



**New energy-efficient construction techniques and materials have** produced energy-saving buildings in the last 30 years; however, the advancement in efficiency has come with a price, namely poorer indoor air quality (IAQ).

Tighter fitting windows and doors and a trend towards bringing in less outdoor air to refresh a building's indoor air, has led to an increase in allergens, mold and other microbes that can have

# POOR BUILDING INDOOR AIR QUALITY CAN LEAD TO AILMENTS AND DISEASE

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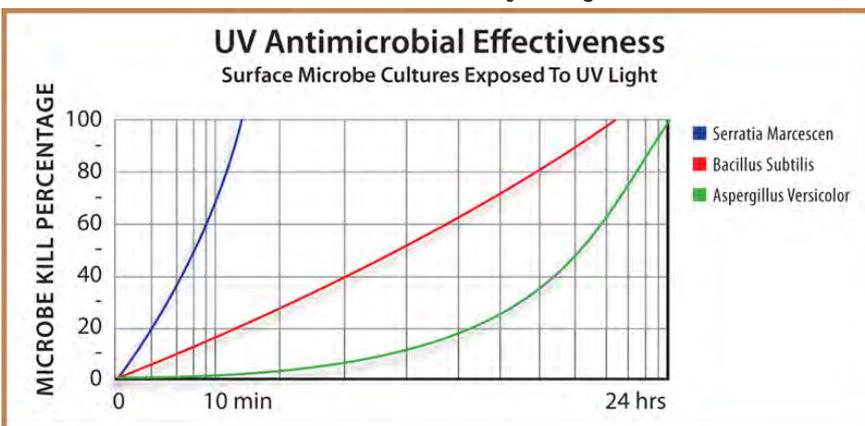
The U.S. Environmental Protection Agency (EPA) reports that indoor air pollution is often up to five times worse than outside air. Consequently, the EPA links poor IAQ to respiratory and other health-related issues such as Sick Home Syndrome.

Asthma, for example, is a growing respiratory concern. An estimated 20 million Americans, about one in 15, suffer from asthma, according to the Asthma and Allergy foundation of America (AAFA). The AAFA reports that 40 to 50 million Americans suffer from allergic diseases.

An association's heating, ventilating and air-conditioning (HVAC) system can contribute to an increase in respiratory problems. Microbes need moisture to survive. A cold air conditioning coil, which is common to all HVAC system types, condenses humidity out of the airflow and creates an ideal microbial growth environment. Mold is particularly prevalent on air conditioning coils, coil encasements and condensate drip pans.

Besides the cooling coils, the HVAC system's air filter is another area for microbial growth concerns. Fabric filter media is ideal for entrapping particulates such as dust. However, it has little effect on microbes, which flow right through it to remain within the building's air circulation. Even if they become trapped in the filter, microbes can continue to reproduce. Particulate filters can only hold microbes, they don't kill them and that includes high efficiency particulate arrester (HEPA) and ultra low particulate arrester (ULPA) filters.

Amidst these growing IAQ challenges, the HVAC industry has produced new technology that's effective for controlling allergens, mold, infectious airborne diseases and other microbes that can affect condominium residents. One solution is germicidal ultra-violet (UV-C) light irradiation. UV-A and UV-B are present in sunlight; higher frequency UV-C light is filtered by the Earth's atmosphere so microorganisms have no defense against it. For this reason UV-C is used within HVAC systems to sterilize microbes so they can no longer produce. Germicidal UV technology has been used for more than a century as a germicidal solution for a variety of applications from disinfecting water



to controlling airborne diseases in hospitals.

Recently, UV light systems have been developed for residential applications. UV light systems are as diverse as the HVAC systems they're put into, but the concept is generally the same. Ideally located near the fan coil, the UV light disinfects the coil and surrounding surfaces as well as the air before it enters the occupied space. They can also be located in plenums or ducts; however, the cooling coils and surrounding surfaces are the main germ source.

