



Indoor Air
Quality for
**COMMERCIAL
BUILDINGS**

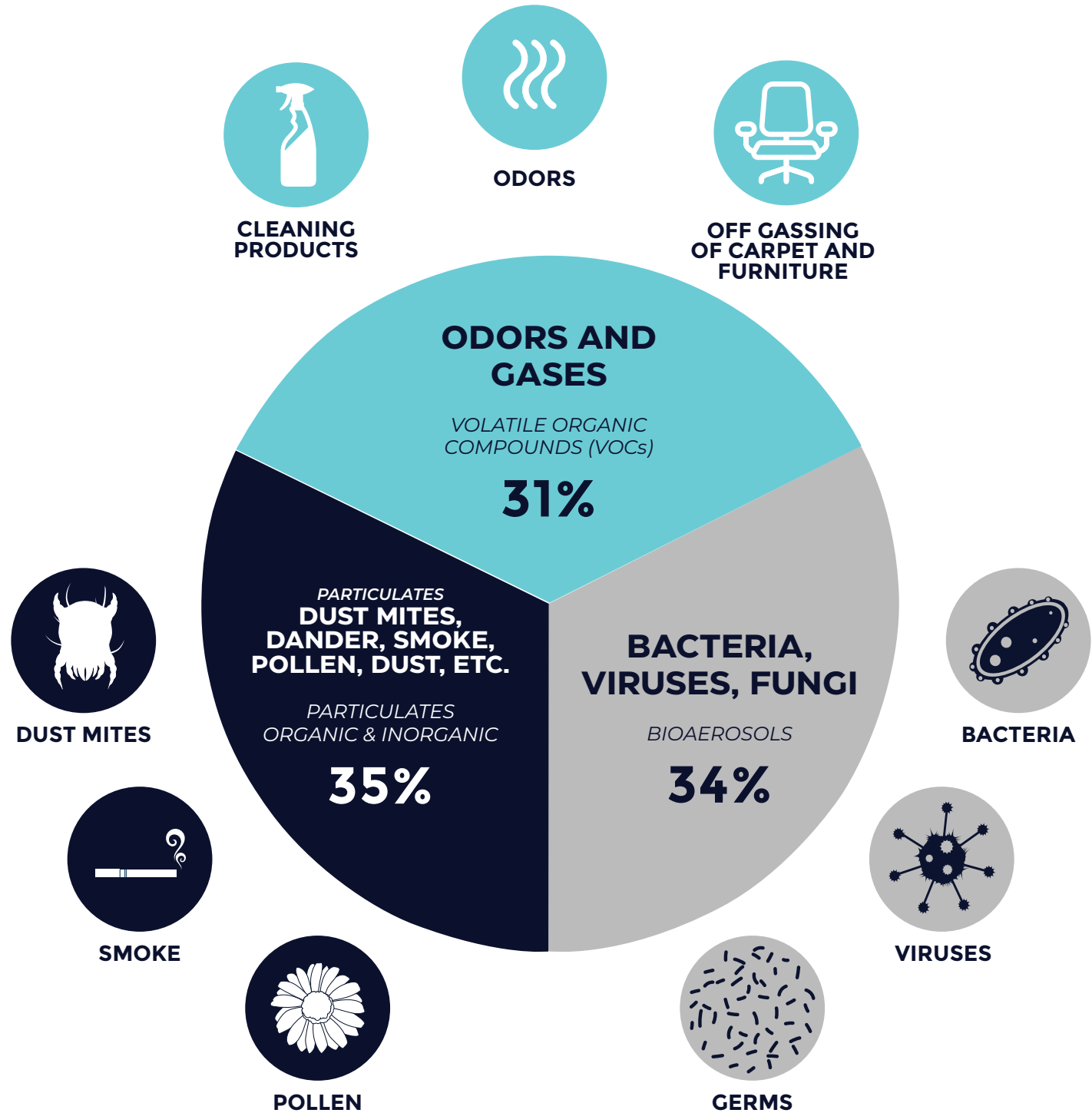


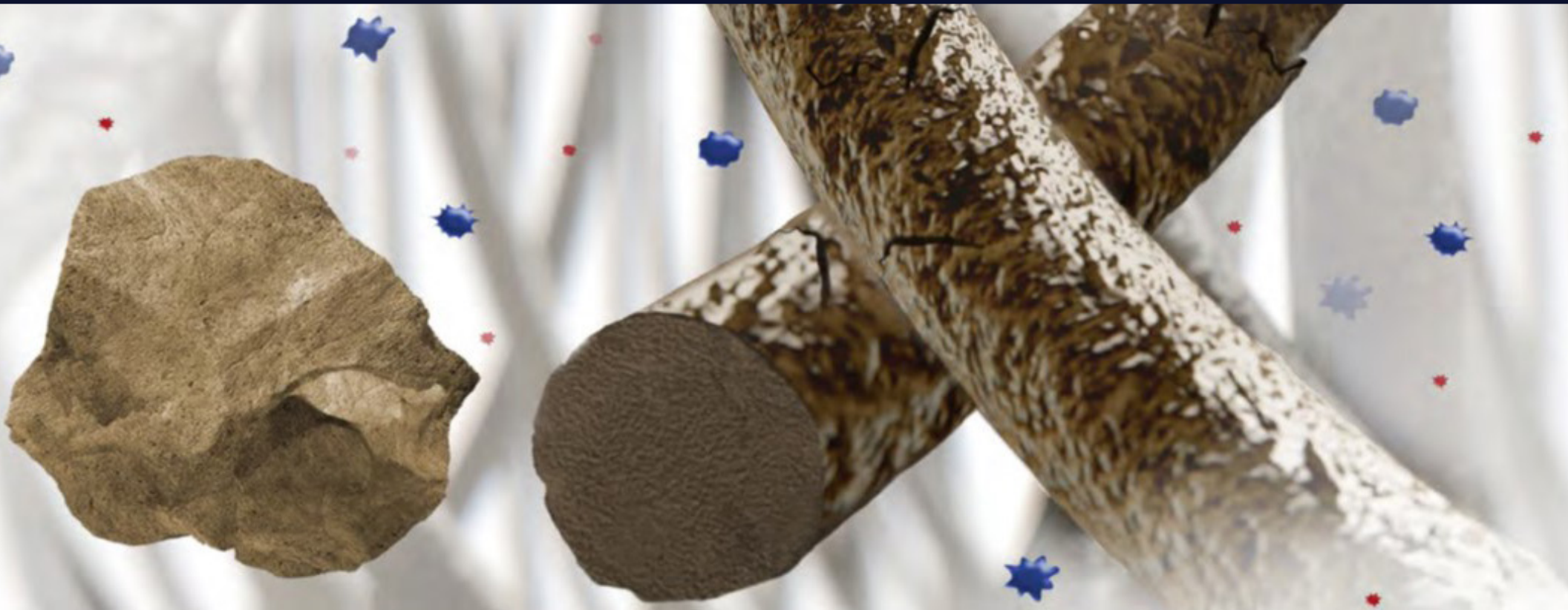
The **quality of the air** we breathe
determines the **quality of the life** we lead.

WHAT'S IN YOUR AIR?



The contaminants in the air we breathe can be placed into 3 categories as seen in this chart. Each category requires different solutions to address how to eliminate or reduce them to healthy air levels.





Particle Size Reference

Fine Beach Sand
90 μm in diameter

Human Hair
50-70 μm in diameter

PM_{10}
< 10 μm in diameter

$\text{PM}_{2.5}$
< 2.5 μm in diameter

This graphic depicts size comparisons for particulate matter (PM) in micrometers (μm).
Note that **$\text{PM}_{2.5}$** is not visible to the naked eye.



The Environmental Protection Agency (EPA) States That

Particulate Matter contains microscopic solids or liquid droplets that are so small that they can be inhaled and cause serious health problems. Some particles less than 10 micrometers in diameter can get deep into your lungs, and some may even get into your bloodstream. Of these, particles less than 2.5 micrometers in diameter, also known as fine particles or $PM_{2.5}$, pose the greatest risk to health.

