

How to "remove ozone" from water

Summary:

- In municipal drinking water applications, removal of residual ozone in a contact system can be accomplished with the addition of hydrogen peroxide (H₂O₂). Known as ozone quenching,
- Aeration by cascade, packed column or air diffusion. This method strips off the ozone to the atmosphere, so proper controls and monitoring must be employed for safety and environmental reasons.

residual ozone destruction

http://www.ozonia.com/tips/residual_destruction.html

Ozone, when properly applied and dissolved at the required residual concentration in water, is a very powerful and effective oxidizing and disinfecting agent. Its properties destroy microbiological organisms and degrade many organic contaminants present in the water.

Ozone is preferred over conventional chemical agents because it is generated on site with limited storage or handling concerns. Additionally, residual dissolved ozone ultimately decomposes into oxygen, making it both process and environmentally friendly.

Ozonation is typically only one step in a chain of treatment processes. As such, it is often removed prior to subsequent unit processes for a variety of reasons.

Unlike bottled water, where a dissolved ozone residual reaching the bottle is desired (or even mandated), production of other beverages may require removal of dissolved ozone to prevent reactions with sweeteners, concentrates or other ingredients.

Similarly, in ultrapure water (UPW) applications, dissolved ozone is removed the majority of the time to prevent contact with ingredients and is periodically allowed to flow through process loops for CIP sanitization.

Municipal water treatment plants use ozone for a variety of reasons, such as, THM precursor control, *cryptosporidium* and *giardia* removal, taste, odor and color removal, general disinfection, etc. However, even here the dissolved ozone must be removed prior to the addition of chlorine used for water protection in the distribution system.

Destruction of residual ozone is therefore essential in these and other applications before the ozonated water can be utilized or continue in the treatment process.

The following are some of the ways ozone destruction can be effectively accomplished:

- In purified water systems (UPW for example), strategic placement of properly designed and sized medium pressure ultraviolet (UV) ozone destruction equipment

simply and effectively reduces residual ozone to below detectable levels with the additional benefit of TOC destruction. Positioning a UV ozone destruction unit directly before the water treatment components requiring protection from ozone (i.e. DI polishing) maximizes the sanitizing benefits provided by residual ozone up to that point. When loop sanitizing is desired, the UV is simply turned off and any sensitive process step is bypassed for a brief period of time. Medium pressure UV systems in UPW also offer the added benefits of TOC destruction and act as "back-up sanitizers" to ozone.

- In municipal drinking water applications, removal of residual ozone in a contact system can be accomplished with the addition of hydrogen peroxide (H₂O₂). Known as ozone quenching, this step is important during plant start-up, performance testing or in general when ozone equipment has to be operated to meet CT criteria and then followed by addition of chlorine or other chemicals.

Other methods used to remove ozone from water include:

- Aeration by cascade, packed column or air diffusion. This method strips off the ozone to the atmosphere, so proper controls and monitoring must be employed for safety and environmental reasons.
- Filtering to water through activated carbon adsorbs the dissolved ozone on the carbon and adds the removal benefit of carbon in general. This technique can be employed where water quality is less than ultrapure and the carbon can actually contaminate the water.

For more information on this or other ozone and UV related topics, [contact](#) your nearest Ozonia office.

http://www.nesc.wvu.edu/ndwc/pdf/OT/TB/TB12_ozone.pdf

mutagenicity

ozone water "carbon filter" reaction

<http://www.water-research.net/ozone.htm>

15 watt water ozinator for 150\$

http://www.maxximastyle.com/Merchant2/merchant.mvc?Screen=PROD&Product_Code=Ozonator&Category_Code=&gclid=CLKV5Z6lwY4CFRnwYAodsVxigQ

<http://www.wwdmag.com/Ozone-Treatment-for-Residential-Well-Water-article4119>

Ozone Treatment for Residential Well Water

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Tech Update

Your customers not only are expecting to have enough water supplied from their water source, but they also demand that it is of superior quality. Ozone's technology coupled with such treatment as filters or softeners can fulfill this expectation. Ozone does not need to be complicated in order to treat small water systems.

- Myrle Melligan, Triple O Systems, Inc.

