

OZONE SYSTEMS IN PUBLIC SWIMMING POOLS

Chlorination of swimming pools is common, it is cheap and dirty. Chlorine reacts with organic waste and forms a large number of highly toxic compounds, also referred to as combined chlorine or THM. These are well known carcinogens, and are also very poisonous to marine life. In swimming pools these toxins may accumulate to very high concentrations. Red eyes and rashes are the most instant and obvious effects, and should be considered signals of a much more serious risk to human health. In Canada Federal Public Health Advisory run through the media in March 2007 stating that the children-asthma epidemic is caused by the chlorine gas that evaporates from pool waters and accumulates in the first 20 cm above the pool water. Similar reports from Germany suggest the need to convert all public swimming pools to ozone.

Health authorities in most countries require the sanitation residual of 0.5 mg/l of chlorine or equivalent disinfectant. Ozone is ~ 35 x stronger than chlorine yet leaving no harmful byproducts. Ozone is much stronger and more than adequate for providing complete water purification and sanitation. It is just a matter of proper sizing.

Our double-safety sanitation system uses ozone as primary disinfectant and chlorine as a backup. ORP electrode controls the ozone dosage while another ORP electrode is in the systems for controlling the chlorine dosage. Both controllers are programmable to the level of sanitation residual. In practical installation the ORP at the chlorinator is set to 0.5 mg/l of chlorine as required by the health authorities, while the ORP at the ozone generators is set about 10% higher. Both ORP are installed into the water return line from the pool.

How does it work: During first startup both, the ozone system and the chlorination, work full speed for quickly achieving 0.5 mg/l. At that moment chlorination shuts down and ozone continues till it reaches ~10% higher level and shuts down too. As the sanitation level drops a bit, ozone starts again, and keeps going while chlorine is shut down. This way the pool is running only on ozone, everything is nice and clean, water quality superior. Only in extreme cases, say if a bus-load of bathers enter the pool, the ozone system may not be able to maintain the residual (or a much larger ozone system would have to be installed), chlorine will kick in for a few minutes, before ozone is able to catch up again. Or in case of maintenance of the ozone system chlorine can temporarily take over.

Ozone and chlorine are installed typically in separate rooms and injected into the main flow via off-gas vessels (see SPT-tank product line), so that free ozone gas cannot enter the pool. This injection is followed by sand-filtration where eventual products of flocculation are removed, so that only clean water (charged with ozone) is injected into the pool.

German DIN system: Some countries may have adapted DIN concept that is based on the tradition of large community drinking water system. Our ozone generators are

perfectly suitable for that concept too: Main flow from the pool is treated with very large dosage of ozone, in large holding tanks for 10 minutes. Due to such short time the ozone system may need to be 10+ times larger. After passing this holding tank all organic materials are burned to ashes. In the next step the full water flow is filtered first on sand filters, followed by carbon filters for final polishing. However, on carbon filters also all ozone is removed. Chlorine is then added into the flow going to the pool. Since such water is clean, only a small amount of chlorine is needed to achieve 0.5 mg/l sanitation residual. However, this chlorine then evaporates to the bathers' faces, and also THM are formed with freshly discharged organic materials. This concept is much more expensive, it requires large building space, and it is a subject of complaints as there is still chlorine in the water and in case of overload ozone is not increased automatically. The first-above double-sanitation system with ozone and chlorine backup is clearly superior to the DIN system.

There are many advantages of treating pool water with ozone:

- Filtration support. Ozone assists flocculation of organic waste materials, thus enhancing the effectiveness of sand filters.
- Water purification. Ozone directly decomposes organic waste by oxidation.
- Water sanitation. Properly dissolved ozone residual of 0.06 mg/L or higher assures a 100% kill of all bacteria, viruses and fungus.
- Water ozonation. Unused ozone slowly decomposes to normal oxygen and remains dissolved in the water to the point of saturation. This makes the pool water clean, sparkling and appealing.
- Leaves no toxic residues in the treated water.
- Ozone is produced on site and does not require storage or transportation.
- Dissolved ozone at levels below 1.00 mg/L do not cause adverse health effects even during long term exposure.
- Un-dissolved ozone off-gas is easy to separate from treated water in the off-gas tank, long before entering the pool, while chlorine is being constantly released in its highly toxic gas form right above the pool water.
- Ozone ends water discharge liabilities.

Ozone prevents calcium carbonate scaling, removes existing scale, cleans and prevents greasy sediments on pool sides. Ozone treated water has a much lower cleaning cost.

HOW CAN WE ASSIST YOU IN IMPLEMENTING OZONE TREATMENT IN YOUR SWIMMING POOL?

There are seldom two identical swimming pools or spas in the world. Our engineers are ready to review and utilize your pool(s), existing equipment (tanks, pumps, filters, buildings) to be fitted for ozonation. To do so most efficiently, please answer the attached questionnaire. We also routinely work with local engineering companies in implementing the most advanced ozone technology in the most efficient, safe, and economical way.

Ozone generators must be installed in well-ventilated and dust-free room. Detailed instructions for installation and operation are provided to each project. The systems are easy to operate and maintain. The overall warranty is three years, except on pumps where the manufacturer's warranty is applied (generally one year).

Please call our Engineering Department

CONFIDENTIAL QUESTIONNAIRE FOR OZONATION SYSTEMS IN PUBLIC,
COMMERCIAL, AND REHABILITATION SWIMMING POOLS AND SPAS.

Please answer only those questions which are relevant to your operation:

1. Name the project clearly for future reference.
2. What is the main water flow through the filtration system?
3. What is the pool volume, and approximate surface area?
4. Provide a sketch of the layout and elevation of the existing hydraulics. Mark the size and head pressure of your pump(s), size the flow in all pipes, and the volume of all tanks.
5. Is there a clean and dry room available, of what size?
6. Do you plan any future expansion?
7. What is the electrical power source available (voltage, current, frequency)?
8. Do you wish to interface the ozonation system into your system computer? If so, please indicate which functions you wish to monitor or control.

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