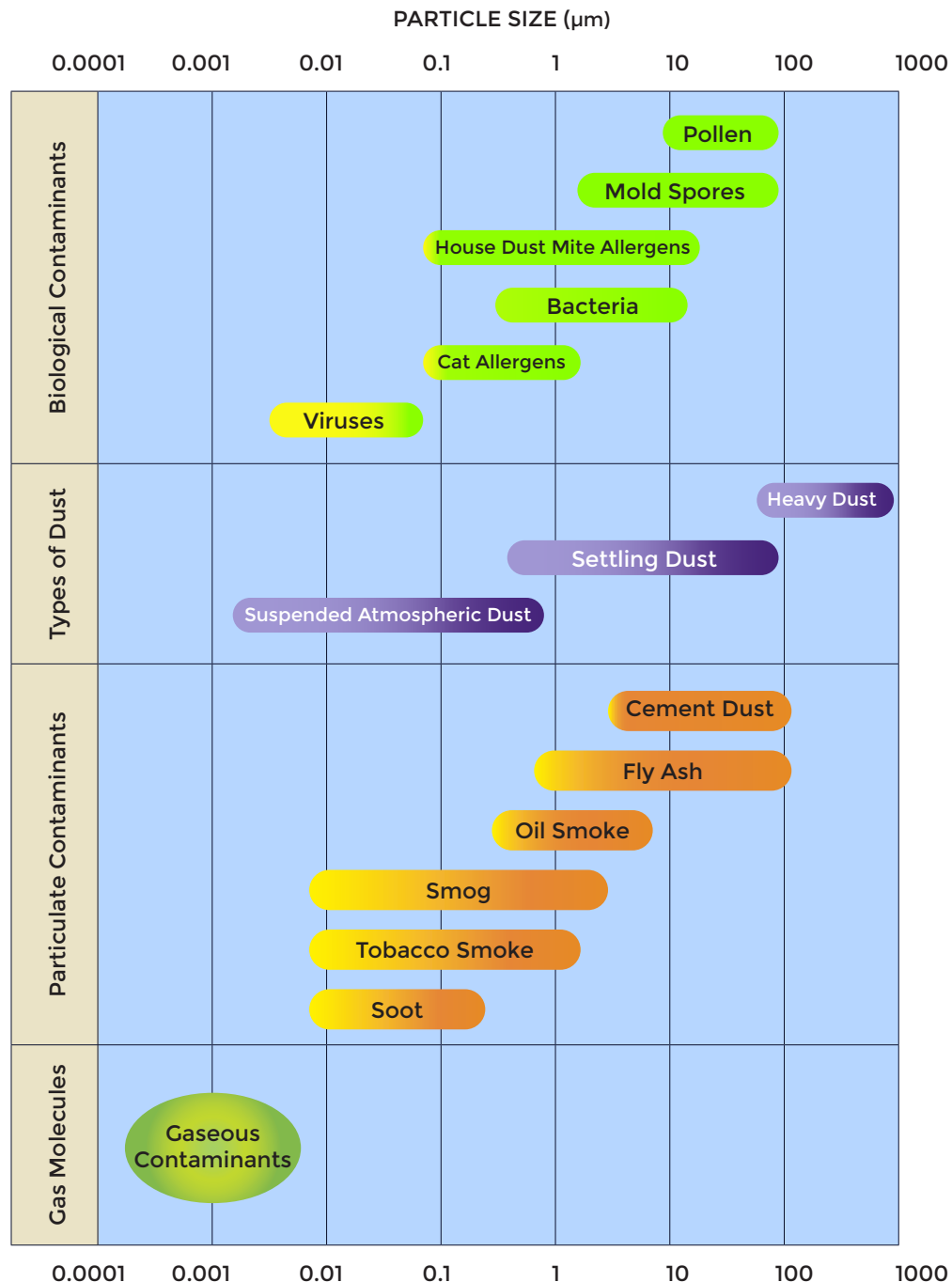
What To Do

Capture airborne particulate matter through air filtration.





SIZING UP AIRBORNE PARTICLES AND POLLUTANTS





AIR FILTER MERV VALUE GROUPINGS



MERV Value	Minimum Particle Size	Typical Controlled Contaminant	Typical Application
1-4	> 10.0 μm	Pollen, dust mites, cockroach debris, sanding dust, spray paint dust, textile fibers, carpet fibers	Residential window AC units
5-8	10.0-3.0 μm	Mold spores, dust mite debris, cat and dog dander, hair spray, fabric protector, dusting aids, pudding mix	Better residential, general commercial, industrial workspaces
9-12	3.0-1.0 μm	Legionella, humidifier dust, lead dust, milled flour, auto emission particulates, nebulizer droplets	Superior residential, better commercial, hospital laboratories
13-16	1.0-0.3 μm	Bacteria, droplet nuclei (sneeze), cooking oil, most smoke and insecticide dust, most face powder, most paint pigments	Hospital & general surgery, superior commercial buildings

*The coronavirus is about 0.12 microns in diameter. N95 (masks) protect down to 0.1 microns, with 95% efficiency, which is where it gets its name.**

**Mayo Clinic*

What is a MERV rating?

Minimum Efficiency Reporting Values, or MERVs, report a filter's ability to capture larger particles between 0.3 and 10 microns (μm).