Ozone does not need to be complicated in order to treat small water systems. A small water system consists of one or multiple households on well, spring or rooftop water. Treatment means removal of iron, manganese and hydrogen sulfide to below the U.S. Environmental Protection Agency (EPA) acceptable levels including bacterial control.

Ozone consists of three atoms of oxygen (O₃) and is a powerful oxidizer and disinfectant. It must be generated on site since it reverts to oxygen (O₂) within minutes. Ozone, which works faster and is more powerful than chlorine, adds nothing to the water except pure oxygen. Chlorine, on the other hand, can produce a carcinogenic byproduct called trihalomethanes (THMs) when combined with organic matter found mostly in surface waters. Its objectionable odor is another disadvantage to those who expect their well or spring water to taste and smell sweet and natural.

In traditional applications, ozone is produced by the corona or high voltage spark method. In order to be effective, the corona-type ozone requires a dry filtered air. Its longevity depends on this because moisture creates nitric acid, thus decreasing ozone output and corroding the equipment. If the air dryer fails, so will the entire system. A corona ozone injection system uses lots of electricity, is complex and, therefore, not very reliable for the average homeowner or small system operator. In addition, applications of corona ozone must be done carefully as high concentrations of ozone literally can destroy common holding tanks and distribution systems. When using corona ozone, stainless steel tanks are recommended as well as an activated carbon filter to remove the excess ozone before the water enters the distribution system. This complicated corona method produces large amounts of ozone and uses a relatively short contact time with the water. For these reasons, corona ozone use is recommended for large commercial applications where it can be monitored on a consistent basis.

An alternative technology has been developed using small, safe levels of ozone produced by the ultraviolet (UV) light method. With this technology, low levels of ozone are continuously introduced into an atmospheric holding tank. If the approach to water treatment would be by injection or single pass, this method would be insufficient to perform its oxidation and disinfection tasks. Since this system bubbles ozone into the tank water 24 hours per day, it not only is extremely efficient but also cost effective due to its low energy consumption of 55 watts, lack of an air dryer and compatibility with tank materials.

Unique to this system is a filter module that is suspended on a stainless steel chain and actually filters the entire contents of the holding tank. The water moves through the 100-square-foot filter at 10 gallons per minute or 14,000 gallons per day, thus removing all of the oxidized particulates and preventing debris from accumulating on the bottom of the tank. When the filter becomes loaded, it is washed off and returned to the tank, eliminating the need for costly filter replacements. This unique in-tank filtration also eliminates filter backwashing and its associated water loss.

An optional piece of equipment used with this system is a mixer/injector that diverts the ozone from the tank and injects it into the incoming water. This injection takes place only

when the pump is in operation and the tank is being refilled with the raw water, thereby pretreating the water before its introduction into the tank.

This type of system is capable of removing all objectionable levels of iron, manganese and hydrogen sulfide. In severe cases, it may be necessary to use two tanks in series and to treat each tank individually. For instance, in a water supply containing 60 ppm of iron, the iron was successfully removed using this dual tank set-up. Generally speaking, tanks need to be sized at four times the daily water usage. An average family of four uses approximately 350 gallons of water per day, so the minimum tank size should be about 1,500 gallons or larger. If possible, take irrigation water off the wellhead before the tank and use the tank water for household use only. Use one system per each 10,000 gallons to be treated. Multiple systems can be used in larger tanks.

When considering this technology for contaminant removal, it is important to know the volume of water used per day as well as the contaminant levels. Contaminant levels are best shown by a water analysis performed by an independent laboratory. Ozone readily oxidizes both iron and manganese but will oxidize all the iron before attacking the manganese. This is a phenomenon that will affect the prescribed dosage and contact times and is another reason to have a thorough knowledge of the water that will be treated. Also, water with a high organic content such as tannin will adversely affect the ozone's ability to act on inorganic material, further affecting dosages and contact times.

An additional benefit of this technology is the aeration process. A system such as this is able to remove undesirable gasses and their effects from the water because it uses ozone in combination with aeration. For instance, when low pH is attributed to carbon dioxide gasses, which are removed in the aeration process, the pH levels then are elevated. Due to the aeration process, this system acts on all dissolved gasses contained in the water including radon and methane. Another benefit applies when a customer has an existing holding tank with no particular water problem. This system can be used to prevent stagnation, algae growth and bacterial contamination.

