidizing gases".

BAPI VOC Sensor Limitations

Because of the relative nature of the sensor output, the VOC sensor cannot define an accuracy tolerance. By definition, accuracy is the variation from an absolute measurement. Since the VOC sensor uses ABC logic, there is no absolute measurement.

The VOC sensor is not an analytical instrument and should not be used in a safety application. It is a broad range sensor that cannot break out measurements of individual gases. For example, OSHA has set permissible exposure limits for ethyl alcohol. The VOC sensor will show elevated levels when ethyl alcohol is present and signal the HVAC system to increase ventilation, but the sensor cannot provide a specific ppm measurement of ethyl alcohol so that the user can document compliance to OSHA exposure limits.

The VOC sensor was designed to monitor common indoor air quality contaminants only. There are several gases that will affect the sensor reading but are not typical indoor contaminants. Typical outdoor gases such as SO₂, H₂, and CO will affect the sensor but have not been tested. The VOC sensor should not be used to monitor CO as it is not sensitive enough to meet safety and OSHA requirements.

The BAPI VOC sensor provides a CO₂ equivalent ppm output so that ASHRAE's popular CO₂-based VRP procedure can be used for DCV; however, CO₂ is not one of the VOCs that the sensor monitors. If your application needs to directly measure CO₂, choose a CO₂ sensor.

Commissioning/Testing

BAPI's VOC sensor is easily tested for proper operation. Many applications need to demonstrate sensor functionality for a commissioning engineer. Isopropyl alcohol or an original Sharpie marker (stinky version) will work for this. Waft a cotton ball soaked in isopropyl alcohol or a marker near the sensor and the LCD will display up to 9999 and the output will reach up to 20,000 ppm.