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A contractor prepares to insert a UVC light tube into a rooftop system

UVC ENERGY

KEEPING HVAC SYSTEMS AND BUILDINGS HEALTHY WITH UVC TECHNOLOGY

BY ROBERT SCHEIR, PH.D.

BUILDING OWNERS AND contractors are well aware of the lost productivity, ill health effects and even litigation that may arise when infectious disease spreads through a building. In addition, the ever-present threat of mold contamination can trigger allergy and asthma symptoms among building occupants, leading to further health issues.

To prevent these problems, you must treat the HVAC system, which functions

as a conduit for airborne microbial contaminants and breeding ground for mold. High-output ultraviolet-C, or UVC, lights installed in the HVAC system are proving to be an effective and efficient strategy for mold and microbial and virus transmission control.

These devices rely on UVC energy, the most germicidal wavelength in the ultraviolet spectrum. Installed in an air-handling system, high-output UVC lights

emit enough energy to penetrate even the tiniest microbe to destroy its DNA and RNA, killing or deactivating it.

In a typical building with 4 to 5 air changes per hour, UVC energy can destroy more than 90 percent of infectious microbes with each air change—reducing them to a level far below what it takes to infect most people. It works against colds; flu; other viruses; and bacteria, including tuberculosis, Legionella, pneumonia and whooping cough. Most hospitals use 15 to 20 air changes per hour, so in these environments, UVC is even more effective and also can reduce the incidence of nosocomial infections.

UVC is an equally effective weapon against surface and airborne mold. Mold originates deep inside the HVAC system, where the cool, moist conditions provide an ideal environment for its growth. It rapidly builds up on coils and releases spores and other contaminants that travel through the air stream and into the occupied space. UVC lights keep coils, drain pans and other components free of mold and organic build-up, eliminating resulting allergic symptoms, as well as the time, cost and potential hazards associated with chemical cleaning programs.

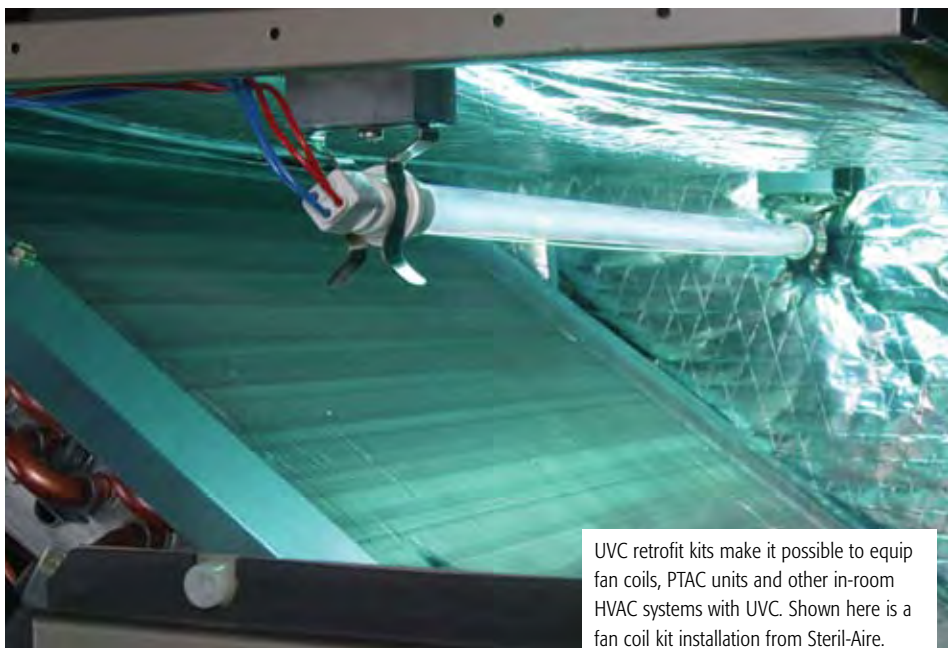
Hundreds of users have reported similar results to the following:

Iolani School—When this independent school in Honolulu installed UVC lights in the air-handling units on a trial basis in 1996, it measured a 99.8 percent reduction in mold levels. More than 10 years after adopting UVC, the school continues to operate the units with virtually no sign of mold growth or odors. Because mold does not build up in the systems, the school has eliminated A/C coil cleanings, saving thousands of dollars annually. Even though some air handlers are 30 years old, the school reports they look—and run—like new.