Question: Who establishes air filter MERV ratings?

ANSWER: The MERV filter rating is the domestic and international industry standard rating system established by the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)



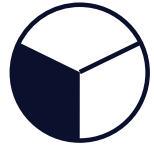
Air Filter MERV Values vs. Particle Size Efficiency

TABLE 3: MERV PARAMETERS

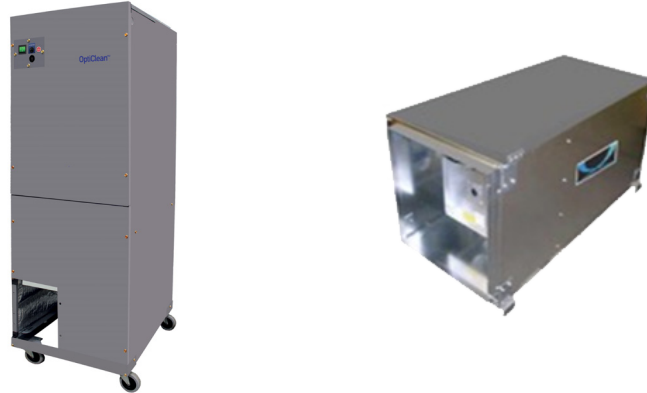
Standard 52.2 Minimum Efficiency Reporting Value (MERV)	Composite Average Particle Size Efficiency, % In Size Range, μm			Average Arrestance, %
	Range 1 (0.3-1.0)	Range 2 (1.0-3.0)	Range 3 (3.0-10.0)	
1	n/a	n/a	$E_3 < 20$	$A_{\text{avg}} < 65$
2	n/a	n/a	$E_3 < 20$	$65 \leq A_{\text{avg}} < 70$
3	n/a	n/a	$E_3 < 20$	$70 \leq A_{\text{avg}} < 75$
4	n/a	n/a	$E_3 < 20$	$75 \leq A_{\text{avg}}$
5	n/a	n/a	$20 \leq E_3$	n/a
6	n/a	n/a	$35 \leq E_3$	n/a
7	n/a	n/a	$50 \leq E_3$	n/a
8	n/a	$20 \leq E_2$	$70 \leq E_3$	n/a
9	n/a	$35 \leq E_2$	$75 \leq E_3$	n/a
10	n/a	$50 \leq E_2$	$80 \leq E_3$	n/a
11	$20 \leq E_1$	$65 \leq E_2$	$85 \leq E_3$	n/a
12	$35 \leq E_1$	$80 \leq E_2$	$90 \leq E_3$	n/a
13	$50 \leq E_1$	$85 \leq E_2$	$90 \leq E_3$	n/a
14	$75 \leq E_1$	$90 \leq E_2$	$95 \leq E_3$	n/a
15	$85 \leq E_1$	$90 \leq E_2$	$95 \leq E_3$	n/a
16	$95 \leq E_1$	$95 \leq E_2$	$95 \leq E_3$	n/a
HEPA	$99.97 \leq E_1$	$99.97 \leq E_2$	$99.97 \leq E_3$	n/a



