



By Roger Nathanson

About the Author

Roger Nathanson is president of Ozone Pure Water, Inc., Sarasota, Fla. His background includes mechanical engineering, plumbing/pipe fitting, swimming pool remodeling/repair, sales and marketing. Ozone Pure Water has been a full service ozone/water treatment supplier since 1980. Nathanson can be contacted at 800-633-8469 or 941-923-8528; opw01@acun.com; www.ozonepurewater.com.

The O-Zone

Today's Lesson: To Dry or Not to Dry

As you have read in previous articles, ozone is a gas made from oxygen. One of the processes used to produce ozone is called corona discharge (CD). The CD method is a combination of high voltage electricity and air, dry air or oxygen in a given space.

The efficiency of the ozone generator (ozonator) is based on the quality of the incoming feed gas.

Why Use Dry Air?

The feed gas can be air, dry air or oxygen. Air is the least costly method. It produces the lowest concentration of ozone and could lead to increased servicing. This is due to the combination of ozone and moisture/humidity. When you combine a certain concentration of ozone with a certain concentration of moisture, you can create a byproduct called nitric acid. All parts from the ozonator out to the injection location should be resistant to ozone and nitric acid.

Dry air can increase ozone production and reduce maintenance compared to

atmospheric/moist air. Air dryers typically remove all of the humidity and moisture from the air prior to the ozonator. The measurement of dryness is called the dew point. The proper range for it is -40° to -70° F.

How Will I Know If I Need a Dryer?

If your manufacturer does not require you to use a dryer, then here is the rule of thumb as to whether you should.

- The humidity in the area where the ozone unit is located is 30 percent or greater.
- The walls and/or floor where the equipment is located is damp/wet.
- The pipes and/or tanks sweat/drip from condensation.
- The ozone unit is located in a damp, dusty, dirty environment such as a well pit, pump house, crawl space or anywhere there is "an enclosed dirt floor."

The formula to use to determine whether a dryer should be used is

$$\text{Environmental Conditions} + \text{\%Relative Humidity} + \text{Operational Time} = \text{Dryer Use and Type}$$

Here's another rule of thumb: If you can go two years without service relating to moisture, then a dryer is not necessary. A dryer always can be installed at a later date, providing the customer is made aware of the option, choice and related service. Never put yourself in the position after the sale and installation of "Oh, by the way, it looks like you need a dryer." Being up front, honest and well-informed is far more important and will reap the greatest reward.

Types of Air Dryers

The most common air dryer you will encounter is the desiccant type. Desiccant dryers consist of a material that absorbs a certain amount of moisture. Desiccant dryer material can be disposed of once saturated or regenerated by heating the material to a set temperature. This heating process causes the release of the accumulated moisture.

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Automatically regenerative air dryers automatically regenerate themselves. As with any filter, dryers have a set capacity, and your supplier can recommend the correct device for your application. Dryer capacities are indicated in terms of hours of operation between regeneration.

Oxygen concentrators are sophisticated air dryers that separate the oxygen from the other gases in air. They then concentrate or pressurize the oxygen in a storage tank from which oxygen may be drawn when needed.

- **Advantage**—Eighty percent oxygen as the feed gas theoretically can increase the ozone production by two to four times, though typical field results show an increase of less than two times. Good for small-scale laboratory-type use.

- **Disadvantage**—The cost is extremely high given the gas flow rate needed to properly oxidize a given gpm water flow rate. They are complex in operation and could require a high degree of maintenance (depending on the manufacturer).

- **Practical Application**—If a higher concentration of ozone is needed, use a larger ozonator and air dryer rather than an oxygen concentrator. The ultimate costs (initial purchase and maintenance) will be much lower.

Anhydrous dryer material. A very poor type of dryer is a container filled with a material that turns to liquid when saturated with moisture. This is very maintenance intensive and can be quite dangerous to your ozone equipment if not changed often. This should never be used, even temporarily.

How Do I Know the Air Dryer is Working?

All dryers should have an indicator (color beads or paper) that will indicate whether the air from the dryer to the ozonator is indeed dry. Blue indicates dry air (less than 10 percent relative humidity) and pink/amber indicates moist. (A dryer without an indicator is like a car without a gas gauge.) Humidity monitors (hygrometers) can be used, but they can be very expensive and color beads or paper are less expensive alternatives.

Dryers Are Not Always Mandatory

Again, not all ozonators and moisture levels produce nitric acid in concentrations that will cause damage. Not all ozonators suffer greatly reduced ozone production when using atmospheric air rather than dry air.

There are some ozone generators on the market that are only slightly affected by moisture. They are able to withstand moisture in the feed air/gas for years without any detrimental affects. Others, however, can require constant cleaning, suffer severe damage in a short time and produce insufficient amounts of ozone, which will cause poor water treatment results. Talk to your supplier about the "hows and whys" of dryer use related to their specific ozonators. **WQP**

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