Specialty Filtration to Target Common Indoor Air Pollutants

I. Introduction

When the topic of air pollution is brought up, outdoor air pollution is generally the focus of discussion while indoor air pollutants are commonly overlooked. However, indoor air pollution presents new challenges in addition to many of the same challenges outdoor pollution may cause. According to the Environmental Protection Agency (EPA), "Americans, on average, spend approximately 90 percent of their time indoors, where the concentrations of some pollutants are often 2 to 5 times higher than typical outdoor concentrations."[1]

II. The Filters

Every home has its unique set of characteristics that make it yours. A one size fits all approach to air purification is likely to be less effective. The TruSens line of specialty filters accommodates your personalized needs with Allergy & Flu, Pet, and Odor & VOC** filters to meet your specific needs.

*** Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids.*

Allergy & Flu Solution

Allergies and influenza tend to have seasonal patterns but are both pertinent year-round. Taking precautions in your home may help to avoid the potentially harmful or irritating effects of either.

According to the Centers for Disease Control and Prevention (CDC), "Most experts think that flu viruses spread mainly by droplets made when people with flu cough, sneeze or talk." [2] Influenza differs based on the strain, but the TruSens Allergy & Flu Filter is anti-viral and captures 99% of airborne viruses, including the H1N1 virus. "In 2009, a new strain H1N1 swine flu spread fast around the world among humans…it spread through airborne droplets from human to human"[3] When the virus is airborne, the combination of the TruSens air purifier and Allergy & Flu filter will help to capture it.

The Allergy & Flu filter also captures 99% of airborne allergens. The cause of an allergic reaction may vary from person to person. "The most common way to be exposed to indoor allergens is by breathing them… All buildings contain indoor allergens because there are so many different sources. For instance, pet hair, dust mites, cockroaches, and mold are common sources of indoor allergens."[4]

Whether your household suffers from allergies, is looking for an anti-viral solution, or both, the Allergy & Flu filter may be the best-fit specialty filter. As always, we would highly recommend

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[1] Environmental Protection Agency. (2018, July 16). Indoor Air Quality. Retrieved from https://www.epa.gov/report-environment/indoor-air-quality#note1

[2] How Flu Spreads. (2018, August 27). Retrieved from https://www.cdc.gov/flu/about/disease/spread.htm

[3] National Center for Biotechnology Information. (n.d.). Retrieved from https://www.ncbi.nlm.nih.gov/

[4] Indoor Allergens. (2018, June 13). Retrieved from https://www.dhs.wisconsin.gov/air/allergens.htm

you consult your physician before making any decisions on how to address your specific concern/room conditions.

Pet Solution

A common addition to households around the world are pets. Unfortunately, some of the most common household pets are also a source of indoor air pollutants. For pet owners with allergies to their pet this can be an obvious problem. "People with allergies may experience upper and lower respiratory tract symptoms including congestion, sneezing, runny nose, chest tightness and wheezing. Other symptoms are itching, watery eyes, and eczema or rashes."[5] Regardless of allergies or not, all pet owners can benefit from a reduction of air pollutants from their pets. The TruSens Pet filter captures up to 99.97% of pet dander and helps eliminate common pet odors. TruSens air purifiers have many benefits to meet any household's needs, adding the Pet filter is best to help out pet owners.

Odor & VOC Solution

Odors and VOCs are unavoidable within a household. Lingering odors may be unpleasant, but VOCs are potentially harmful. In developing the Odor & VOC filter, TruSens set out to target both these issues.

"Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors. VOCs are emitted by a wide array of products numbering in the thousands."[6]

VOCs can be emitted from several household products such as cleaning products or paints. Exposure to VOCs can lead to health effects including eye, nose and throat irritation, headaches and nausea. The TruSens Odor & VOC filer helps remove common cooking and cleaning odors, and reduces VOCs.

III. Technology Behind TruSens Specialty Filters

TruSens air purifiers come with a Standard Filter inside. These filters are great for targeting air pollutants in general, and will still help to capture allergens, odors, pet dander and more. The specialty filters are custom made to enhance the needs of a specific home and each filter includes a prefilter, carbon layer, and HEPA filter.

