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Test Lab Looks at UV, Carbon Media and Photocatalytic Oxidation for IAQ



Air purifier tested for both microbial and VOC removal.

Airmid Healthgroup, a third-party indoor-air-cleaning device test facility, has released the laboratory test results of a new combination ultraviolet light, activated carbon-media air purification and photocatalytic oxidation device.

The Dublin, Ireland-based AHG, an international leader of IAQ-equipment testing, successfully demonstrated the APCO air purifier manufactured by Fresh-Aire UV is capable to both sterilize microorganisms and reduce VOCs. AHG reported the APCO's UV light was "highly effective" at inactivating microbes, and that its titanium-dioxide infused carbon media matrix and PCO combination was "capable of reducing high concentrations" of VOCs commonly found in residences and commercial buildings, such as hospitals, hotels, offices and schools.



The UV-C light portion of the study simulated airstream microbe inactivation in an ASTM-/AHAM-style environmental test chamber that simulated a typical building's indoor environment and HVAC air-handler arrangement. A single-pass test was also performed on an ASHRAE Standard 52.2 test duct system.

The test's UV-C light single-pass inactivation results were: bacteria (*S.epidermidis*)—98.85%; virus (*MS2 coliphage*)—99.03%; and mold (*A.niger*)—78.80%.

The test, which simulated the typical indoor HVAC conditions of 73°F (23°C), 55% relative humidity and air-flow velocity of 492 ft/min (0.93m³/sec), was performed on a single pass. IAQ experts claim even higher inactivity rates among the three tested microbes could occur in a multiple-pass environment, such as a typical building HVAC-recirculation unit with an APCO device.

Additional multiple passes of the air contaminants through the APCO product will further decrease the total concentration (mg/m³ or ppmv) of the air contaminants in the test chamber or indoor space, according to Dean T. Tompkins, Ph.D, P.E., a Milwaukee, WI-based IAQ consultant who reviewed the AHG test results.

"For practical reasons, demonstration test data assessing the performance of the APCO were based on experiments performed for a finite period of time. When operating in a building's HVAC system with no finite time period of concern, additional air passes through the APCO will result in contaminant concentrations below those achieved at the end of AHG's experimental test period," said Tompkins, the former Chairman of ASHRAE Technical Committee 2.3—"Gas Phase Contaminants and Removal Equipment" and a 15-year research scientist in the Environmental Chemistry and Technology Program at the University of Wisconsin, Madison, WI.

Commercial and residential APCO models are designed to sterilize and inactivate mold, fungi, viruses and other microorganisms in the airstream and on internal surfaces of HVAC air handlers. Meanwhile the activated carbon-media matrix element adsorbs airborne VOCs, such as cleaning agents, off-gassing from interior furnishings materials and other gaseous contaminants. The UV-C light performs a second duty because its close positioning to the activated carbon media creates a PCO process that chemically transforms the captured gaseous contaminants to harmless CO₂ and H₂O molecules.

In addition to UV-light disinfection, VOC-removal capabilities using APCO's activated carbon-media and PCO functions were also tested. According to AHG authorities, the APCO is "capable of reducing very high concentrations of formaldehyde and acetaldehyde." This is in light of the fact the test used a limited residence time combined with 100 times normal gas contaminant concentration exposures found in typical commercial building environments. Multiple passes typical of a recirculating HVAC system will also reduce gaseous contaminants further, according to Tompkins.

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