S3.5.2 *Gas-Phase Air Cleaners for Use in HVAC Systems*

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Many owners and operators of commercial and residential buildings need to reduce the levels of air contaminants such as ozone, sulfur dioxide, formaldehyde, and VOCs from the occupants' breathing air. While particle filters are in common use, gas-phase air cleaner are less common and not as well understood. These air cleaners may be used to remove a wide variety of contaminants from the air. However, owner/operators need good information about which air cleaner works for which contaminants and, further, to determine which air cleaner is best for a given application.

Sorbents such as activated carbon are used in most air cleaners that remove gas-phase contaminants from the air. Different contaminants are removed by different sorbents. In addition, air cleaners contain different sorbents in various quantities (from grams to kilograms) and in various configurations (from flat panels to V-banks) all of which will have an impact on the filter's performance. Thus, it is critical to have test data to document the performance of air cleaners. To meet this need, ASHRAE has published a new laboratory test standard giving the HVAC market its first gas-phase test standard for air cleaning devices. This method is ASHRAE 145.2-2011 "Laboratory Test Method for Assessing the Performance of Gas-Phase Air Cleaning Systems: Air Cleaning Devices."

For this research, currently marketed air cleaners were chosen to cover a wide range of the capabilities. All of the air cleaners are sorbent-based, but the sorbents are designed to apply best to different contaminants. Five different air cleaners (3 commercial and 2 residential) were tested for efficiency and capacity per ASHRAE 145.2.

Six contaminants were chosen to include compounds that are undesirable in air but are commonly found in indoor air or in outdoor air that is entering buildings. These compounds also serve to highlight the capabilities of the test method and the differences across types of air cleaners. The compounds selected for these tests were toluene, hexane, sulfur dioxide, ozone, formaldehyde and nitrogen dioxide. As required in the test method, the compounds are tested separately.

The results include low concentration 'initial efficiencies,' breakthrough curves for high concentration exposure, and capacity measurements for the five air cleaners for multiple compounds. Representative test results are presented in comparison tables and presented graphically.

The results of this research will help buyers with selecting gas-phase air cleaners especially by enabling them to ask the right questions about efficiency, breakthrough time and capacity when selecting products. These data allow comparison between the air cleaners, show the great variability in performance, and highlight the usefulness of the ASHRAE 145.2 test method.