

# WHAT YOU CAN'T SMELL MIGHT HURT YOU

Gaseous contaminant filtration helps retailers breathe easier. | Ronald Cox, CAFS

**R**etailers know when something stinks. Odors and gaseous contaminants can permeate throughout a retail space, leading to a variety of potential health effects as well as less-than-ideal working conditions. One problem is that the traditional air filters used in most retail facilities capture particulate contamination, but do nothing to reduce gases. Instead, reduction of gaseous contaminants occurs only as a result of diffusion and ventilation of the air inside the building with outside air.

Not all gaseous contaminants — including volatile organic compounds (VOCs) — can be identified by smell alone. In fact, the issue of controlling VOCs and other gaseous contaminants may be even more important when there are no odors associated with them to trigger complaints.

Fortunately, most harmful gaseous contaminants can be removed from the breathing air inside retail facilities with a combination of source removal/reduction, proper ventilation, and an effective gas phase air filtration system.

## GASEOUS CONTAMINANTS AND THEIR HEALTH EFFECTS

The most recognizable form of gaseous contaminants in retail facilities are odors. These may come from a variety of sources and can be distracting and annoying to shoppers and employees.

Of more concern are gaseous contaminants that are not detectable by occupants. Many of these gases are irritants and can have an effect on people's health and productivity.

Common gaseous contaminants in retail

facilities may include combustion byproducts, such as carbon monoxide, nitrogen oxides, sulfur dioxide and polycyclic aromatic hydrocarbons (PAHs); human and cooking odors; and carbon dioxide and volatile organic compounds (VOCs).

Some gaseous contaminants are classified as VOCs, which are emitted as gases

from certain solids or liquids. According to the U.S. Environmental Protection Agency (EPA), concentrations of many VOCs are consistently higher indoors (from two to five times higher) than outdoors, and elevated concentrations can persist in the air long after the activity is completed. There are no standards yet for VOCs in non-industrial settings.

A variety of different VOCs may be in the indoor air at any one time. They are emitted by a wide range of commonly found products:

- Paints and lacquers
- Paint strippers
- Cleaning supplies
- Pesticides
- Building materials and furnishings
- Office equipment such as copiers and printers
- Correction fluids and carbonless copy paper
- Graphics and craft materials, including glues and adhesives
- Permanent markers
- Photographic solutions

According to the EPA, research shows that some VOCs can cause chronic and acute health problems at high concentrations, and some are known carcinogens. Low to moderate levels of multiple VOCs may produce acute reactions as well. There is also the potential for interaction of VOCs with other chemical compounds to form a third compound that may pose a threat to health and comfort, according to leading air quality investigators.



Photo courtesy of Kimberly-Clark Filtration.

Not all gaseous contaminants — including VOCs — can be identified by smell alone.

Fortunately, most harmful gaseous contaminants can be removed from the breathing air with a combination of source removal/reduction, proper ventilation, and an effective gas phase air filtration system.

Health effects of VOCs may include:

- Eye, nose and throat irritation
- Headaches
- Loss of coordination
- Nausea
- Fatigue
- Liver, kidney and nervous system damage
- Allergic skin reaction

#### SOURCE REDUCTION AND REMOVAL

Pollutant source removal or reduction is an effective approach to resolving IAQ problems related to gaseous contaminants when sources are known and control is feasible.

When source removal is not possible or practical, there are a number of steps that can be taken to reduce the amount of odors, VOCs and gaseous contaminants in the indoor environment:

- Safely discard partially full containers of old or unneeded chemicals. Gases can leak even from closed containers.
- Buy limited quantities of VOC-emitting products that are used only occasionally or seasonally.
- Use sealants on all exposed surfaces of paneling and other furnishings.
- Allow time for building materials in new or remodeled areas to off-gas pollutants before occupancy.
- Adopt integrated pest management techniques to reduce the need for pesticides.
- Store food properly, and dispose of garbage promptly.
- Select or specify low-emitting products when building or remodeling.

Some manufacturers of product categories linked to VOCs and gaseous emissions choose to have their products certified by the Greenguard Environmental Institute. The GREENGUARD® Certification Program is a third-party verification for low-emitting products. The program identifies specific products that have been tested and continue to be tested to ensure that their chemical and particle emissions meet acceptable indoor air quality pollutant guidelines and standards. This certification program is a valuable tool for architects, designers, product specifiers and purchasing organizations that want to locate, specify and purchase

low-emitting products for indoor environments. The GREENGUARD Certification Program is voluntary and available to all manufacturers and their suppliers.

