

# Questions and Answers About Ozone

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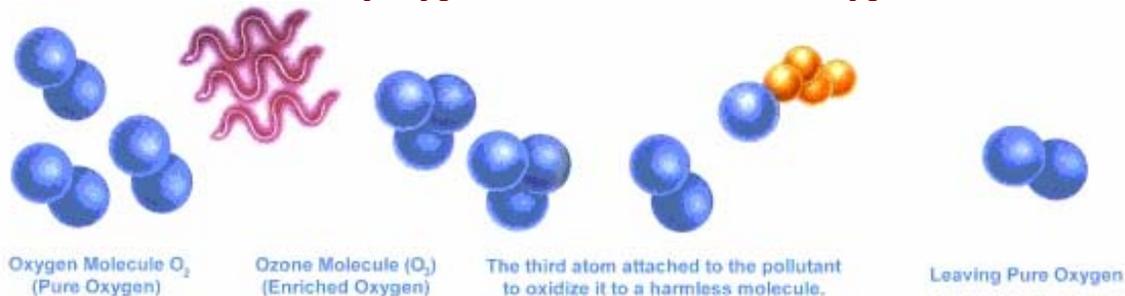
## WHAT IS OZONE?



Ozone ( $O_3$ ), sometimes called "activated oxygen", contains three atoms of oxygen rather than the two atoms we normally breathe. Ozone is the second most powerful sterilant in the world and can be used to destroy bacteria, viruses and odors. Interestingly ozone occurs quite readily in nature, most often as a result of lightning strikes that occur during thunderstorms. In fact the fresh, clean, spring rain smell that we notice after a storm most often results from nature's creation of ozone. However, we are probably most familiar with ozone from reading about the "ozone layer" that circles the planet above the earth's atmosphere. Here ozone is created by the sun's ultra-violet rays. This serves to protect us from the ultra-violet radiation.

## HOW DOES OZONE WORK?

While ozone is very powerful, it has a very short life-cycle. When contaminants such as odors, bacteria or viruses make contact with ozone, they are destroyed completely by oxidation. In so doing, that extra atom of oxygen is consumed and there is nothing left...no odor...no bacteria...no extra atom, only oxygen. Ozone reverts back to oxygen after it is used.



## HOW IS OZONE PRODUCED?



There are basically two methods of producing ozone...ultra-violet and corona discharge. Corona discharge creates ozone by applying high voltage to a metallic grid sandwiched between two dielectrics. The high voltage jumps through the dielectric to a grounded screen and in the process, creates ozone from oxygen present in the chamber. Ultra-violet (UV) light creates ozone when a wavelength at 254 nm (nanometers) hits an oxygen atom. The molecule ( $O_2$ ) splits into two atoms (O), which combine with another oxygen molecule ( $O_2$ ) to form ozone ( $O_3$ ).



## HOW LONG DOES THE OZONE LAST?

As soon as ozone is formed in the generator and dispersed in a room, some of it reverts back into oxygen ( $O_2$ ). This step occurs by several processes including the following: Oxidation reaction with an organic material such as odors or smoke; Reactions with bacteria etc., which again consumes ozone by oxidation reactions. Additionally ozone itself has a half-life which means that "residual" ozone created (extra unneeded ozone) will return to oxygen usually within 20-30 minutes, in amounts equal to half its level. What this means is that after each subsequent 20-30 minute period there would be half as much residual ozone left at the end of the period as was present at the beginning of the period. This is similar

to a geometric progression of 16; 8; 4; 2; 1. In practice the half life is usually less than 20 minutes due to temperature, dust, and other contaminants in the air. Therefore, ozone, while very powerful, doesn't last long. It does its job and then reverts back to oxygen.

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### ***WILL THE ODOR COME BACK?***

No. If ozone is applied properly it destroys (oxidizes) the source of the odor. However, in the case of mildew (mold) the odor will return if you are unable to get rid of the moisture that is the source of the mildew (mold).

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### ***HOW DOES OZONE HANDLE TOBACCO SMOKE?***

It eliminates the irritation caused by phenol gasses, by oxidizing them into simpler compounds that are not as harmful. Phenol gasses are the invisible part of tobacco smoke that causes such discomfort to one's eyes and create the offensive odors. Ozone rids any environment of the effects of smoke completely, rather than merely filtering out the visible particles.

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### ***WILL OZONE REMOVE STAINS?***

No, ozone will not remove the stains. Ozone will deodorize and help to decontaminate the problem but will not remove the actual substance.

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### ***WILL OZONE AFFECT COMPUTERS, FABRICS AND PAINTINGS?***

No, ozone will not affect personal computers, fabrics, leather furniture or paintings. The concentrations are not high enough even during shock treatments for long periods (> 30 days) of time.

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### ***WHAT IS THE RIGHT LEVEL OF OZONE?***

The right level is when all the generated ozone is being consumed. This only applies to continuous ozone use in occupied environments – not for shock treating. However, this is difficult to attain because it becomes a balancing act. Initially the machine's output is set high to get rid of the problem odor as quickly as possible. As this is being accomplished less ozone is required for the diminishing odor etc., thereby leaving some residual ozone in the air. If the machine output is not turned down, then more residual ozone will remain. If a strong smell of ozone is noticed, then there is more ozone present than is required. Simply turn the rheostat (output level control) down. With ozone, *more is not considered better*.

**NOTE: It is not necessary that ozone be detected by humans for it to be effective. Ozone can work even when humans are not able to smell it.**

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### ***IS OZONE HARMFUL AND WHAT IF ANY ARE THE LONG TERM EFFECTS?***

Ozone has been known for almost a century, so a great deal is known about it. Several regulatory agencies, including the Occupational Safety and Health Administration (OSHA), have stipulated that the safe allowable level of residual is 0.10-ppm (parts per million). Note that this permissible level is for continuous exposure throughout an entire 8 hour day for 5 days a week. The temporary affects of such a low exposure would range from headaches, to sore throats, irritation in the eyes, and nose. No long term effects have ever been documented from ozone exposure. Ask Ozone Supplies for Material Safety Data Sheets (MSDS) sheets if desired.

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### ***HOW CAN YOU DETECT THE LEVEL OF OZONE?***

There are a number of methods available, the most common being the Draeger tube. Residual ozone becomes apparent to sensitive humans in the range of 0.01 - 0.03-ppm, or well below the permissible levels for continuous exposure. As noted previously, this residual smell is ozone that has not been consumed by the odors and is now remaining in the air. Ozone Supplies also carries portable & wall-mount ozone sensors to measure the ozone level inside a room or home. These sensors are portable and light and can easily detect the ozone levels emitted by the entire line of ozone generators.

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### ***WHAT ARE THE APPLICABLE REGULATIONS REGARDING OZONE?***

In the states, OSHA regulates two levels for ozone exposure. They are 0.10-ppm time weighted average (TWA) for an 8-hour day, and 0.30-ppm for 15 minutes. In Canada, guidelines vary by province. The best concentrations for continuous use are in the range of 0.01 - 0.03-ppm, which is well within the guidelines.

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### ***HOW OFTEN DO THEY REQUIRE MAINTENANCE?***



Under heavy duty use, or severely polluted areas, ozone generators should be inspected every 2 to 3 weeks for fine dust or oily residue collecting on surfaces of generator unit or plates. Light duty use requires cleaning every 2 to 6 months depending on severity of pollution. NOTE: If a fine dust or oily residue appears or the output has significantly decreased since first used, it is time to follow the recommended cleaning procedures.

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