Florida Hospital—This hospital chain has added UVC devices to new and existing HVAC systems. They have found UVC enhances heat-transfer efficiency, improves airflow through the system and allows air handlers to operate at peak performance. The resulting savings in energy, estimated to



UVC installation in a large A/C coil at a Florida Hospital



UVC retrofit kits make it possible to equip fan coils, PTAC units and other in-room HVAC systems with UVC. Shown here is a fan coil kit installation from Steril-Aire.

be in the six figures annually, have combined with reduced coil-cleaning costs to provide rapid payback. Even more important, hospital officials have found UVC enhances indoor air quality and infection control.

Types of Devices

From the largest central air-handling system to the smallest packaged room unit, you can achieve UVC protection without costly modifications to the air handler itself. The germicidal effect is virtually immediate and continuous, as long as the lights are kept on

24 hours a day with the fan running.

UVC devices come in a variety of sizes and configurations to fit different HVAC systems. Large commercial air handlers usually are outfitted with internally mounted UVC devices that are installed end to end, downstream of and facing the coil. Smaller HVAC systems with more limited space and/or access—including rooftop units—may be equipped with a different style of device that utilizes an external power supply and single or multiple light tubes that are inserted into the

[FIELD TECHNIQUES]

system through a small hole drilled in the equipment wall.

For small in-room systems, such as unit ventilators, fan coils and packaged terminal air-conditioner units, you can purchase special retrofit kits designed to simplify the installation of UVC into these units. Using the kits, you can readily deliver UVC protection to patient rooms, classrooms, hotel and dorm rooms, and similar areas. In addition, some free-standing room air purifiers combine UVC with particulate and/or gas phase filtration to achieve multistage air cleaning in areas where spot IAQ control is desired. And where cleanup of mold or other surface contamination is needed, UVC devices are available in a variety of hand-held and portable configurations for remedial applications.

Because of its ability to kill or inactivate airborne viruses and bacteria, UVC has become an acknowledged control strategy for helping to safeguard buildings against bioterrorist threats. The Washington, D.C.-based U.S. Environmental Protection Agency and U.S. Department of Homeland Security have released test reports on several UVC devices. The full reports, accessible at www.epa.gov/nhsrc/news/news062606.html, are useful for comparing different devices.

The Role of UVC Output

For UVC to be an effective IAQ control tool, you need sufficient output for the application. New-generation, high-output devices provide up to five times the output of older-style lights. How do you know if output is adequate? As you evaluate devices, reliable suppliers should be able to provide data based on the following parameters:

➤ Look for a device that delivers output per inch of glass of at least $10 \mu\text{W}/\text{cm}^2$ at 1 meter, in a 400 fpm air stream of 45 F (7 C). Output claims should be stated "per inch of glass" and based on tests performed at a distance of 1 meter from the light source.

➤ Make sure output has been independently tested under HVAC conditions. Some devices are tested in warm/still air,



Close-up studio shot of illuminated high-output Steril-Aire UVC Emitter™ tubes.

which can yield misleading results. Some are tested under HVAC conditions, but the lamps are insulated with sleeves to give higher output results designed to deceive the buyer.

➤ Ask for documentation on dose per watt, a measure of the energy required for microbial control. This is a more sophisticated measure of performance because it considers not only output but also the energy used by the device in delivering that output.

When properly selected, sized and installed, UVC devices are proven "multitaskers" that can offer multiple benefits to owners and managers of all types of facilities. ■■

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