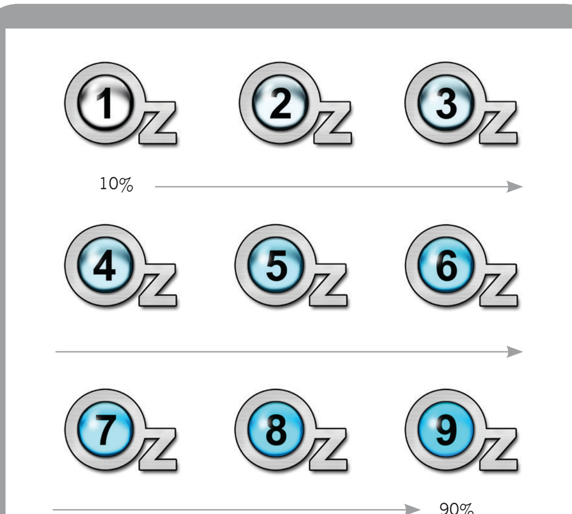
Ozone Ratings

Ozone Removal Efficiency

Over 100 million Americans live in areas where ozone creates a health concern according to the US Environmental Protection Agency.



Camfil molecular air filters are rated for ozone removal efficiency.

Ozone may be removed from the air by molecular air filters. To help users assess the effectiveness of different products, Camfil has developed a unique ozone removal efficiency rating system.

Ozone

Ozone is a naturally occurring gas that is widely present in our environment at ground level. The ozone molecule is composed of three oxygen atoms, rather than the two atoms of normal oxygen. Ozone is formed by the interaction of other gaseous pollutants such as oxides of nitrogen and volatile organic compounds (VOCs) under the influence of ultraviolet (UV) light. City center levels of ozone increase during periods high pollution of high sunlight. Ozone is an oxidizing agent, and has the potential to damage or destroy other molecules.

Ozone and Human Health

The inhalation of ozone can be harmful to human health. The presence of ozone in the air may be correlated to hospital admission rates for respiratory illness. Exposure to ozone is linked to premature death, asthma, bronchitis, heart attack, and other cardiopulmonary problems. Long-term exposure to ozone has been shown to increase the risk of death. A study of 450,000 people living in United States cities showed a significant correlation between ozone levels and respiratory illness over the 18-year follow-up period. The study revealed that people living in cities with high ozone levels, such as Houston and Los Angeles, had an over 30% increased risk of dying from lung disease. Ambient ozone levels and high alerts may be available on local government websites in many parts of the world. Ozone can be hazardous to humans even at very low levels.

In indoor spaces, not only ozone, but the reaction products of ozone interacting with chemicals found indoors can cause health concerns. ASHRAE's Environmental Health Committee (EHC) issued an Emerging Issue Brief on Ozone and Indoor Chemistry in January of 2011 that reports on research showing that "safe O_3 levels would be lower than 10 ppb". The EHC document describes several actions that can be taken to reduce the health impacts of ozone and associated by-products in indoor spaces that include: removing ozone at outdoor air intakes; minimizing ozone emissions from equipment used indoors; reducing concentrations of terpenes and carbonyls (aldehydes) using source reduction and gas phase removal equipment; and using high efficiency particulate filters (MERV 13 or greater) to remove secondary organic aerosols and ultrafine particles that are created as by-products of ozone reactions.

For buildings with air change rates of more than 1.5 air changes per hour, ASHRAE Standard 62.1 requires air filters for ozone removal when limits as published by the EPA are exceeded. Unfortunately, over one hundred million people in the United States live in areas where ozone may be elevated and the outdoor levels must be considered in the design phase.

Removing ozone from the air with molecular air filters will reduce ozone levels through processes of adsorption and decomposition. Camfil's ozone rating system provides an efficiency value for the proper selection of air filters to address local concerns.

camfil

Ozone Rating

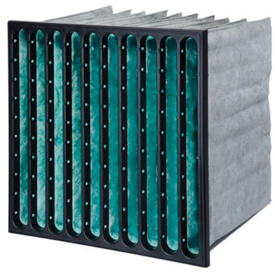
Ozone Removal Efficiency

Camfil uses a unique test rig to measure ozone removal efficiency. Ozone is injected into the airstream, tempered for humidity and temperature, while sensitive ozone detectors measure the concentration upstream and downstream of the filter. Filter efficiency is calculated from the up-and downstream ozone concentrations. Camfil is the market leader in the validation of performance of molecular filters. In our testing facilities, air filters can be challenged with many different types of gases and vapors. Using temperatures between 40 and 120ºF and relative humidity levels between 30 and 90%, we can determine the performance of our filters under the conditions specific to our customer's applications.

CityPleat 150, 200, 300, 400, 500

Average Ozone Removal Efficiency 30%

City-Flo XL



Average Ozone Removal Efficiency 30%

CityPleat 1000, 1500

Average Ozone Removal Efficiency 50%

CityCarb E

Average Ozone Removal Efficiency 70%

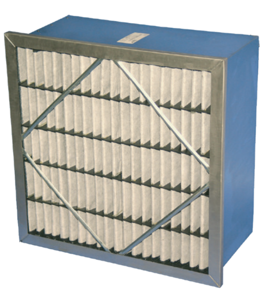
CityCarb CH

Average Ozone Removal Efficiency 85%

CitySorb DP Acid

Average Ozone Removal Efficiency 85%

CitySorb DP



Average Ozone Removal Efficiency 85%

CityCarb I

Average Ozone Removal Efficiency 95%

All filters tested at 500 fpm face velocity, ozone challenge = 150 – 450 ppb, temperature = 40° F, relative humidity = 50%. All filters tested include a high quality broad spectrum adsorbent, based on activated carbon selected to destroy the ozone molecules. **Laboratory tests show that filters based on the use of potassium permanganate (strong oxidizing agent) are unlikely to be as effective.** The reaction between ozone and carbon is catalytic in that ozone is not adsorbed on the surface of the carbon as are other gases, but rather the reaction will form carbon dioxide and oxygen ($C + 2O_3 = CO_2 + 2O_2$). Ozone does not have a significant effect on the life of the carbon filter, but the carbon will be affected by other gas contaminants. When installed in a system with little or no challenge for the carbon surface area by other gases, the air filter's affinity for removing ozone is almost indefinite.

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