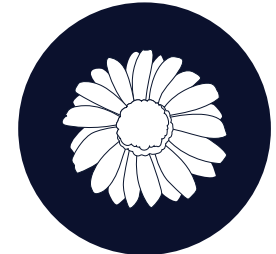
SOLUTIONS TO ADDRESS PARTICULATES



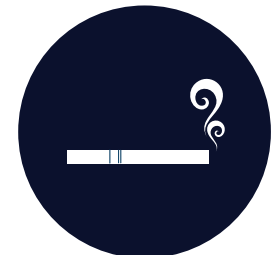
HEPA Filters



Air Purifiers with MERV 15+



POLLEN



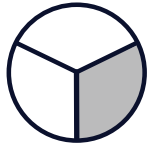
SMOKE

MERV 13+ Filters



DUST MITES

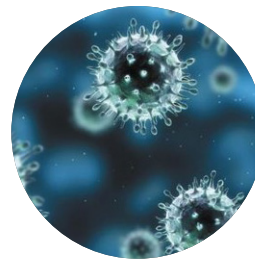
ALWAYS verify that your filter is not restricting the air to a point that it is adversely affecting the performance and reliability of your HVAC system.



Bioaerosols (short for biological aerosol) are a subcategory of particles, that are released from ecosystems into the atmosphere. They consist of both living and non-living components, such as fungi, pollen, bacteria and viruses.

What To Do

Disrupt the outer structure of a microorganism's cell(s), preventing replication and causing cell death. This is typically done through UV irradiation and/or an oxidation process.



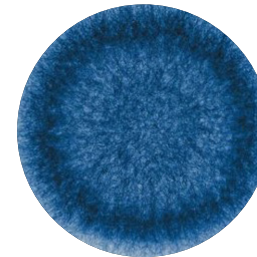
VIRUS



BACTERIA



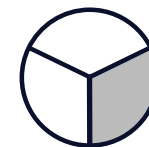
POLLEN



MOLD

What is a Bioaerosol?

Living Airborne Micro Organisms such
as: Bacteria, Viruses, Germs,
Mold Spores etc



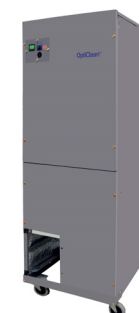
UV LIGHT

Ultraviolet energy inactivates viral, bacterial, and fungal organisms so they are unable to replicate and potentially cause disease. UV Light irradiation works best at surface decontamination but can also kill airborne bioaerosols. The UV-C wavelength inactivates microorganisms living on HVAC air ducts and evaporator coils with a kill ratio of 90 percent or higher, depending on light intensity, length of exposure, lamp placement and lamp life cycle. The technology removes both bacterial and viral aerosols from the air.



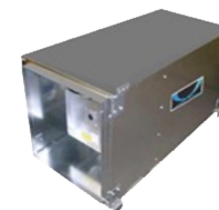
IONIZERS

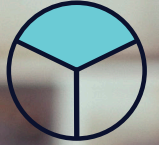
Ionizers (or plasma air cleaners) apply a high-voltage discharge to create positive and/or negative ions which can disrupt the cells of airborne microorganisms which can kill or deactivate them. Photocatalytic Oxidizers (PCOs) and Ozone Generators do somewhat the same by oxidizing Bioaerosols. Caution should be taken when using products that could create ozone.



AIR PURIFIERS

Air Purifiers capture airborne particulates by either trapping them within the filter's material or by magnetically charging the particles and collecting them. Some Air Purifiers also provide additional germicidal





What are Volatile Organic Compounds?

VOCs are organic chemical compounds whose composition makes it possible for them to evaporate under normal indoor atmospheric conditions of temperature and pressure. This is the general definition of VOCs that is used in the scientific literature and is consistent with the definition used for indoor air quality. Essentially, they are odors and gases and are made up of the tiniest of particles.

