Ozone and its role in Air Purification

The Truth about this Misunderstood Element from Nature

Summary

The whole issue regarding Ozone and its use for Air Purification is "At What Level?". There is a misconception that Ozone Producing Air Purifiers have been banned by the EPA, California, Canada and the list goes on. This is untrue. What Canada has done, and what California has done, is a limit on the level of ozone for use in occupied spaces, and in both cases that limit is .05 parts per million (ppm). GreenTech Environmental agrees with this level and GreenTech Environmental products have been designed for and already comply with this standard.

For those concerned about ozone levels inside as well as outside there are ozone test kits available. These kits have treated paper which turns colors in the presence of ozone, giving the user a visual indicator of the ozone level. GreenTech Environmental does not support the use of ozone above .05ppm in occupied spaces. The ozone test kit is an excellent way to verify the ozone levels are within the EPA guidelines.

There are two areas we don't agree with the EPA, California ARB or Health Canada, and those are……

1. Effectiveness of low level ozone used for air purification. These government organizations say ozone is ineffective except at very high levels, levels which are hundreds of times above the level they say is safe for continuous exposure (.05 ppm). Peer reviewed and published testing has shown the effectiveness of ozone at levels well below .05 ppm.
2. Ability of consumers to intelligently and safely operate an ozone generating device which produces ozone levels above .05ppm for use in unoccupied space. There is no evidence of anyone being harmed from using such devices and even these health and safety organizations cite the benefits of high level ozone for remediation. Canada and California have even made provisions for commercial businesses to purchase and operate ozone generators but consumers no longer have the right to use them.

More information on these two topics is presented in the Q&A section of this report.

Discussion

The information readily available regarding ozone makes it appear as ozone is the cause of many of our air quality problems. Headlines such as…….

- Good up high - bad nearby
- Ozone exposure can lead to Asthma attacks
- Ozone Purifiers banned in California

- California regulators work to eliminate ozone from the lower atmosphere
- Caution – Today is a **Ozone Alert Day**

Even the US EPA has made many negative statements regarding ozone including….

- At concentrations that do not exceed public health standards, ozone has little potential to remove indoor air contaminants
- At concentrations that do not exceed public health standards, ozone is not effective at removing many odor-causing chemicals
- If used at concentrations that do not exceed public health standards, ozone applied to indoor air does not effectively remove viruses, bacteria, mold, or other biological pollutants
- Results of some controlled studies show that concentrations of ozone considerably higher than these standards are possible even when a user follows the manufacturer's operating instructions.

GreenTech Environmental is a manufacturer of Air Purification Devices that use safe levels of ozone intentionally, in addition to several other active purification technologies, to purify the air and surfaces.

If a person were to take several weeks and really study the issue of ozone and whether it is appropriate for use in indoor air cleaning devices, they would realize the key is **what level?** Many have made the statement the ozone is dangerous, and GreenTech Environmental agrees. In fact nearly everything in nature, every element, everything that we count on in our every day life is dangerous if used incorrectly or in the wrong amounts. Let's take for instance

Water: Too much will kill you (drowning), and too little will kill you (dehydration). Tsunamis kill people and water is the major component of a Tsunami, so should we to blame water? Sounds silly but Ozone is a major component of Smog, does that make Ozone the cause of Smog? Of course not, and most discussions buried down deep in the web pages of the EPA and other organizations validate this fact.

Oxygen: One of the most basic elements in nature. It is life giving in the right concentration (typically 18-20% of breathable air is oxygen). Yet at too high a level it can kill you

Electricity: Can't live without it, but it kills thousands each year. It is a powerful force that needs to be handles with respect.

Ozone is no different. At the right and natural level, like you find outside on a non-polluted day, ozone is safe. Typical levels are .01 to .05 ppm. Ozone at high levels, such as is used for remediation of fire damage, mold remediation and other uses, can cause lung irritation and shortness of breath. So ozone, along with nearly all elements in nature must be respected, and devices that generate ozone must also be properly handled and

operated, just as your gas stove or electrical devices must be properly operated. Improper operation of literally hundreds of household appliances can cause injury or even death.

From the plethora of negative information written on the internet and in print regarding the hazards of ozone producing air purifiers you would think this is a major cause of death for asthmatics and children, the two groups said to be most at risk for ozone exposure. The truth is NOT ONE person has ever been identified as being permanently harmed by ozone producing air purifiers. GreenTech Environmental and dozens of other manufacturers have sold millions of purifiers, and if all you read about ozone on the internet were true, you would think all manufacturers of ozone producing air purifiers would have thousands of pending personal injury lawsuits, yet GreenTech nor any other manufacturer we are aware of has ever had a single judgment against it for personal injury. In fact, the majority of testimonials received at GreenTech Environmental have come from those who are identified most at risk; asthmatics and children.