Prefilter:

Compared to the Standard Filter's prefilter, the Pet filter is lower density for easy cleaning and helps capture larger airborne particles such as pet dander and hair. The Allergy & Flu Filter and the Odor & VOC filter each contain a durable mesh prefilter that captures both smaller and larger

[5] Pet Dander. (n.d.). Retrieved from https://www.lung.org/clean-air/at-home/indoor-air-pollutants/pet-dander
[6] Volatile Organic Compounds' Impact on Indoor Air Quality. (2017, November 6). Retrieved from https://www.epa.gov/indoor-air-quality-iaq/volatile-organic-compounds-impact-indoor-air-quality

particles. The prefilters are the first line of defense within the filter as a whole and may help extend the life of the carbon layer and HEPA filter within.

Carbon Layers:

Activated carbon is best used for odor and VOC removal. Due to this, the Odor & VOC filter has the most carbon mass. The Standard Filters have a carbon layer that that fits on the HEPA drum, while the specialty filters each have a carbon drum that stacks in front of the HEPA drum. Each specialty filter carbon drum varies in the layers of carbon pellets – the Allergy & Flu carbon drum has 1 layer of carbon pellets, the Pet carbon drum has 2 layers of carbon pellets, and the Odor & VOC carbon drum has 3 layers of carbon pellets.

To specifically target odors and VOCs, the carbon pellet layers have larger amounts of carbon mass. "A number of studies using activated carbon filters showed that they are excellent volatile organic compounds (VOCs) adsorbents, having a long lifetime with a consistent VOCs removal efficiency."[7]

Carbon is an ideal material to consume these VOC gases because "the adsorption isotherm (maximum capacity of VOC gas that can be adsorbed) is also a function of the amount of adsorption area that molecules of the VOC can reach. Pores on the surface allow entry to the interior area of each of these adsorbents. The interior is where most of the adsorption area exists. Carbon has pores leading to smaller pores, which lead to even smaller pores. This apparently continues ad infinitum in carbon, and much of the internal surface area is in these micro-pores."[8] The process of adsorption is summarized in the following: "Adsorption is the most traditional method for removal of VOCs. Activated carbon, molecular sieve and silica gel are porous materials with a large surface area medium for physical and chemical adsorption. Physical adsorption involves VOCs being trapped onto the materials such as zeolites, activated carbon, activated alumina and molecular sieves and porous clay ore without changing their original form."[9] In short, "Overall, the ACCF (Activated Carbon Cellulose Filter) showed average 99.7 % dust removal efficiency and at the same time performed 98.9–100 % BTEX (benzene, toluene, ethylbenzene and m-xylene) gas removal at the 6.7 m/s linear velocity condition. The result promises excellent simultaneous dust and VOCs removal, with the filters to be used for a wide range of air quality control purposes."[10] The larger carbon mass present in these specialty filters promises greater adsorption to remove offensive odors and VOCs from your home.

High Efficiency Particulate Air (HEPA) Filters:

"HEPA is a type of pleated mechanical air filter. It is an acronym for "high efficiency particulate air [filter]" (as officially defined by the U.S. Dept. of Energy). This type of air filter can

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[7] S.Y. Kim, Y.H. Yoon, & K.S. Kim (2016) Performance of activated carbon-impregnated cellulose filters for indoor VOCs and dust control. Retrieved from http://www.bioline.org.br/pdf?st16202

[8] Environmental Protection Agency (1999) Choosing an Adsoption System for VOC: Carbon, Zeolite, or Polymers? Retrieved from https://www3.epa.gov/ttn/catc/dir1/fadsorb.pdf

[9] Environmental Protection Agency (1999) Choosing an Adsoption System for VOC: Carbon, Zeolite, or Polymers? Retrieved from https://www.mdpi.com/1420-3049/21/1/56/pdf

[10] S.Y. Kim, Y.H. Yoon, & K.S. Kim (2016) Performance of activated carbon-impregnated cellulose filters for indoor VOCs and dust control. Retrieved from http://www.bioline.org.br/pdf?st16202

theoretically remove at least 99.97% of dust, pollen, mold, bacteria, and any airborne particles with a size of 0.3 microns (μm).

These filters are separated into different HEPA grades based on their filtration efficiency of these small PM 2.5 and PM 10 particles. The standard to determine this "…is centered on the performance of the filter for the most difficult, or most penetrating particle size (MPPS)." The TruSens Z-1000/Z-2000 purifier models include a HEPA type filter and the Z-3000 includes a True HEPA filter. All models capture particulate matter as small as 0.3 microns. TruSens specialty filters all contain True HEPA and are available in every size.

Conclusion

TruSens is here to equip you with the tools you need to help achieve better quality air in your home. TruSens air purifiers are a great addition to your household for indoor air pollutants, incorporating a TruSens specialty filter may help target your specific needs. Find which specialty filter is best suited for your home today.