VOCs are mostly released into the air from the use of products and materials containing VOCs. They include common items such as:

- Cleaning Supplies, Solvents and Chemicals
- Construction Materials, Glues and Caulking
- Carpets and Floor Coverings
- Paints and Stains
- Off gassing of carpet and furniture

What To Do Ventilate, Absorb or Adsorb, Ionize



**CLEANING
PRODUCTS**

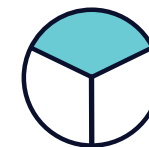


ODORS



**OFF GASSING
OF CARPET AND
FURNITURE**





Treat It

IONIZERS

Ionizers apply a high-voltage discharge to ionize incoming gases, breaking their chemical bonds and chemically altering them. PCOs and Ozone Generation also chemically alter VOCs by generating hydroxyl or oxygen radicals through oxidation. Caution should be taken when using products that could create ozone.



Exhaust It

VENTILATION *(Exhaust Fans)*

Exhausting contaminated indoor air and bringing in fresh outside air to a space dilutes contaminants that build up in your occupied spaces. The most basic way to ventilate is through your HVAC equipment's economizer or fresh air intake.

ENERGY RECOVERY

VENTILATOR *(ERV)*

An ERV exhausts pollutants while recovering heat and moisture. It efficiently recovers heat and needed moisture from the exhaust stream during cold weather without over-drying. It also pre-cools and pre-dehumidifies incoming air during hot, muggy weather. An ERV is the best year-round solution for fresh air, minimizing the added load to your heating and cooling equipment. Be aware of ERV technology that could allow for cross contamination.



HEAT RECOVERY VENTILATOR *(HRV)*

An HRV can refresh and revitalize indoor air removing unseen pollutants. It helps maintain system efficiency in the winter by recovering heat from the exhaust air stream and transferring it back to the incoming air stream. The heat only recovery does have some benefits in the summer, when the transfer goes from incoming to exhaust air



Absorb It

ABSORPTION FILTERS

Example:
Activated Carbon
Filter



IONIC BONDING FILTERS

(Secureaire air purifier)

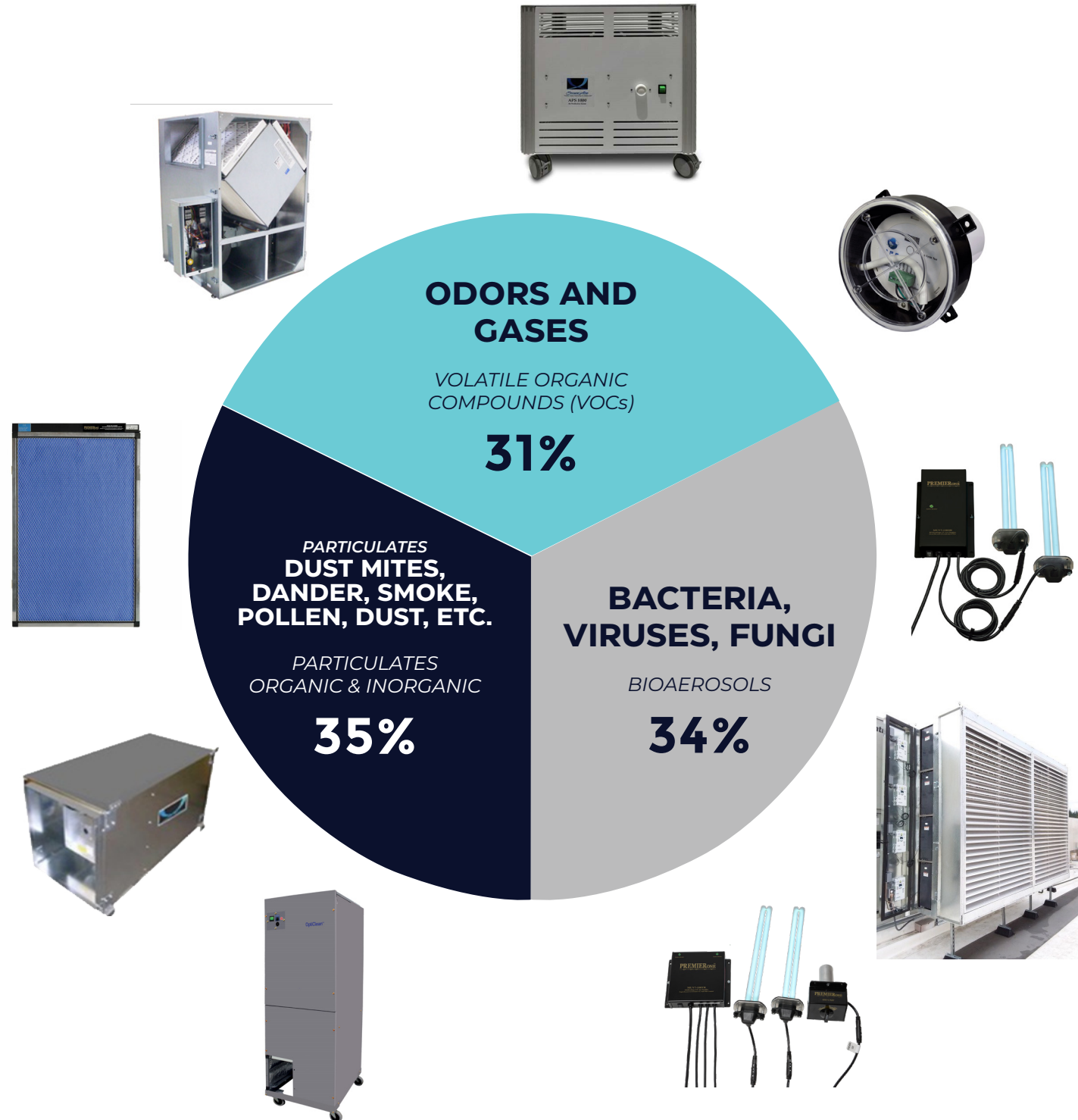
Some Air Purifies capture VOCs through Absorption and/or Adsorption. Absorb is when two materials chemically combine. Adsorb is when one material sticks to the surface of another. In absorption, one material is taken internally into another. In adsorption, one material coats the surface of another.



