

# Environmental Restoration with Ozone

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## Reducing indoor air pollution with ozone

*This past September, the California Air Resources Board (CA ARB) finalized the regulation order for limiting ozone emissions from indoor air cleaning devices. This regulation basically prohibits the sale, supply, offer for sale or introduction into commerce, of any indoor air cleaning device for use or intended for use in occupied spaces unless the device is certified by the ARB to produce an ozone emission concentration not exceeding 0.05 ppm.*

The International Ozone Association (IOA) testified at CA ARB meetings to say that, “Ozone can be effective in building air and surface treatment for reduction of odors from fire damage, cooking, animals and smoking, mold and other organisms directly in rooms if applied and controlled at sufficiently high concentrations. These concentrations are typically above levels deemed safe for prolonged exposure by people, animals and most plants. Therefore, we support regulation of indoor air cleaners that generate ozone for use in occupied space.”

CA ARB had good intentions by regulating devices generating ozone for treatment of occupied residential space; however, there are many other indoor air contaminants the public is exposed to within their homes that need to be addressed to protect public health.

The U.S. Environmental Protection Agency ranks indoor air pollution among the top-five environmental risks to human health. According to the CA ARB, Americans spend 90% of their time indoors. Premature deaths, lost worker productivity and medical treatment due to indoor air pollution cost the state of California alone \$45 billion a year. Approximately 532,000 (39%) of the 1.36 million cases of doctor-diagnosed asthma in the U.S. involving children under the age of six could be prevented by eliminating exposure to indoor pollutants and allergens in housing.

### UV-Generated Ozone

Over the past decade, virtually all service-restoration companies have utilized traditional destructive methods to deal with indoor contaminated properties. Such methods include the use of potentially toxic biocides that are applied by fogging or spraying or are hand-wiped on floors, walls, counters, furniture and HVAC systems. The theory is that the biocides will kill a wide range of microbial organisms that include fungi, bacteria and viruses.

Few, if any, claims are made regarding the efficacy of biocides against “biofilms,” a polysaccharide adhesive matrix that protects most bacteria and many fungi from outside influences. In addition to biocides, most traditional restoration companies employ portable HEPA units to scrub the air of fugitive spores and other fragments. Both biocides and portable HEPA have limitations that may still render the property uninhabitable even after their deployment.

The use of biocides acts as a chemotherapy of sorts for surfaces contacted in the property—that is, the use of a toxic material to destroy another organism where, in fact, the cure may be worse than the microbe or cell that it is trying to kill.

For many individuals, entering a property after the application of a biocide results in irritation and respiratory

distress. Volatile organic compounds (VOCs) produced by many biocides linger for days. Few restoration companies ventilate properties sufficiently after biocide application. Portable HEPA, while somewhat effective for elevated airborne spores, often miss organisms and fragments that have settled to the floor or furniture, and as such are no longer airborne.

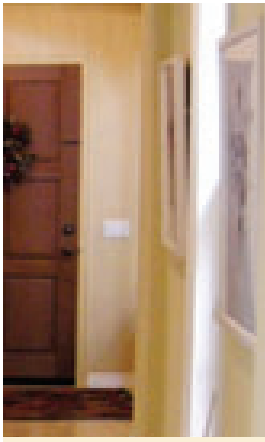
### Ozone Alternative

The use of ultraviolet (UV)-generated ozone properly sized and placed within an indoor environment in the absence of humans, pets and plants—with elevated levels of bacteria, fungi, allergens, viruses and VOCs—provides an effective method to inactivate a significant percentage (79% to 97%) of these organisms within four to twelve hours of application. Additionally, UV-generated ozone at levels of 10 to 12 ppm will penetrate biofilms and destroy bacterial- and fungal-protected colonies. UV-generated ozone also has the added advantage of reducing or eliminating offensive odor created by a wide variety of indoor conditions.

Proper use of UV-generated ozone includes correct placement of the units to ensure total saturation of ozone throughout the property, including the furnace air intakes. During the application of UV-generated ozone, measurements are required to ensure that sufficient levels have been reached. Following the application, the property is ventilated and air testing is conducted to ensure that the ozone levels are below the threshold limit value.

In properties that have microbial contamination, spores, fragments and particles will drop to the floor or furniture due to gravity, attachment to dust and through the application of ozone. It is necessary to HEPA vacuum the entire property after an ozone application to remove all dead or damaged particles.

Environmental laboratory samples should be taken before treatment to establish a baseline and after ozone application to validate the effectiveness of ozone treatment. Additionally, it is advisable for companies offering



ozone remediation services to develop and document the ozone remediation process, including support of trained medical personnel, scientists and industrial hygienists.

While some properties severely damaged by flooding require the removal of water-impacted building materials and rapid dry-out techniques (an important role for traditional water restoration companies), the use of UV-generated ozone in the final stage of cleanup presents an important treatment option. For contaminated properties not directly impacted by flooding, UV-generated ozone is an effective stand-alone treatment with a higher level of microbe destruction than the current use of

conventional biocidal chemicals.

Ozone treatment thoroughly saturates an indoor environment while the use of biocides and portable HEPA are used in select areas of the property thought to have contamination. Most restoration companies will treat what they see, but bacteria and fungi below visual detectable levels less than 50 microns may occupy numerous areas of the property and thus escape traditional methods. The worst outcome of a restoration effort is to miss the objective (high percentage removal of micro-organisms) and lead the client to believe that the property is safe to occupy. For biocides to be truly effective, the entire property would need to be saturated,

which would likely render the site off-limits for days or weeks while the chemical constituents of the biocides dissipate.

UV-ozone, on the other hand, fills the property in hours and is then quickly ventilated out by properly trained technicians. Occupants can return as soon as the ozone levels are at 0.03 ppm or less, which takes about 45 minutes on average. *wqp*

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