



Aqua Sun Ozone
International, Inc

Memorandum

To Air Resources Board
From Ed Otero, President | CEO, Aqua Sun Ozone International
Subject Comments for consideration at the AB 2276 Workshop
Date 11 December 2006

As previously advised, we at Aqua Sun Ozone International appreciate the opportunity to be involved in your workshop on December 13. This is an important topic and we are pleased that we have been given the opportunity to work with the Air Resources Board and provide input into the discussions on the day.

At Aqua Sun, our air products utilize a UV lamp technology in our air products as compared to the high ozone output technology of corona discharge. We would like you to consider the following information in your discussions and it is our opinion that UV Lamp technology is a considerably better and safer technology than corona discharge.

What is Ultraviolet (UV) ozone generation?

Ultraviolet lamps emit UV light at 185 nanometers (nm). Light is measured on a scale called an electromagnetic spectrum and its increments are referred to as nanometers.

Air (usually ambient) is passed over an ultraviolet lamp, which splits oxygen (O_2) molecules in the gas. The resulting oxygen atoms (O_3), seeking stability, attach to other oxygen molecules (O_2), forming ozone (O_3). The ozone is injected into the air stream, where it inactivates various contaminants.

What is Corona Discharge (CD) ozone generation?

The technologies involved in corona discharge ozone generation are varied, but all operate fundamentally by passing dried, oxygen-containing gas through an electrical field. The electrical current causes the “split” in the oxygen molecules. Generally accepted technologies can be divided into three types - low frequency (50 to 100 Hz), medium frequency (100 to 1,000 Hz), and high frequency (1,000 + Hz). Since 85% to 95% of the electrical energy supplied to a corona discharge ozone generator produces heat, some method for heat removal is required. Also, proper cooling significantly affects the energy efficiency of the ozone generator, so most corona discharge systems utilize air and/or water for this purpose.

At the heart of a corona discharge ozone system is the dielectric. The electrical charge is diffused over this dielectric surface, creating an electrical field, or “corona”.

Critical to Corona Discharge ozone systems is proper air preparation. The gas feeding the ozone generator must be very dry (minimum -80 degrees F), because the presence of moisture affects ozone production and leads to the formation of nitric acid which can be very corrosive to critical internal parts of a corona discharge ozone generator. Ozone output decreases as moisture content in the air increases.

Disadvantages of Corona Discharge ozone generation

- Corona discharge ozone generators can use oxygen preparation thereby doubling the ozone output per given volume vs. dry air – thus often producing high and unsafe levels of ozone.
- Creates high quantities of ozone (up to 100 lb/day).

Advantages of UV ozone generation

- Maximum ozone production rate is two grams/hr per UV bulb – a significantly safer level of ozone output.
- The highest concentration of ozone that can be produced by 185nm UV lamp is 0.2 percent by weight, approximately 10% of the average concentration available by corona discharge.

We recognize that there should be a limitation to the amount of ozone that an individual is exposed to and we support the Air Resources Board for monitoring these levels across our industry. We at Aqua Sun Ozone have chosen to utilize the far safer technology of UV lamps to generate smaller and safer levels of ozone and we are confident that you will agree that our products are far safer than those using corona discharge technology.

We notice that previously you have placed several of our products on your 'Hazardous ozone generators sold as air purifiers' list. I thought it appropriate to share with you how we have worked to ensure these products fall within your standards of 90 ppb for one hour. Specifically:

- 100 This small unit delivers 30 ppb per hour, well below the 90 ppb per hour you have previously advised as being an acceptable level.
- 700 This unit delivers less than 28 ppb per hour.
- 202A This unit delivers 60 ppb per hour and includes an automatic timer with a 10 minute cycle that turns the unit on and off to ensure that there is not constant delivery of ozone to an area.
- 206A This unit delivers 40 ppb on the low cycle and 80 ppb on the high cycle. Once again, this unit includes an automatic timer to ensure that there is not a constant delivery of ozone to an area.
- 308 This unit delivers 30 ppb to 70 ppb – and also delivers negative ions. Once again, this falls below the 90 ppb per hour you have previously advised as being safe.

We welcome the opportunity to work with the Air Resources Board to ensure that our products are fit for purpose and safe for consumers. We are confident that we have already made great strides to achieve this outcome given our choice of technology.