



By Roger Nathanson

About the Author

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This column will discuss two important topics regarding the use of ozone.

- **Ozone dosages.** How much ozone is “practical” for certain applications?
- **Ozone air treatment.** How ozone can be used in air treatment, what your liabilities are and precautions you should be taking.

Ozone Dosages

Based on three criteria—application, gallons per minute (gpm) flow rate and contaminate type and quantity—you will be able to determine the amount of ozone that will need to be injected. *(This dosage is a product of more than 20 years of trial and error, not a theoretical calculation.)*

Application. This breaks the job down into two categories: Simple oxidation (SO) or complex oxidation (CO).

- **SO** pertains to iron, sulfur and manganese, which oxidize quickly and easily. They require very little ozone and no detectable ozone residual. *(Residual is undetectable with the inexpensive test kits on the market today.)*

The O-Zone

Today’s Lesson: How Much is Enough?

- **CO** pertains to the oxidation of items such as volatile organic chemicals, organic odors, microbes such as bacteria, protozoa, amoeba and viruses. CO also pertains to the need to have ozone residual. When sizing an ozone unit for CO, the gpm and the water analysis must be ascertained. *(A rule of thumb is 0.3 ppm of ozone residual for a three-minute contact.)*

Ozone dose to applications. Certain applications require higher ozone residuals than others.

- **Bottled water**—Low to mid-range residual (0.05–0.3 ppm).
- **Cooling towers**—Low to mid-range residual (0.05–0.3 ppm).
- **Water reclamation**—Mid to high-range (0.2–0.5+ ppm).
- **Iron, sulfur and manganese oxidation**—Ultra-low range (below detectable levels).

- **Water reclamation for odor control only**—Low range (less than 0.1 ppm).
- **Bacteria kill**—Mid to high range (0.2–0.5+ ppm).

The rule of thumb for sizing an ozonator is

- **Iron, sulfur, manganese oxidation** = 0.5 grams/hr (500 ppm) per 5 gpm.
- **Bottled water to maintain purity** = 1 g/hr/5 gpm.
- **Killing bacteria** (100 cfu) = 1 g/ 1 gpm.

Once the ozonator has been selected you then must decide the type of ozone injector (ozone pump or venturi) and air dryer.

The other items to select are a contact tank, an automatic ozone unit actuation switch and filtration.

Care must be taken when sizing ozonators.

- Ozonators producing more than 6 g/hr will require the piping to be Schedule 80 CPVC or stainless steel.

- There can be no brass or copper anywhere there is ozone residual.
- There must be certain O-rings and gaskets used; EPDM/Viton, Teflon or Silicone are best.
- The off gassing from the gas release device must be ventilated in such a way as to prevent any ozone odor in the living or working area.

Ozone Air Treatment

Ozone air treatment is a viable method for eliminating such things as

- Mold
- Mildew
- Bacteria and viruses
- Most odors including
 - Smoke
 - Animal
 - Fish
 - Locker room
 - Sewage/waste
 - Restroom

Whether the treatment will be frequent or infrequent will depend on the amount and frequency of contamination. Don’t expect the air to stay clean or smell good after one treatment if recontamination occurs.

This brings us to the most important point: contact with ozone gas. Basically, there should be no contact on a regular basis. The rule of thumb is “if you can smell it, don’t be around it.”

Ozone is detectable by the average human nose at 50 parts per billion. OSHA’s limit is 0.1 ppm in an eight-hour period. It is this author’s personal opinion that no one person or animal should be breathing ozone for any period of time.

Indoor air quality standards are becoming stricter and are being enforced more often. This could make what some companies are proclaiming as safe and legal not so in the near future. Not only is there a legal/liability issue, there also is an integrity issue. How many people would sell or use chlorine in a dish with a fan blowing it into the air? Why would someone do the same thing using ozone instead of chlorine? Ozone is a fantastic oxidizer and disinfectant in the air and water. Ozone, as well as most everything we use (chemical liquid, solid and gas) can be classified as a pollutant and/or irritant.

Ozone used in water treatment has no chance of becoming an irritant or pollutant if the system is designed and installed properly. Ozone air treatment will not become an irritant and pollutant if designed and installed correctly and the customer or end user is properly informed. **WQP**

For more information on this subject, write in 1014 on the reader service card.



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