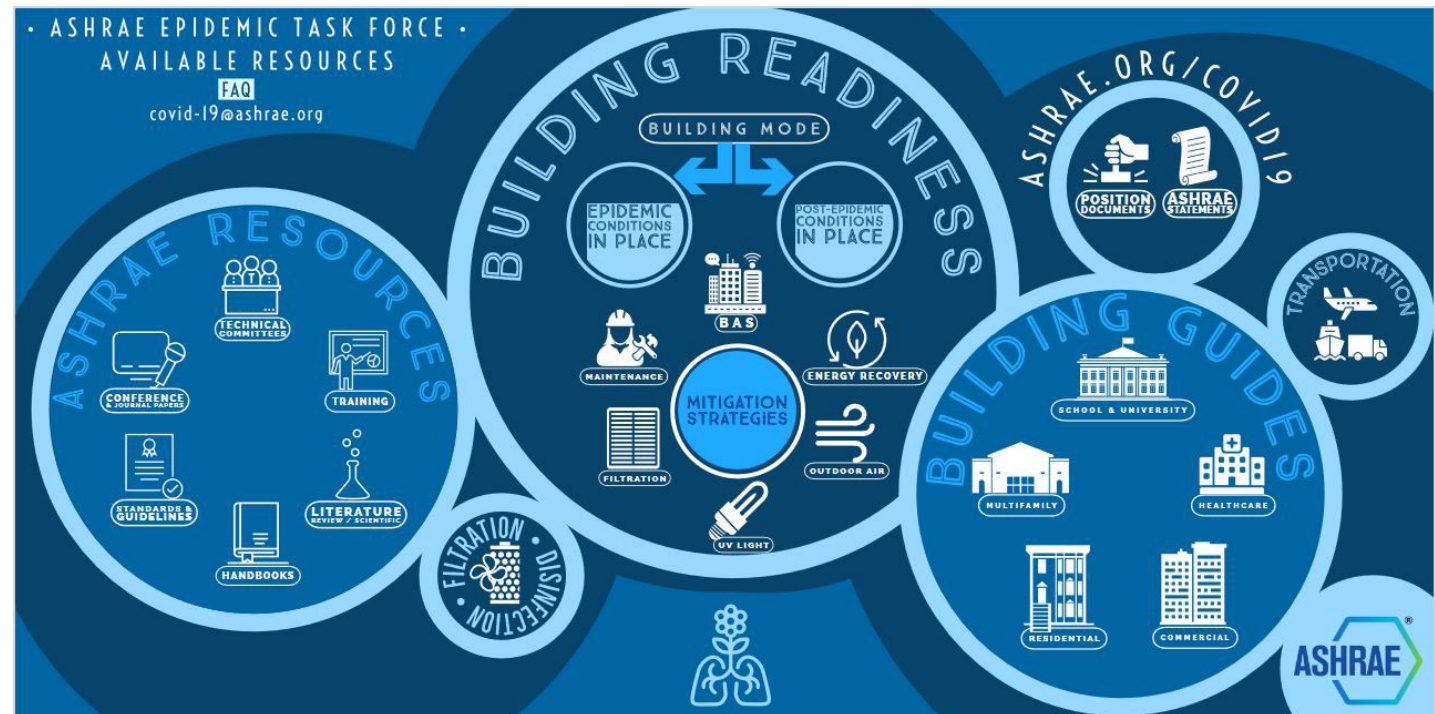
CONTAMINANT / SOLUTION SUMMARY

Efficiency: The efficiency of an air-cleaning device is a fractional measure of its ability to reduce the concentration of pollutants in the air that passes once through the device. The efficiency of a device is measured in a laboratory where all relevant variables are controlled. Efficiency ratings allow comparison between different devices when they are tested under the same conditions (e.g., the same flow rate, air speed, pollutant concentrations).

Effectiveness: The effectiveness of an air-cleaning device or system is a measure of its ability to remove pollutants from the spaces in which it is operated. The effectiveness of the device or system is a function of its use in real-world situations. While this can be simulated under controlled conditions in a laboratory test space, the in-use effectiveness of any device depends on many factors including its location, installation, airflow rate, and operating hours.

