Clean with ozone

By Jack J. Reiff

If you have ever stepped outside after a thunderstorm and smelled the crispness in the air, then you have experienced carona discharge of an enormous degree in a natural setting. There are several methods such as this that produce ozone naturally. Natural carona discharge and ultraviolet (UV) light from the sun is a process known as the photo chemical process of generating ozone, and both of these can be reproduced in a mechanical or electrical manner.

There are various adaptations and combinations of ozone generators that can enhance its application for use in commercial laundry while remaining within an efficient and economical operation. All of these systems use a method of aggressive agitation in its simplest term to break up oxygen molecules (O_2) so that these molecules temporarily attach themselves to other O_2 molecules to become ozone (O_3).

The benefits ozone offers, especially in water treatment and the laundering of textiles, have been documented, and data establishes the benefits of ozone oxidation and sterilization resulting in a quick return on investment for ozone equipment.

Some pollutants can only be oxidized by ozone. *Cryptosporidium Parvum*, for example, is a drinking water pollutant that is resistant to most chemical disinfectants but is effectively destroyed by ozone. Some disinfectants act as a barrier to cysts, but do not destroy them, whereas ozone is capable of eliminating them.

Photo Chemical Process

Light comes in various colors depending on the specific wavelength that we can see. When atoms are exposed to high energy from any source, they tend to become excited and emanate energy in the form of radiation. The nature of the radiation depends on the source, the excitation energy used and the media through which the radiation is traveling. The wavelength is measured as the distance between the peaks of a wave (angstroms) and the amplitude (height) of the wave.

The generation of UV radiation is through the use of discharge lamps placed in a glass tube with an inert gas much like the cold plasma generators. The construction of the unit and its performance depends on several factors, such as the type of glass used. The glass can restrict the flow and intensity or distort the wave in some other way as it travels through the glass. The inert gases are another factor and are selected for the job at hand as well as the metallic substance—usually mercury—to achieve a specific wave of light.

Visible light is at a wavelength above 400 nm, while UV radiation is below 400 nm. UV radiation can be divided into four general intensities: UV-A, between 315 and 400 nm; UV-B, between 280 and 315 nm; UV-C, between 200 and 280; and vacuum UV, which is below 200 nm. Vacuum UV is strongly absorbed by air, and UV-C is primarily used to destroy organisms. The level of nanometers in the UV-C range that inactivates organisms is at 253.7 nm. Ozone-forming and ozone-destroying wavelengths of UV light coexist at approximately 254 nm. It is for this reason that UV generators are also used as ozone-destruct units.

UV generators are rated by their capacity to treat water at specific flow rates. The UV dosage is the product of the radiation intensity and the exposure time expressed in microwatts per square centimeter. It is this dosage that determines a unit's effectiveness and not the watt input or the radiated output of the UV lamps.

The dwell time, or exposure time, of the contaminants in the reactor determines the elimination of the organisms. The dwell time can be varied based on water flow in volume or velocity. The organisms to be eliminated must be in the conveying fluid and reside in the radiation zone long enough to absorb a lethal dose of UV light. For this reason, most UV ozone systems must have a treatment chamber so that exposure to the UV is controlled. The UV lights are housed in a sleeve or jacket that is transparent to the UV radiation but acts as protection for the light source

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The use of ozone in commercial laundries

as well as an insulator for the light to control the heat buildup.

The life span of the light source—the bulb—varies with age and film buildup on the shell of the lamp. These two factors impede the proper generation of the UV light and interfere with the extinction of organisms. It is quite possible for a UV sterilizer or ozone generator to lose its intensity when the sleeves used for protection get cloudy from the mineral content or particulate matter that is in the water. It is for these reasons that the Food and Drug Administration and other agencies are specifying in-line UV intensity meters for output verification. There are various lamp sizes, intensities, internal pressure levels and outputs that can be matched to the design demand of a particular situation.

UV light works differently than corona discharge generation of ozone. The method of operation with UV light is to continuously expose the medium to be processed, whether it is air or water, through the high-intensity light contained within the reactor tube. The light permeates through the medium and shines through any organisms that are in the air or water stream. Intense UV rays impact the sensitive RNA and DNA of bacteria, preventing the organism from reproducing. Bacteria, having a short life span and relying on rapid reproduction to flourish, are essentially prevented from further growth or activity.

Because the UV light is only used within a small contact area, it does not provide residual disinfection in the water or air. UV light is an effective tool, but it does not prevent growth of bacteria unless it provides constant exposure. Ozone that is generated oxidizes the bacteria and particulate soil destroying the bacteria cells, preventing reproduction of the bacteria. Ozone also oxidizes the soil or particulate matter, changing or destroying the chemistry of the soiling materials such as organic compounds. It is for these reasons that necessary steps are taken to ensure the purity of the UV generators so that the desired results are obtained.

Commercial Ozone

The use of UV in destroying waterborne diseases is well established. Its use in the pharmaceutical, food, beverage, cosmetic, healthcare, manufacturing, wastewater treatment and laundry processing are also well documented.

Although UV is used to generate ozone, it is also used as on-off gas control and ozone destruct unit controlling the ozone use to these areas of need. *wqp*

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