Ozone air systems have been under scrutiny by several state agencies and consumer groups. The claims that ozone is harmful to one's health are justified with the evidence presented, but are these claims really substantiated?

By Jeffrey H. Roseman

Proper air monitoring equipment is essential to the safe use of ozone systems

The Air Around Us

It is like the old saying: "Bring me the numbers, and I will do the statistics." If the information is not correctly interpreted, then false conclusions can be assumed. There are many myths involved when it comes to ozone air purifiers. A lot of the information is not intentionally put out to mislead the consumer to make a sale, but it is merely a lack of education of the sales representative and consumer.

When ozone is monitored and proper levels are maintained, ozone can be a beneficial and healthy method of creating good air and water quality in a home, business, or agricultural or industrial environment.

Technologies

Let's first take a minute to discuss monitoring equipment. Inexpensive gear can be useful and provide a baseline for the average dealer or consumer. Most medium-priced gear is reliable and accurate; plus, some systems offer digital readouts and data logging. Lab-grade units are expensive, and most are used in sophisticated environments where accuracy and reliability cannot be compromised.

Heat metal oxide sensor (HMOS) technology is not always the best option because it requires a warm-up period, and contamination from cigarette smoke can cause the units to stop sensing, leaving the area to be monitored vulnerable to toxic ozone levels. The warm-up period can take two to three days for the unit to work properly, and if it becomes contaminated, it can take 12 to 48 hours to burn off the contaminant before functioning resumes. This breach in measurement could be critical in many operations. These units also need to be calibrated annually, and this cannot be done on site. They must be sent back to the manufacturer or to an authorized service center, which adds to the maintenance cost.

Electrochemical technology is used in many applications, but it is best suited for reading higher levels of ozone (exceeding 2 ppm). Calibration is required, and this technology is prone to cross sensitivity.

Gas sensitive semiconductor (GSS) technology is next up the ladder for accuracy and testing for lower levels of ozone gas. The principles of HMOS technology are the basis of this technique, but improved accuracy, T90 response, less cross sensitivity and drift are benefits of GSS technology. Maintenance issues and the need for calibration are also eliminated with this technique. Sensing heads can be removed and new ones inserted with only a 24-hour warm-up period. The heads are refurbished at a fraction of the cost of new equipment. Near-scientific accuracy has proven that GSS is a viable alternative to more expensive UV photometer measuring devices.

UV photometers are laboratory-grade meters. Accuracy, drift and T90 response are exceptional but come with a price tag. These monitors are reserved for the scientific community or customers who require a high level of accuracy and have financial resources to purchase higher-end products. These units also require calibration and maintenance of the UV lamps, and because they are geared toward fixed installations, they are not as easily transported.

Applications

Now that some light has been shed on the technologies used for ozone measurement devices, how can dealers or consumers use them in their operations? The U.S. EPA has set standards for ozone exposure limits. These guidelines are set to protect users in an environment where ozone is used either for air systems or off-gassing from water treatment equipment. The Occupational Safety and Health Administration limits exposure to no more than an average of 0.10 ppm over an eight-hour period. The U.S. FDA recommends levels of no more than 0.05 ppm for indoor medical devices.

High levels of ozone can cause lung irritation, coughing, throat irritation, chest pain and shortness of breath. Monitoring devices should be used to help control high levels of exposure or warn inhabitants that toxic levels are present. These devices can be used to turn ozone generators on and off or to shut down the equipment in the event of a breach in safety equipment. There is much controversy surrounding the sale and use of air purifiers incorporating ozone. Many of the claims made are misleading and in some instances false.

Understanding of ozone characteristics can be demonstrated when proper monitoring equipment is used. ORP monitors are one method of measuring oxidation-reduction potential in water treatment, and dissolved ozone meters using inline electrodes or chemical reagents can determine ozone in water. These are the most critical aspects to ensure ozone systems are functioning at optimal concentrations. Air monitoring devices are crucial when workers are present in an area where ozone could cause health problems and most times are implemented or recommended by manufacturers. The residential and commercial markets suffer the most with sales of ozone air purifiers that are not controlled or even checked. Most of the time, sales representatives are unknowingly misguided or uneducated. Low ozone levels can be beneficial for indoor air quality; however, when ozone generators create ozone levels that are intolerable for human or animal habitation, the problems mentioned previously can occur.

Evaluation of HMOS & GSS Monitors

An evaluation of two ozone monitors, one using HMOS technology and the other using GSS technology, proves quite informative. The units were used to test an ozone air unit and also for testing off-gas of an ozone water application. Both were instrumental in providing data, but the accuracy of the GSS unit was by far the best for gathering the facts. The HMOS unit did provide a good baseline and would be fine in many applications, but its biggest downfall was the warm-up time. It took 48 to 72 hours to begin measuring at levels that were similar to the GSS unit; plus, the readings were not as accurate. The HMOS device is less of an investment, but when it comes to convenience and reliability, the extra cost for the performance of the GSS outweighs the price difference.

The units were tested side by side in several instances. An ozone air generator using corona discharge ozone was tested in a small room to determine levels of ozone. Both the HMOS and GSS units were fairly close in readings, but the digital readout of the GSS unit provided more accuracy than the light bar readings of the HMOS unit. In addition, the readings of the GSS unit were more on target for the projected or calculated values of the amount of ozone to be emitted. An electronic digital timer was used to turn the ozone unit on and off at different variables. This method provided a very comfortable level of ozone in the air, and at no time were established EPA levels for indoor environment levels exceeded. The GSS model had maximum and minimum alarms that warned of too much or too little ozone in the air.

Air temperature also changed, and it was very interesting to note how a slight change in temperature affected the ozone levels. Ozone concentrations are dependent on temperature, not only in water, but also in air. The warmer air dissipated the ozone faster than the cooler temperature, and it was remarkable how much of a difference it made on the ozone levels. This is something sales reps should know when selling units for homes and businesses.

Humidity also plays a significant role in ozone production and concentration. High humidity can cause corona units to create byproducts of nitrogen (nitric acid and nitrous oxide) and also cause ozone to dissipate faster. These variables are precisely why monitoring is so important to providing customers with a satisfactory setup of their air systems. Seasonal air temperature changes make adjustments necessary, but without monitoring equipment, these ozone levels would not be known or adjusted.

Being able to show a potential customer safe levels and having concern for proper air treatment keep the sales rep and dealer out of trouble. Too many times, a sale is lost because consumers are not educated about the proper use of ozone. They believe all the hype the media present and do not pursue the real truth. This also holds true for the consumer believing all the promises that a sales rep presents in a demo. In both instances, the information is correct but often misconstrued.

The Big Conclusion

The bottom line is that ozone needs to be monitored, and levels emitted into the air need to be analyzed and controlled. Proper air dosages, whether they are produced from ozone air generators or off-gassing from water treatment applications, need to be measured to protect humans and animals from being exposed to high doses of ozone. *wqp*

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