The following information is provided to bring the truth about ozone, both the risks and the benefits in a Question and Answer format.

Q: I heard that any amount of ozone is bad so why would a person want a device which intentionally generates ozone?
A: Ozone is produced naturally by sun light and ozone is a component of ground-level air no matter where you go in the world, and this has been the case since the beginning of time. If you go into the remote areas of the world which are unaffected by air pollution, ozone levels are between .01 and .05 parts per million (ppm). It is impossible to find a place outdoors where the sun shines with an ozone level of zero. So ozone itself isn't unnatural or bad at low levels.

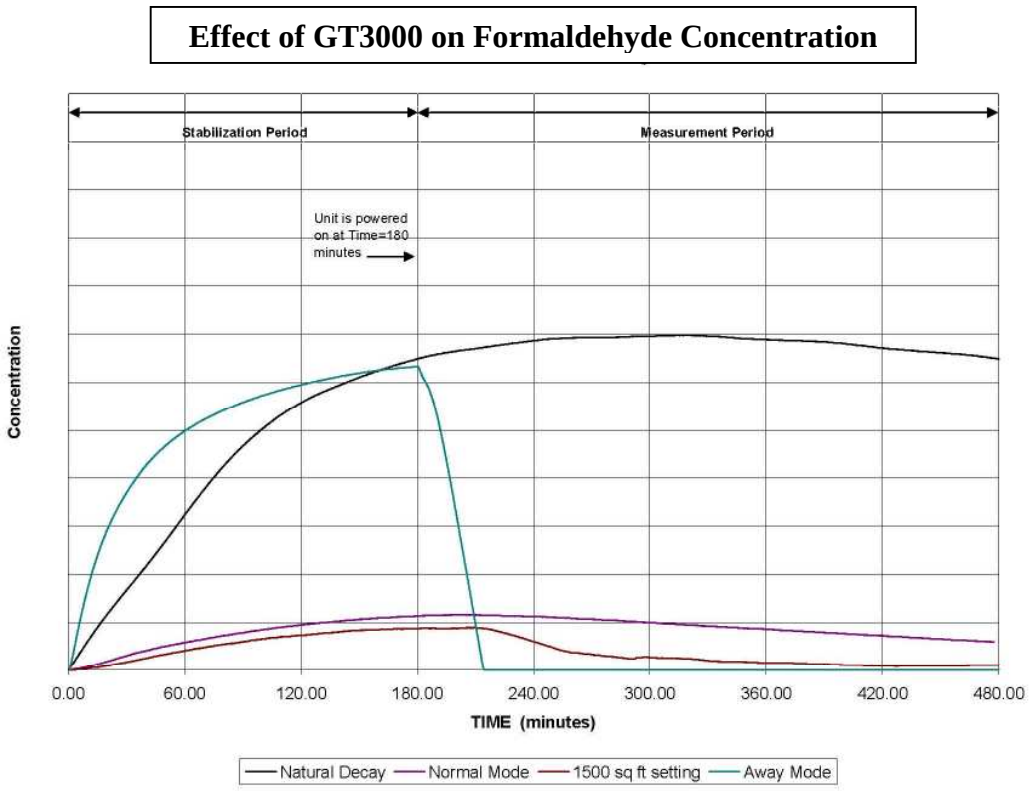
Q: Is ozone at ground level bad?
The truth is ozone is our friend and a much needed natural element to keep the environment stable in spite of what we as humankind do to pollute the outdoor environment. When there are high levels of hydrocarbons and other Volatile Organic Compounds being emitted into the air, sunlight reacts with the pollutants to form ozone. The more pollution, the more ozone is formed. In areas where there is significant pollution, the ozone levels outside can reach levels that can cause discomfort and combines with the other constituents of pollution, are not healthy to be out in. Ozone reacts with these pollutants, oxidizing them and ultimately reducing the overall pollution level.