#### VENTILATION

One technique for controlling odors and gaseous contaminants is to dilute them with outdoor air. Dilution can work only if there is a consistent and appropriate flow of supply air that mixes effectively with room air, according to the EPA.

Another technique is to use dedicated exhaust ventilation systems to isolate and remove contaminants by maintaining negative pressure in the area around the contaminant source. Local exhaust can be linked to the operation of a particular piece of equipment (such as a kitchen range) or used to treat an entire room (such as a smoking lounge, restroom or custodial closet).

Avoid re-circulating air from areas that are strong sources of contaminants. Confine activities that produce odors and gaseous contaminants to locations that are maintained under negative pressure relative to adjacent areas. Finally, make sure that external vents are located well away from the fresh air intake of the HVAC system to avoid recontamination.

#### GAS PHASE AIR FILTRATION

Air cleaning, via air filtration, is usually most effective when used in conjunction with either source control or ventilation. However, filtration may be the only approach when the source of pollution is outside of the building and the gaseous contaminants are brought in through the building's fresh air ventilation system.

Controlling gaseous pollutants requires specialized air filtration products. Traditional particulate air filters — and even HEPA filters — are not effective at removing gaseous contaminants.

While a variety of materials, such as silica gel, activated alumina and porous clay may be used, most gas phase air filters are made with activated carbon. Activated carbon is made from a variety of high carbon-content substances including coal, wood, coconut shells and bamboo. On a microscopic level, activated carbon looks and acts much like a natural sponge. Activated carbon particles



Photo courtesy of Kimberly-Clark Filtration

Traditional particulate air filters — and even HEPA filters — are not effective at removing gaseous contaminants.

are highly porous and have a vast amount of surface area (1 gram of activated carbon may have a surface area exceeding 1,000m<sup>2</sup>.)

As odor molecules come into contact with the carbon, they are drawn into the carbon and held into place by a variety of forces — similar to a magnetic or gravitational attraction. Carbon-based odor molecules have a high affinity for bonding with the activated carbon because it lowers overall surface energy. Of all the adsorbents known, activated carbon is one of the strongest physical adsorbents, so it is an excellent material for creating a fresh and clean-smelling environment by removing odors and other gaseous contaminants from the air.

Some filters with activated carbon are dual-layer filters. The upstream layer provides particulate filtration and protects the carbon layer from particulate loading, to ensure maximum odor removal. The downstream layer absorbs and retains gaseous contaminants from the air stream.

Gas phase filtration may be recommended in any of the following scenarios:

- Newly constructed buildings
- Newly remodeled buildings (new wallpaper, paint, carpets, etc.)
- Newly installed furnishings

- Areas where large volumes of photocopying are conducted
- Areas where known solvents are used (e.g., nail salons, craft centers)
- When source control and ventilation control have not resolved odor issues
- When people complain of eye and respiratory irritation

When gaseous contaminant filtration is indicated, effective filtration systems employ a combination of particulate and gas phase filtration technologies. In two-stage HVAC filtration systems, particulate pre-filters in the MERV 7 to 8 range protect higher-efficiency final filters. In environments with significant gaseous contaminant levels, final filters may be replaced with granular bed or deep pleat carbon filters. If doing so, it's important that the HVAC system has adequate fan capacity

to handle the increased airflow restriction of these filters.

In more typical scenarios, gaseous contaminant levels are low to moderate, and single-stage pleated gas phase filters may be used. These filters are more expensive than traditional pleated filters, but they remove the entire spectrum of airborne contaminants: particulates and gases. Be sure to select a filter that has a particulate filtration level of at least MERV 7, and again, be sure that the HVAC system has adequate fan capacity.

#### CONCLUSION

While the human nose is a good barometer for odor problems, it is important to remember that there are many gaseous contaminants that don't generate odors. These gaseous contaminants should, nonetheless,

be removed from the indoor breathing air through a combination of source control, ventilation and gas phase air filtration.

Combined with effective particulate air filtration, gas phase air filters can help achieve superior IAQ, making retail facilities healthier, more productive places. **PRSM**

*®GREENGUARD is a Registered Trademark of GREENGUARD Environmental Institute.*

RONALD COX IS A MARKET  
 MANAGER AND NAFA-DESIGNATED  
 CERTIFIED AIR FILTER SPECIALIST  
 WITH KIMBERLY-CLARK FILTRATION  
 PRODUCTS. HE CAN BE REACHED AT  
[RCOX@KCC.COM](mailto:RCOX@KCC.COM).