This technology also is appropriate for use in surface water and/or rooftop catchment systems. Under surface water conditions, a sand filter is suggested to remove turbidity (dirt) and debris before the water enters the tank. The ozone then is able to expend all of its energy on killing bacteria. When treating surface water, it is advised that a secondary method of disinfection should be added as back-up protection, since you are dealing with water subject to fecal coliform and other primary health contaminants. If Giardia or Cryptosporidium (protozoa) are of concern, do not rely on ozone technology. Instead, use a 1 micron absolute filter for removal after the tank treatment. When treating other contaminants in well water such as total dissolved solids, use the in-tank ozone system before both water softeners and reverse osmosis units to keep resins and membranes clean.

Maintenance is a major consideration in any type of water treatment equipment. Maintenance required for this system is minimal. It consists of cleaning the filter approximately every three to six months by pulling it from the tank and hosing off the

accumulated debris. The ozone diffuser also is cleaned at the time by dipping it into muriatic acid. The ozone-producing UV light needs to be changed every 18 to 24 months if treating secondary contaminants or every 12 months if used for bacterial control.

Installation is another important consideration when dealing with water treatment equipment. This ozone system normally will take less than two hours to install, and its installation is relatively simple. The ozone generator is mounted beside or up to 200 feet from the holding tank. Tubing that carries the ozone gas runs from the generator, up the side of the tank and down inside the tank where it connects to the filter module. The filter module is suspended from the tank top on a stainless steel chain and contains the diffuser that bubbles ozone up through the tank water. The mixer/injector is mounted into the inlet pipe to the tank.

Using atmospheric vented holding tanks/cisterns to apply ozone is a simple, viable, cost-effective and reliable method of water treatment for problem well water. Water treatment professionals worldwide have used this technology successfully since its development in 1990.

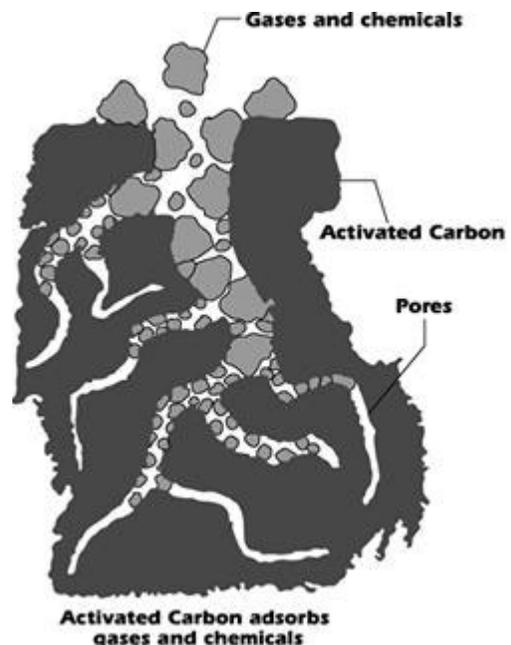
Your customers not only are expecting to have enough water supplied from their water source, but they also demand that it is of superior quality. Ozone's technology coupled with such treatment as filters or softeners can fulfill this expectation.

Myrle Melligan is sales manager and tech support for Triple O Systems, Inc., Campbell, Calif. She can be reached by e-mail at sales@tripleo.com.

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Carbon Filter Regeneration.

The best way of removing harmful VOC's, chemicals, and gases from the air in our opinion is via a good HEPA machine with 15 lbs or more of activated carbon or utilizing a carbon furnace filter. Activated carbon and or Zeolite will absorb harmful gases and chemicals in the air. The only problem is that once the carbon granules are full, they can no longer do their job. We have a solution. Rejuvenate your carbon filters with ozone! The Ozone will be absorbed by the carbon and oxidize the harmful substances collected by inside the carbon pores. Depending on the amount of VOC's and harmful substances in your indoor air, you only need to run your ozone generator 10 minutes a day to both enhance the effectiveness of your carbon filter and to prolong the life of your carbon filter. (A saving of hundreds a year) You won't smell any ozone whatsoever; it will all be absorbed by your carbon filter where ozone can fulfill the measure of it's creation and assist carbon in fulfill it's mission as well.



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http://www.appliedozone.com/ozone_generators_ozonators.html