

What are HEPA filters?

They are high efficiency particulate air filters that are made up of a mat of randomly aligned fibers

What are we trying to clear from the air?

1. VOCs: (volatile organic compounds) Highly volatile substances that are meant to be a solid/liquid, but once consumed by humans, they can be dangerous. We can find these products in aerosols, paint, household cleaning products, and etc
2. Bacteria/ viruses
3. Mold spores
4. Dust mites(dirt, soot, hair, carpet fluff)
5. Allergens (mainly pollen)

Components listed have a negative impact on human health according to the concentration and duration of exposure

What is air made out of:

1. Nitrogen 78%
2. Oxygen 21%
3. Argon 0.93%
4. The remaining is made out of: CO<sub>2</sub>, Helium, Neon, Krypton, Methane, Hydrogen

How do filters purify the air?

Method 1: Particle size

The regular components of the air like the carbon and so on are much smaller in size than the air contaminants which are larger in size compared to the normal components. The small components go through the air filter while the large components are trapped. Biological matter are one million times larger. The tiny molecules pass easily through the many tiny pores. Which brings us to the HEPA technology, High efficiency particulate arrestance. Which remove up to 99.7% of particles that are larger than 0.3 micrometers in diameter. Most of the biological material will be filtered out as the air passes through. This does not help with smaller molecules tho. So the VOCs will be a bit harder to remove than the biological matter.

Method 2: Adsorption onto activated carbon

In this method, we activate charcoal (mainly made out of carbon) by exposing it to high levels/ concentration of oxygen. This will create small pores on top of the material the carbon is in, causing the small particles to get absorbed into the pores. This is a common technique for removing pollutants in the air and works on small molecules. If we are able to find the correct device to work with these two methods, we can remove a wide range of contaminants.

There are more innovated techniques. (but typically home)

But a device that may work is the EnvirKlenz, which uses two step filtration process of 1. HEPA filtration (for large particles) 2. Adsorptive surface (small molecules). Such devices include an absorptive surface of metal oxide, which use "destructive adsorption" which is removes microbes. Once absorbed, a UVC lamp shines on these spores, destroying any pathogens. This surface addresses VOCs. These types of filters use chemisorption which cause Oxygen, Nitrogen, and Sulfur to make covalent bonds with the metal (metal oxide surface) which is

waaay stronger than the activated carbon, which uses physisorption (weaker electrostatic interaction). Chemisorption is effective on:

Formaldehyde (gas used in making building materials with a really strong smell)

Fragrances

Pesticides

Tobacco smoke

Contaminants are bound to a cartilage that is replaced every 6 months. Different air filters work in different ways using air filtration, ionization, and ultraviolet light.

Are plants or filters better?

Filters can remove so many pollutants and bacteria while plants only absorb carbon and release oxygen. Plants can however absorb some VOCs through their root soil such as acetone, benzene, and formaldehyde. A mix of both would be great. But a filter would work better as it filters out both large and tiny particles.

### Plants:

What are the top plants that can produce oxygen outdoors, and what else can they do?

Most plants produce oxygen. But some produce more, in addition, some plants cleanse out the air by clearing out VOCs (Volatile Organic Compounds)

1. Areca Palm (this option might be out because it is a whole palm tree and will not fit on the drone)

But, In the end, we do know that the snake plant is the only plant that is using less amount of sunlight and and less water but is producing 3 times more oxygen for better air.

