Alternative Technologies for Treating Swimming Pools Water

Ozone-Based Swimming Pools Water Treatment

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1. Chlorine based technologies

Chlorine is known to destroy the bacteria present in water by oxidation. However, it also reacts with organic residues found in the swimming pools and then forms a large number of highly toxic compounds, commonly referred to as chloro-organic compounds such as chloroform, chloramines. Some of these compounds are known to be potentially carcinogenic and quite harmful to aquatic ecosystems. In swimming pools, these toxic compounds could reach harmful concentrations. Red eyes and irritated skin are just some of the instant and obvious effects and they should be regarded as a high risk signal for human health. As an attempt to reduce the toxicity of swimming pool water, make-up water (new fresh water) is used to dilute the concentration of toxic compounds. Consequently, a large amount of water must be discharged to the environment, polluting the recipient water bodies.

2. Ozone-based Technologies

The use of ozone-based technologies started more than 50 years ago. The two primary ozone based alternatives are as follows:

• Partial Ozonization
This practice is mostly used in countries where there is a law/regulation that forces maintaining a residual concentration of chlorine. Such is the case of Costa Rican public swimming pools. However, ozone is a much better oxidant than chlorine; it reacts first, avoiding the consumption of chlorine.

As a result, a chlorine application in the order of 5-10% of the normal dosage is sufficient to comply with local regulations and keeps 1pmm of residual chlorine.

In Europe, there are more than 30,000 swimming pools treated only with ozone as opposed to the situation in US, where the ozone-based technologies have been used in combination with chlorine because the US EPA recommends to keep 1 ppm of chlorine. Thus, the advantages of applying ozone alone is not often valued and appreciated.

Moreover, some chlorine distributors claim that in any case some form of chlorine is necessary and they use this as an excuse to prevent the use of ozone based-technologies. This situation has generated an understandable level of distrust in ozone-based technologies among US companies which explains why the US is 30 years behind Europe in this area.

In British Columbia, Canada, the regulations applicable to swimming pools require that an appropriate level of disinfectant remains present in the water.

The regulation enforced in this country states that if a non-chlorine based product is used instead, then the water should always have a concentration of the substitute product whose disinfections power is at least equivalent to the minimum concentration of chlorine required. Nevertheless, some health inspectors and even some engineers still demand the use of chlorine. Perhaps this is the cause of a prevailing misunderstanding of the capacity and stability of a small residual of ozone in the water. Indeed, it is just a matter of dosage and circulation of water inside the swimming pool.

Many questions have arisen about the application of ozone in swimming pools. For instance, people ask if the dissolved ozone is toxic to humans. Actually, no toxicity problems have been observed in exposures greater than 8 hours per day at 0.15 mg/L of dissolved ozone (residual). Fortunately, ozone is much less toxic than alternative products based on chlorine and bromide.

Bromide, Ozone and Hydrogen Peroxide have been used with success in the past with or without any chlorine residual. Ozone is the strongest and most appropriate of them. Its stability in the water is very convenient and ideal. Current technologies allow a simple and automatic maintenance of the appropriate residual level of ozone.

ADVANTAGES OF OZONE IN SWIMMING POOL WATER TREATMENT

• Support to filtration. Ozone facilitates the flocculation of organic substances and residues thereby increasing the effectiveness of sand filters.
• Purification of Water . Ozone directly decomposes the organic wastes by oxidation.
• Greater water hygiene. When properly dissolved, a 0.05 mg/L or greater ozone residual ensures a 100% elimination of bacteria, viruses and fungus normally present in water.
• Constant water ozonization. The ozone that remains present in the water is decomposed into oxygen which stays dissolved in the water until the saturation point. This makes the water look always clean, "crispy", crystal clear and tempting.

REMEMBER:

• Ozone reduce toxic residues in the treated water.
• Ozone is produced in the place of application, thus no storage nor transportation is required.
• When ozone concentration is kept under 0,15 mg/L there are no potential harms for human health, even after a very long exposition.
• The undissolved ozone is easily separated from the treated water at the discharge and gaseous destruction deposit, much before it enters the swimming pool. On the contrary, chlorine is continuously discharged in the form of a highly toxic gas to the surface of the swimming pool water, which generates the common smell of chlorine and causes serious damages to human health and infrastructure (ie. Corrosion in the case of indoor pools).
• The use of ozone in swimming pools poses no risk for the environment and avoids the environmental risks associated to the use of chlorine and to discharge water.
• Ozone prevents the formation of calcium scaling, eliminates existing scaling problems, cleans and prevents the formation of oil/grease sediments on the sidewalls of swimming pools, etc. This implies a significant reduction in cleaning and maintenance costs.
• Ozone is produced "on-the-site" with a very low energy cost, thereby reducing water treatment costs. Usually, an ozone system is paid off in just few months through the generation of cost savings.
• The application of ozone does not require the use of dissolved salts which are known to irritate the skin. The turbidity, pH, alkalinity and floor stain problems generated by the use of calcium-based chlorine products are also avoided through the use of ozone.
• The complete automation of ozone application systems avoids and prevents the human error that is commonly present in the application of chemicals. It also avoids and prevents the risk of handling and storing hazardous chemicals.

DISADVANTAGES OF OZONE IN SWIMMING POOL WATER TREATMENT

• When the treatment of a swimming pool is changed from chlorine-based [illegible] to an ozone based technologies, a few changes may be observed in the water. First, during the start-up of the ozone generation equipment, the ozone could cause the formation of foam for a few hours.

Flocculation of organic sediments will take place and the aspect of the water may turn "milky" for some time. These changes are the result of the oxidation process generated by ozone. They will take place only once and the filtering devices will eliminate the byproducts generated from this process. Later on, the water will turn crystal clear and have a pleasant smell.
• If there are power shortages for a long period of time, it is necessary to use chlorine to maintain the disinfections level in the water until the power comes back.
• Given the unlimited variations in size, shape, uses and water volume among swimming pools, it is always necessary to execute a study to determine the kind of ozonization system and to select the appropriate equipment for each particular situation. As a result, the acquisition of an ozonization system must be done once the system is fully designed and the system can only be sold "tailor-made" for each application.
• For some pockets, the initial investment may be deemed rather high although the payback period is very short.

OTHER APPLICATIONS OF OZONE

• Disinfections of potable water.
• Elimination of iron, manganese and heavy metals from water.
• Bleaching, disinfections and treatment of industrial wastewaters.
• Bleaching of textile fibers.
• Air purification (fights the sick building syndrome)
• Preservation of grains, vegetables and fruits in warehouses and grocery stores.
• Disinfections of water in aquaculture systems (ie. Shrimps and fish ponds)
• Treatment of injuries, wounds and skin ulcers.