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## Three Steps to Improve Indoor Air Quality

By Thomas Aiken

Maintaining good indoor air quality (IAQ) is one of the most important aspects of facility maintenance because it directly affects the health, productivity and comfort of building occupants. Even modern, well-ventilated buildings can have poor indoor air quality. In fact, both the U.S. Environmental Protection Agency (EPA) and the World Health Organization recognize "Sick Building Syndrome" and "Building-Related Illness" as serious conditions occurring from new and remodeled buildings worldwide.<sup>1</sup>



Substance Group	Example	Sources
Alkanes	heptane, methane	human breath, bio-effluents
Alcohols	alcohol, mineral spirits	cleaning supplies
Aldehydes	formaldehyde	building materials
Ketones	butanone	paints
Esters	methyl acetate	glues
Terpenes	pinene	perfumes and glues
Aromatics	xylol	paints and glues

Figure 1

One common cause of [indoor air pollution](#) comes from volatile organic compounds. VOCs have the potential to be harmful to humans when a high concentration is released into indoor air from materials commonly found in many

buildings (see Figure 1). A study published in *Occupational & Environmental Medicine* concluded that even exposure to standard office building supplies (i.e., carbonless copy paper, photocopier/printer fumes) could cause Sick Building Syndrome symptoms such as respiratory infections, eye irritation, breathlessness and more.<sup>2</sup> Similarly, an *Indoor Air Journal* study found that indoor residential chemical emissions were risk factors for respiratory and allergic effects in children – something school maintenance professionals in particular must address. This study also reported an elevated risk from renovation and cleaning activities, new furniture, carpets or textile wallpaper.<sup>3</sup> While the presence of a large concentration of VOCs in indoor air is certainly cause for concern, IAQ can be improved when building owners and facility managers take the following three steps:

## 1. Implement source control

When it comes to IAQ, prevention is a key factor. Leaky roofs, HVAC system malfunctions, improper cleaning and other [facility maintenance](#) issues can all affect the quality of indoor air. Fortunately, many VOC sources such as dusty carpet, old furniture and flaking paint are easy to remove. Other sources may not be as simple to replace, but are just as important to evaluate. For example, particle board, a common building material, can contain formaldehyde, which is a known carcinogen.

When renovations are necessary, facility managers can help ensure the well being of a building's occupants by selecting low-VOC paints, flooring, wall/ceiling systems and wood products, especially now that these items are more readily available. The EPA recommends using IAQ-safe products that are non-toxic and not prone to moisture damage or mold growth. It's also important to ensure that a building's janitorial service uses third party-certified environmentally-friendly cleaning products, which won't negatively affect indoor air as much as chemically-laden counterparts.

## 2. Install IAQ sensors that detect VOCs

To improve indoor air quality, source control is a good place to start. However, off-gasses from some materials and furnishings can't be avoided entirely. That's where indoor air quality sensors with the ability to detect VOCs can help. These sensors can be integrated into a building's HVAC system to improve indoor air quality and reduce energy costs. In demand-controlled ventilation (DCV) systems, the sensor alerts the system to increase ventilation only when the threshold air quality levels for target VOCs are exceeded. After the level of VOCs returns to normal, the sensor signals the system to turn off. One source of VOCs often overlooked by many facilities managers is from humans. Pack too many people in a small, inadequately ventilated area and VOCs from their breath and other bio-effluents can make the air smell unpleasant. In one study of the indoor air quality in a health club, switching from a time-controlled HVAC system to a DCV system equipped with an AppliedSensor iAQ sensor, reduced energy consumption by 60 percent. In addition to cost savings, a post-installation satisfaction survey of the health club's patrons revealed that visitors gave the facility a higher rating for its good air quality.<sup>4</sup>

It's important to note that many indoor air quality monitors detect only carbon dioxide (CO<sub>2</sub>), and not VOCs. AppliedSensor's iAQ sensors use metal oxide semiconductor (MOS) technology to detect rapidly a broad range of VOCs, which directly correlates to the amount of CO<sub>2</sub> in the building. These sensors include a maintenance sensing element to correct baseline readings automatically at certain intervals without the need for recalibration or compensation for humidity.

## 3. Become IAQ Knowledgeable

Outdoor air pollution has been a concern for years, with well-funded government efforts to reduce smog by controlling emissions from vehicles and factories. In contrast, the affects of indoor air pollution on humans is a relatively new issue. For building owners and facility managers who want to learn more, the EPA has a comprehensive guide to IAQ on its website.<sup>5</sup> Also consider utilizing resources from – or becoming a member of – an industry organization such as the Indoor Air Quality Association. Additionally, doing a quick search of the **BUILDINGS** digital archives will lead you to a library of educational articles, including "[Five Common Mistakes to Avoid When Handling IAQ Complaints](#)."<sup>6</sup> With source control, VOC detection and a good understanding of IAQ, maintaining good indoor air quality can become an essential element in your facility management strategy.

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### Footnotes

1. [http://www.epa.gov/iaq/pdfs/sick\\_building\\_factsheet.pdf](http://www.epa.gov/iaq/pdfs/sick_building_factsheet.pdf)
2. <http://oem.bmj.com/content/64/3/178.abstract>

3. <http://www.iaqscience.lbl.gov/pdfs/voc-1.pdf>
4. [http://appliedsensor.com/pdfs/AppliedSensor\\_FitnessClub\\_AppNote\\_0610.pdf](http://appliedsensor.com/pdfs/AppliedSensor_FitnessClub_AppNote_0610.pdf)
5. <http://www.epa.gov/iaq/ia-intro.html>
6. <http://www.buildings.com/ArticleDetails/tabid/3321/ArticleID/6219/Default.aspx/default.aspx>