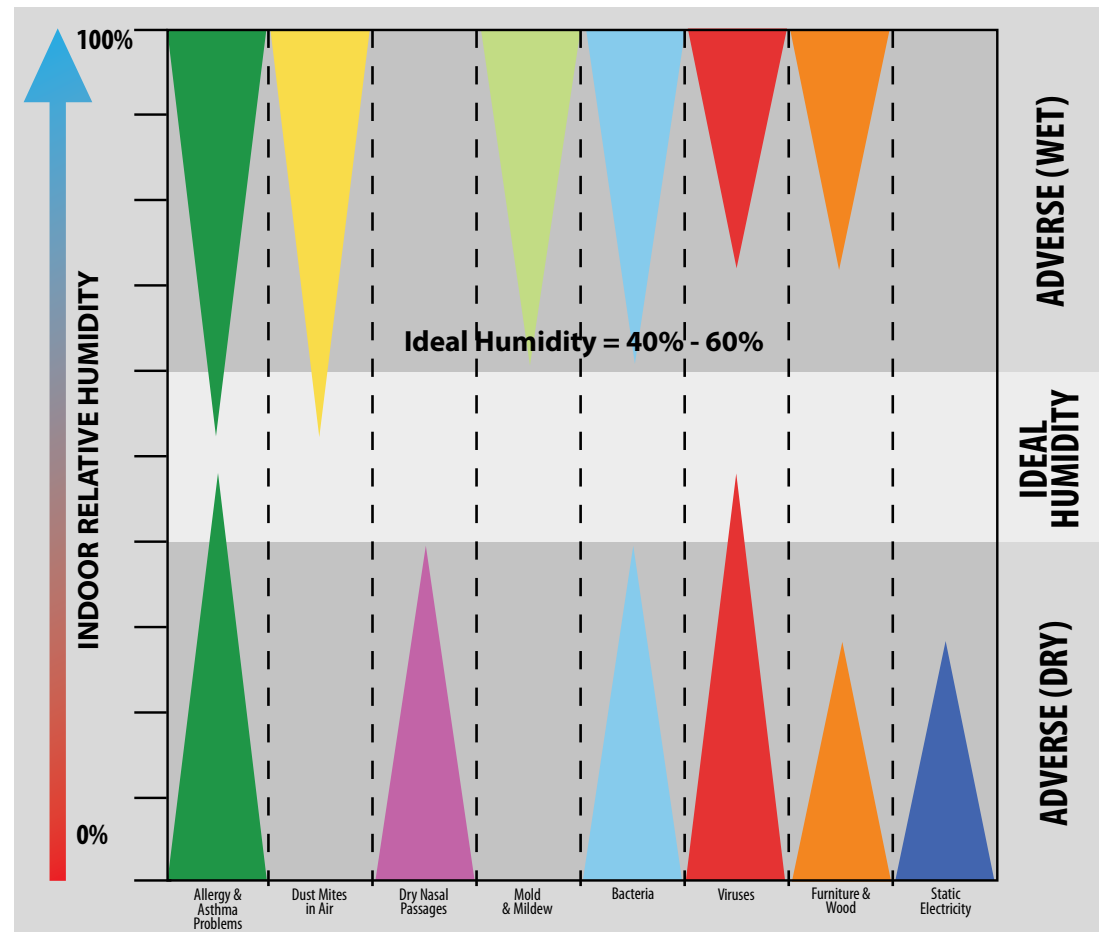


Scan for
Additional
Resources:



Proper Control of Humidity is Important in IAQ

Maintaining ideal humidity in your building can be key to relief from dry nasal passages, static electricity and dry, itchy skin. Proper humidity control is also important for minimizing the growth of bacteria, molds and viruses. Dry indoor air can increase the possibility of catching or transmitting cold and flu viruses.



