

# Ozone for Residential Swimming Pools and Spas

## An essential part of an effective swimming pool and spa water treatment

By Deborah Kon

**T**oday, swimming pool and spa professionals such as dealers, distributors, builders, are faced with a multitude of water treatment options such as ozone, chlorine, bromine, algacides, clarifiers, filter aids, and shock treatments. How can a professional in the swimming pool and spa industry recommend a particular treatment to a residential swimming pool and spa owner? Professionals in the swimming pool and spa industry need to be well informed so that they can recommend the best option to suit their customers' needs. The first step in this process is to determine what their customers are looking for in a swimming pool and spa water treatment.

In general, owners of residential pools and spas tend to appreciate pool and spa water treatments that provide excellent water quality, use fewer chemicals, less work, and lower cost. The second step in this process is to understand the key requirements of proper water sanitation. Fulfilling these requirements most effectively forms the basis of the water treatment system.

### **Proper water sanitation**

Water sanitation involves three parts: disinfection, oxidation, and a safety residual. Disinfection is the killing of viruses,

bacteria, and algae, on contact. Oxidation is the breakdown of nonliving components such as organics and nitrogen containing compounds. These non-living components are introduced into the water by the bathers and include body oils, sun tan lotions, cosmetics, urine, and perspiration. Residual is the amount of free available disinfectant in the water to ensure that disinfection is occurring at all times. Proper water sanitation can be most effectively achieved by using a combination of chlorine and ozone.

### **Chlorine and Oxidation**

The traditional approach to treating swimming pool and spa water has been to use chlorine. Chlorine is an excellent disinfectant and it provides a safety residual in the water. However, chlorine is not efficient in oxidizing non-living bather waste. In an outdoor pool, approximately 70% of the chlorine is used up for the breakdown of non-living bather waste. In a spa, approximately 85% of chlorine is used for the same purpose. When such a large proportion of chlorine is used for oxidation, complications arise. At pool and spa residual levels, when chlorine encounters body oils, sun tan lotions, and cosmetics, chlorine does not break them down. Instead, chlorine combines with

them to form new chlorinated organic compounds. The chlorinated compounds cannot be broken down, but rather consume a significant amount of chlorine, form scum lines, greases that clog filters, and contribute to formation of soft-scale. At operating residuals levels, chlorine also combines with nitrogen-containing compounds from urine and perspiration to form compounds called chloramines. Chloramines cause the obnoxious "chlorine" odour noticed around swimming pools and spas. They also cause skin irritation and red, itchy eyes. These reactions also tie up a lot of chlorine preventing it from acting as a disinfectant and a residual in the water. The formation of chlorinated organic compounds and chloramines requires constant chlorine addition and superchlorination or shocking of the water.

### **Ozone and Oxidation**

Ozone is more efficient than chlorine at oxidizing non-living bather waste. Ozone does not combine with organic compounds and nitrogen compounds to form chlorinated organic compounds and chloramines. Ozone instead completely breaks apart the organic and nitrogen containing compounds. These resulting smaller molecules are more water soluble, they cannot combine with chlorine to form chlorinated

organic compounds and chloramines, and some can gas-off. This reduces formation of scum lines, clogging of filters, and soft-scale formation, and most importantly to the bathers, obnoxious odour and skin and eye irritations are reduced.

### **Combination of Chlorine and Ozone**

Chlorine's disinfection and residual properties are excellent, and in the pool and spa water, chlorine can be used as the primary disinfectant and the free available residual. In the pool and spa water, ozone is the primary oxidizer. By breaking down non-living bather waste, ozone increases chlorine's effectiveness as a disinfectant and a residual. Since ozone prevents the formation of chlorinated organic compounds and chloramines, the need to superchlorinate or shock the pool or spa is reduced. And, since the formation of chlorinated organic compounds is minimized, the use of shock treatments, scumline cleaners, filter degreasers, clarifiers, scale inhibitors, scents, and filter aids can be greatly reduced.

### **Ozone Safety**

If the ozone generator is installed and operated properly, ozone does not pose any health hazards to the bathers. Because ozone is very reactive and does not have a lasting residual in the water, the bather will not be exposed to any significant amount of ozone. Once introduced into the water, ozone quickly reacts with nonliving contaminants to produce oxygen, heat, and carbon dioxide, which are not hazardous and simply gas-off. The safety limit for exposure to ozone is 0.1 parts per million (ppm) over an eight-hour time period. The typical allowed indoor off-gassing from an ozone generator is set at 0.1 ppm. Ozone generators for residential swimming pools and spas are certified as safe by Underwriters' Laboratories (UL) under standard UL 1563, and by National Sanitation Foundation (NSF) under standard 50.

### **Tips for Ozone Use in Swimming Pools and Spas**

Ozone can also be used with bromine. Bromine acts as disinfectant and provides a safety residual.

Ozone is compatible with mineral products and with copper and silver ionization systems.

Ozone can and should be used with chlorine generators. Chlorine generators produce chlorine by splitting salt molecules. Ozone is required to fulfill the oxidation function rather than the generated chlorine. Without ozone, chlorinated organic compounds and chloramines will form.

Ozone increases the capacity of a chlorine generator, prolongs its cell life, and stabilizes pool water chemistry.

The free chlorine / bromine residual in pool and spa water is required and should be maintained at all times.

In a swimming pool or a spa, if ozone is used with chlorine, the minimum amount of free chlorine in the water should be 2.0 ppm, or with bromine, the minimum amount should be 4.0 ppm bromine.

If ozone is performing its oxidation function in the water, the difference between total chlorine and free available chlorine should be 0.5 ppm or less. This means that most of the chlorine is being used for disinfection and a residual rather than being present as chlorinated organic compounds and chloramines.

### **Installation Basics: Swimming Pools**

Ozone generators can be installed on both new and existing swimming pools. Installations are very simple and easy. Most ozone generators for residential pools are installed on the suction side of the pool pump. When the pump is on, ozone is drawn into the pump. Ozone passes through the pump impeller and it is pressurized into the water as it enters the filter. The filter's bleed tube sends ozone into the pool

water as a fine bubble mist. For system specific instructions and parts required for the installation, the manufacturer of the ozone generator should be consulted.

### **Installation on Spas**

The installation of the ozone generator on spas is also very quick and easy.

Most new spas have factory provisions in place that allow for an easy installation of the ozone generator. These factory provisions are the ozone injector, which is a mini jet in the foot well, a venturi with a return in the spa wall, the air flow/draw capability, and plugged tubing in the equipment bay under the spa skirt. As is the case with swimming pool installation, the ozone generator is connected to the spa's recirculation pump. The ozone generator can either be on only while the pump is on the low speed cycle or be on for 24 hours per day. For system specific instructions and parts required for the installation, the manufacturer of the ozone generator should be consulted.

### **Conclusion**

The use of chlorine and ozone for swimming pool and spa water treatment most effectively addresses the three water sanitation requirements, and provides the pool and spa owner with a water treatment system that gives excellent water quality, is easy to maintain and is cost effective.

### **About the Author**

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