Most association buildings have some

type of fan coil, whether it's an under-the-window ventilator supplied by the facility's central plant, a ductless mini-split system, a ducted split-system consisting of an outdoor condenser and indoor air handler or a self-contained, all-in-one packaged unit within the premises. In most of these instances, a germicidal UV light should be installed in close proximity to the cooling coils. It consists of a power supply and a UV-C lamp that's typically 12-inches or longer to span the width of the coil. Installation should be performed by a certified HVAC contractor and in most cases shouldn't take more than an hour or two, depending on the accessibility and compactness of the UV light mounting location. The UV system works continuously, killing microbes around the clock and is not turned off when the HVAC system is not running. UV-C lamps need replacement every one or two years.

Research studies state 90 percent of microbes are sterilized within 10 minutes and 99.9 percent are sterilized within 24 hours of UV-C light exposure.

## DISINFECTING THE BUILDING'S COMMON AREAS

Since many association buildings have common area air handlers, the board should also investigate UV light irradiation for those systems, too. In common area ventilation, residents may be breathing a combination of air ex-filtrated from living units and re-circulated common area air. Therefore, influenza, tuberculosis or other respiratory infection from residents can potentially be distributed via the common area HVAC system. The distribution of infectious airborne microorganisms is one reason why hospitals have been leaders in germicidal UV light use with commercial HVAC systems.

Besides IAQ benefits, a germicidal UV light system installation can also reduce HVAC system maintenance and increase energy efficiency. Energy is saved because UV-C light suppresses biological growth on coils that causes airflow friction and static pressure increases that make the blower work harder and less efficiently. The coil's heat transfer decreases, as well. For example, a thin growth of bio-film on coil surfaces can reduce the free area of heat transfer and increase air velocity up to nine percent. Cleaner coils can also deliver an impressive 30 percent increase or more in cooling capacity when compared to dirty coils. Ultimately, cleaner coils will need less maintenance, which translates into savings.

## ADDING GAS-PHASE AIR PURIFICATION AND PHOTO CATALYTIC OXIDATION (PCO)

UV light equipment manufacturers have recently gone beyond simply sterilizing microbes. UV lights are being combined with gas-phase air purification, which is a proven technology for eliminating odors from cooking, cleaning chemicals, pets, cigarette smoke, off-gassing furniture and paint, formaldehydes and adhesives in carpeting and other gaseous contaminants. These volatile organic compounds (VOCs) are the source of most unpleasant odors and are potentially toxic.

Once only used for controlling airborne chemical contaminants such as chlorine, sulfur and ozone in heavy industries such as petrochemical, paper mills, waste water treatment, gas phase air purification is used in commercial, institutional and now residential applications. Gas-phase media, which is typically an activated carbon-based material derived from coconut shells, charcoal or wood chips and infused with titanium dioxide, adsorbs and holds VOCs.

UV lights can kill microbes; therefore microbial odors will eventually dissipate. Unfortunately, odors caused by VOCs aren't affected by UV lights and particulate filters. However, the addition of a gas-phase matrix of carbon media will adsorb the gaseous contaminants, thus removing them from the airstream and circulation.

Eventually the carbon media reaches 100 percent adsorption capacity and replacement media can be costly. However, technological advances in the last five years are solving the cost dilemma with a new development called photo catalytic oxidation (PCO) that can regenerate the carbon media and extend its useful life indefinitely.

A good way to experience the PCO effect is on the beach. In the daytime there are rarely foul odors, because the sun's UV rays penetrate the sand and generate clean, oxidizing molecules. At night without sunlight, fishy ocean odors dominate. Likewise, the type of germicidal UV light that's used to disinfect the HVAC system's interior surfaces, can also perform double duty by regenerating the carbon media; converting the adsorbed chemicals into harmless carbon-dioxide and water vapor. Therefore, the gas-phase carbon media is continually reused.

Advances in IAQ technology are bringing all three technologies - germicidal UV light, gas phase air purification and photo catalytic oxidation - together into one cost-effective add-on unit for HVAC systems. Association boards and their residents can now benefit from the ultimate IAQ improvement through the combination of these three technologies.

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