

Ozone in Your Pool and Spa

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Today, pool and spa owners look for excellent water quality, using fewer chemicals, less work, and lower cost. No matter which water treatment system is used on a pool or a spa, there is a need to eliminate materials introduced by bathers (non-living bather waste), disinfect or kill bacteria, viruses, algae, and to create a safety residual in the water.

- **Oxidation** is the elimination of non-living bather waste such as body oils, cosmetics, sun tan lotions, perspiration, urine.
- **Disinfection** is the killing of viruses, bacteria, and algae, on contact.
- **Residual** is the free available disinfectant present in the water to ensure disinfection.

The residual is legislated and must be chlorine, bromine, or biguanides. Many pool and spa owners use chlorine to fulfill all three water sanitation requirements (oxidation, disinfection, and residual). This more traditional approach to water treatment is not the most efficient. For example, in outdoor swimming pools, approximately 15% of chlorine is used for disinfection, 70% of chlorine is used for partial oxidation, 5% of chlorine is used to maintain a safety residual, and UV light from the sun destroys 10% of chlorine. In the spa water, if chlorine is used as a stand alone sanitizer, approximately 5% is used for disinfection, 85% is used for partial oxidation, 5% is used to maintain a safety residual, and 5% is destroyed by the hot water. Since spa water temperature is above body temperature, the amount of non-living bather waste is 20 times greater than in cooler water. Therefore, a larger percentage of chlorine is used up.

Chlorine is an excellent disinfectant and provides a residual in the water. However, some problems are encountered when only chlorine is used for the elimination of non-living bather waste. When chlorine encounters a non-living organic compound, chlorine becomes incorporated into the compound and this new chlorinated compound cannot be broken down any further. Chlorine combines with body oils, sun tan lotions, cosmetics, perspiration, and urine. The combining of chlorine uses up the chlorine and it can no longer function as a disinfectant and residual in the water. The chlorinated organic compounds form scum lines, greases that clog filters and result in the formation of soft-scale. Chlorinated compounds that were formed from sweat and urine (chloramines) are responsible for the obnoxious "chlorine" odor, eye and skin irritations often experienced by the bathers. As these chloramines form, more and more chlorine is needed to establish a sufficient free chlorine residual in the water. This is known as "superchlorination" or "shocking".

Ozone (O₃) consists of three oxygen atoms. Ozone is a very reactive gas that causes the characteristic odor sometimes noticed during a thunderstorm. Ozone is the strongest oxidizer commercially available for pool and spa water treatment. Because Ozone is a more powerful oxidizer than chlorine, it reacts with non-living bather waste quicker than chlorine does. Ozone does not combine with the compounds; instead it causes them to break apart. The broken parts are more water soluble, and some can even gas-off and harmlessly dissipate into the air. Compounds from urine and perspiration are altered so that they cannot form chloramines that cause eye and skin irritations. So, the use of Ozone provides a more enjoyable swimming experience. Ozone is crucial in pool and spa water sanitation as it is important to eliminate non-living bather waste. Spas are much smaller and warmer and this results in even greater accumulation of wastes than in pools. This makes Ozone's role even more important in the spa water.

In the pool and spa water, chlorine acts as a primary disinfectant and it provides the safety residual. Ozone is the primary oxidizer. Ozone is not a disinfectant since it does not have a lasting residual in the water. The disinfection is achieved by maintaining a free-available chlorine or bromine residual in the water at all times. Ozone's role is to remove or alter non-living bather wastes. In the water, Ozone provides a continual effective high-level non-chlorine shock. When Ozone is used together with chlorine, Ozone increases chlorine's effectiveness as a disinfectant and residual. Without Ozone, the pool and spa owner needs to counteract the formation of chlorinated compounds by using more and more chlorine to keep a free available residual and requires "shocking" compounds and other expensive specialty chemicals to treat the problems caused by chlorine combines.

When Ozone is used as an oxidizer in pool and spa water, the quality of the water will improve as problems with combined chlorine compounds are eliminated and eye and skin irritations are greatly reduced. Overall water maintenance and care are minimized as filter runs are longer since clogging greases and oils are broken down, scumline or bathtub rings are kept away or are easily brushed off. The cost of running the pool and spa is lowered as the use of the following specialty chemicals can be reduced: "shock" treatments, scumline cleaners, filter degreasers, clarifiers, scale inhibitors, scents, filter aids.

On a final note, pool and spa owners do not have to exclusively use chlorine for water treatment and deal with its unpleasant effects. Today we can modernize water sanitation by using more targeted and better combinations such as chlorine and Ozone together, to produce excellent water quality, reduce eye and skin irritations, use fewer chemicals, create less work and make the operation of a pool and a spa more economical for their owners.

About the Author

Deborah Kon is the laboratory manager at UltraPure Water Quality Inc, a manufacturer of Ozone generators for residential pools and spas. She holds a B.Sc. (Hons.) degree, with a major in chemistry from the University of Guelph, in Guelph, Ontario, Canada.