COMMERCIAL IAQ SOLUTION COMPARISON							
Air-Cleaning Technology	Advantages	Disadvantages	Effectiveness			Installed Price	Cost of Ownership
			Particles	Bioaerosols	VOCs		
1" to 2" MERV 13 Filters	Base PM2.5+ effectiveness. 50% Efficient on .3-1.0 PM.	Very restrictive to HVAC System Airflow. Captures some but does not kill Bioaerosols.	✓	✓		Not Recommended	Not Recommended
4" MERV 13 Filters	<ul style="list-style-type: none"> MERV 13 - Base PM2.5+ effectiveness. 50% Efficient on .3-1.0 PM. Mechanical media filters see improved efficiency with time. 	<ul style="list-style-type: none"> Captures some but does not kill Bioaerosols. Regular replacement is required. Used particle filters can be a source of sensory pollution/odors. High pressure drops on some media filters can negatively impact HVAC systems. Confusing number of test standards and rating metrics. 	✓	✓		\$	\$
Electrostatic Filters	<ul style="list-style-type: none"> Increased efficiencies and effectiveness by electrostatically collecting particles. MERV ratings up to 14. 		✓				
4" MERV 15 Filters	<ul style="list-style-type: none"> MERV 15 - Better PM2.5+ effectiveness. 85% Efficient on .3-1.0 PM. Mechanical media filters see improved efficiency with time. 		✓✓				
HEPA Filters	Best PM2.5+ effectiveness. 99.97% Efficient on .3-1.0 PM. Does not affect HVAC System airflow when installed as a bypass filtration system or in stand-alone applications.	<ul style="list-style-type: none"> Captures some but does not kill Bioaerosols. Too restrictive to airflow to be sole filtration for HVAC systems. Regular replacement is required. Used particle filters can be a source of sensory pollution/odors. 	✓✓✓	✓✓		\$\$\$	\$\$
Ionizers, Ozone Generators, Plasma, Photocatalytic Oxidizers (PCOs)	<p>Can improve the effectiveness of a media filter by combining fine particles into larger particles.</p> <ul style="list-style-type: none"> Typically low power draw requirements Quiet No/low maintenance Improve filtration efficiency.* 	No industry testing standards. Typically low effectiveness based on the many variables within an application. Can have*high removal efficiency for some gases as well as particles, and they can also kill or deactivate airborne microorganisms. However, a number of harmful byproducts could form including ozone, carbon monoxide, and formaldehyde.	✓	✓	✓	\$\$	\$
UV Lights	Surface disinfection and some airborne neutralization of bioaerosols.	May produce byproducts		✓✓		\$\$	\$\$
Absorption Filters: Activated Carbon Filters	Reduces smells and VOCs through chemical absorption.	Regular replacement is required because its adsorption capacity is exhausted and physical adsorption is a reversible process, meaning pollutants may not be permanently captured.			✓	\$	\$\$
HRVs	Exhausts contaminants, while recovering heat.	Adds to heating and cooling utility bills. Does not recover humidity in the summer or winter. Requires condensate drain.		✓	✓✓✓	\$\$\$\$	\$\$
ERVs	Exhausts contaminants while recovering energy (heat and humidity). Does not require condensate drain.	Adds to heating and cooling utility bills.		✓	✓✓✓	\$\$\$\$	\$\$
Two Step Air Purifiers	Better PM2.5+ effectiveness. 85% Efficient on .3-1.0 PM. Captures and kills Bioaerosols.	Regular cartridge replacement required.	✓✓	✓✓✓		\$\$\$	\$
Three Step Air Purifiers	Better PM2.5+ effectiveness. 85% Efficient on .3-1.0 PM. Captures and kills Bioaerosols*. Absorbs and Adsorbs VOCs. Some produce no byproducts. Whole-house solution for all 3 contaminate categories.	Regular cartridge replacement required.	✓✓	✓✓✓	✓✓✓	\$\$\$	\$

*Can improve the effectiveness of a media filter, by combining fine airborne particles into larger particles.

COMMERCIAL IAQ PRODUCT LIST

Product	Model #	IAQ Target	Typical Application
PremierOne UV	MUV-7-50-PS-16	Bioaerosols	Up to 6 Tons
PremierOne UV	MUV-7-100DR-16	Bioaerosols	Up to 12 Tons
PremierOne UV + O3	MUV-7-50DR-16	Bioaerosols & VOC's	Up to 6 Tons
PremierOne UV + O3	MUV-7-100-TR16	Bioaerosols & VOC's	Up to 12 Tons
PremierOne 1" Polazired Media Air Cleaner	P6100-1620	Particulates	Filter Upgrade
PremierOne 1" Polazired Media Air Cleaner	P6100-1625	Particulates	Filter Upgrade
PremierOne 1" Polazired Media Air Cleaner	P6100-2025	Particulates	Filter Upgrade
PremierOne 1" Polazired Media Air Cleaner	P6100-2020	Particulates	Filter Upgrade
<i>*available to order in custom sizes</i>			
Puro-Green Pleated MERV 13 Filter	PR13-LxWxH I.E. PR13-16x25x2	Particulates	Filter Upgrade
Nu-Calgon iWave-C Ionizer	4900-10	Particulates, Bioaerosols, & VOC's	Up to 10 tons
Nu-Calgon iWave-M Ionizer	4900-35	Particulates, Bioaerosols, & VOC's	PTACs and Mini Splits
Carrier/Bryant OptiClean Air Scrubber & Negative Air Machine	FN1AAF015000	Particulates & Bioaerosols	Up to 1500 CFM
SecureAire Three Step Air Purifier	APS-1000X	Particulates, Bioaerosols, & VOC's	Standalone up to 1000 CFM
SecureAire Three Step Air Purifier	APS-2000X	Particulates, Bioaerosols, & VOC's	Standalone or ducted up to 2000 CFM
SecureAire Three Step Air Purifier	ACS-4000X	Particulates, Bioaerosols, & VOC's	Ducted up to 4000 CFM
SecureAire Three Step Air Purifier	ACS-6000X	Particulates, Bioaerosols, & VOC's	Ducted up to 6000 CFM
SecureAire Three Step Air Purifier	ACS-8000X	Particulates, Bioaerosols, & VOC's	Ducted up to 8000 CFM
Renewaire Commercial ERVs	HE Series	Fresh Air Exchange	Sizes available from 250-7950 CFM
Renewaire Commercial ERVs	EV450	Fresh Air Exchange	450 CFM
Aprilaire Steam Humdiifer	800	Comfort and Bioaerosol Mitigation	Up to 34 gallons per day
Aprilaire Steam Humdiifer with Fan Pack	865	Comfort and Bioaerosol Mitigation	Up to 34 gallons per day
Aprilaire Modulating Steam Humdiifer	801	Comfort and Bioaerosol Mitigation	Up to 34 gallons per day
Aprilaire Modulating Steam Humdiifer with Fan Pack	866	Comfort and Bioaerosol Mitigation	Up to 34 gallons per day



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JANUARY 2021