Q: Is ozone the same thing as "pollution", in other words if we didn't have ozone in our atmosphere would we no longer have pollution?
A: Ozone is no more the cause of pollution than firefighters are the cause of all structure fires. Think about it, whenever you see a fire, you see firefighters battling the fire. If you want to see how many fires your city had last year, you could check to see how many times the fire department was dispatched and used their firefighting equipment last year. Are the Firefighters to blame for the fires? Nonsense! But there is a direct correlation. In the same way ozone is blamed for pollution, but only because ozone is easy to

measure. Thanks to ozone, pollution is reduced. According to Dr. James Marsden, Regent's Distinguished Professor from Kansas State University *"Low level ozone is required to clean the air outside and make it breathable – without it we would not have life on this planet. Higher levels of ozone are a by-product of pollution; If there is more pollution, there is more ozone. Because ozone is very easily measured it is used as an indicator of air pollution, so people often confuse it with air pollution itself. That's not the case at all. It's not simply the presence of ozone, but the dosage level that is important. Safe, natural levels are needed to clean the air."*

Q: Why doesn't AHAAM, Consumer Reports, American Lung Association or other organizations embrace this active technology which includes low-level ozone?
A: The reality is these organizations are dominated by main-stream passive technology companies that stand to loose hundreds of millions of dollars. These companies sell HEPA filters and Electrostatic Precipitators which are not solving the indoor environmental crisis. The test protocols used to determine the CADR (Clean Air Delivery Rate) of a device are designed around determining the difference between what goes in the back and what comes out the front. ActivePure Technologies work actively in the room reducing particles, pathogens and VOC's. The particles we reduce are not trapped in the machine so the results of a single-pass test are poor and this is why the results of "standard" tests are so poor. No test organization has a method to evaluate a device which over time reduces these contaminate levels. Yet what we want in our homes is a device that improves our overall air quality and that is exactly what ActivePure Technologies do.

Q: There are reports that ozone creates dangerous by-products such as formaldehyde as it breaks down various chemical compounds. Why shouldn't I be concerned?
A: Ozone is effective at breaking down thousands of chemical compounds typically referred to as VOC's. The "breakdown" process is typically referred to as a cascading process, where other chemical compounds are formed in the process of breaking down the initial compound. It is true that formaldehyde can be formed from certain compounds, but what has not been disclosed by critics is how effective ozone is at breaking down formaldehyde. Here is test data showing the use of the GT3000 in a chamber with Formaldehyde and the resulting reductions based upon the mode of operation:



This cascading process can ultimately take hours or even days but in the end-products of the chemical reactions that occur when ozone reacts with biological compounds are carbon dioxide and water. It should also be noted that when formaldehyde is formed from typical VOC levels, the formaldehyde level is typically well below the WHO safe guideline concentration of 900 mg/lit, and the formaldehyde is being broken down with the other VOC's at the same time it is being produced. Again, quite contrary to this myth, a hallmark of ozone use for purification purposes is the fact that it produces so little by-product that the benefits of responsible ozone use far outweigh any potential risks of misuse. In fact, ozone is essentially an oxidizing/purifying agent, releasing the extra oxygen atom to leave a harmless oxygen molecule behind. Nothing could be more natural and beneficial than that!

Q: The EPA, California ARB and Health Canada say low level ozone used for air purification is not effective. Why does GreenTech Environmental claim it is?
A: Kansas State University research has proven the efficacy of ozone levels at and below .05ppm with multiple pathogens. In addition, many customers have written to GreenTech Environmental expressing their thanks for this technology which includes low-level ozone. Their statements indicate their air purifier has cured them and the list of ailments is wide spread. In reality the air purifier has not "cured" anyone, but the purifier has been effective at inactivating airborne contaminates and reducing particles from the air (Grinshpun et al, 2007) and decontaminating surfaces (Marsden et al, 2007), which provide significant benefits to the body by reducing the exposure to contaminates which exacerbate health conditions.

Q: GreenTech Environmental produces purifiers that generate high levels of ozone which you admit can be detrimental to human health. Why would someone want to use such a device?
A: Higher levels of ozone are useful in reducing odors and killing pathogens. By increasing the ozone level above the EPA standard of .05ppm, we can speed-up the process which at lower ozone levels can take a much longer period of time to get the same results. Examples of uses for higher levels of ozone, what GreenTech calls the "Away Mode", are mold remediation; removing smoke odors, skunk odors, or any other odors which are typical in the indoor environment; decontaminating a room after an illness; and the list goes on. Two clearly anti-ozone health and safety organizations, Health Canada and the California ARB, not only allow but embrace high-level ozone producing devices to be in the hands of professionals, even hotel housekeeping staff. What they don't allow is a typical homeowner to have access to this equipment. This means a homeowner will have to hire a contractor to come in and treat their home in the event of a problem which requires high-level ozone.

In GreenTech purifiers with "Away Mode" capability, typical indoor ozone levels are raised to .25 to .3 ppm. This level, although 5 to 6 times above the EPA continuous exposure limit, is below the ozone levels measured outdoors in some large metropolitan areas during critical ozone alert days.

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