

OZONE & UV SYSTEMS ALLOW POOL TO APPROACH ZERO-CHLORINE

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Chlorine has killed more bugs and oxidized more bather waste than any other chemical or system, and by a wide margin. It is arguably the industry's simplest, most effective sanitizer. Dump it in, and it will kill organisms, control algae and oxidize the leftovers.

Still, a lot of pool owners don't like it; never did, and it's safe to say they never will.

The industry has responded with ozone and UV sanitizing systems, some of them quite sophisticated, to give customers the option of either lowering chlorine levels to a minimum or eliminating them altogether.

While these systems have improved in all aspects over the years — they are smaller, more efficient and produce more sanitizing power — some new developments have aided their acceptance. First, and perhaps most important, is their incorporation into advanced control systems, which can constantly monitor pool water and attenuate the addition of small amounts of conventional sanitizer to keep up with varying demands.

Secondly, more pools are pumping for longer periods at lower rpm, an industry shift that is happening very gradually but steadily. This is helping sanitization, as water stands stagnant in these pools for

shorter periods of time and mixing is improved, thereby lessening reliance on a strong chlorine residual to fight algae.

And finally, while the middle-income pool market has suffered in recent years, the upper-income market (the prime target for UV and ozone systems) continues to show strength.

These factors have combined to make ozone and UV systems more attractive and popular, as they are able to dramatically lower chlorine levels — reductions of 50 to 90 percent. With such reductions, the negative effects of chlorine are virtually eliminated.

And in a small number of pools, chlorine elimination is not virtual but absolute, notes Marc DeBrum, sales engineer, ClearWater Tech, San Luis Obispo, Ca. "We have many customers that use ozone only — their pools are chlorine-free."

It's a trickier proposition, to be sure. Generally, something must be added to control algae (DeBrum favors phosphate removers) and kill organisms in such pools. On the whole, he says, it's probably simpler and easier to maintain a 0.2 to 0.5 ppm chlorine residual, which is negligible in terms of what bathers experience, but still provides a good defense against unwanted pool invaders. In comparison, the EPA chlorine standard for drinking water is a maximum of 4 ppm.

"It's such a small amount," DeBrum says, "you won't have the aspects that you dislike about chlorine, but it will still provide enough of a residual sanitizer."

If It's Water, a company that makes UV sanitization equipment in Downingtown, Pa., provides a product with a similar

chlorine-level reduction, according to Bill McTear, vice president. "What a lot of our customers are doing is, instead of using a chlorine concentration of 3 ppm, they're keeping a chlorine level of around 1.5 ppm," he says.

So instead of replacing chlorine or bromine, ozone and UV can make excellent partners for the halogen sanitizers. Both of them assume a portion of the sanitizer burden.

Ron Barnes, CEO and head of engineering, Prozone, Huntsville, Ala., an ozone manufacturer, believes a particularly ideal combination is ozone with a salt chlorine generator.

He notes that a sanitizer has three main functions — disinfection, oxidation and algae control. By far, most of a pool's chlorine is used up in the oxidation process. Ozone equipment assumes that role almost entirely, so much less chlorine is needed overall.

"The major advantages of that combination have to do with the fact that, not only do you have this major gain in sanitization of your water [using ozone], but you also have the fact that you have reduced your demand for chlorine in the system because the ozone is dealing with the by-products. Which means now you can use less salt, and you end up with a cleaner, less-expensive-to-operate, more-effective system, by combining the two together."

Low Flow Advantages

The development of low-flow pumping has boosted the efficacy of these systems. Both ozone and UV are installed in-line and provide their killing (and in the case of ozone, oxidizing) operation on water as it passes through the plumbing.

With new low-flow pump technology, however, water moves more slowly through the pipes; it spends more time passing through ozone and UV chambers, and less time laying stagnant in the pool, where algae and other microorganisms can multiply.

“Ozone and salt, both are aided by low-speed pumping,” notes Scott Clay, program manager for pools at PG&E, San Francisco. “Look at the chemistry of a pool. A pool doesn’t like stagnant water. So if you look at what people have done in the past, they’ve pumped really fast for 4 hours and shut her down, and for 20 hours a day there’s stagnant water.”

When the pump is run slower for longer periods of time, he says, the continual mixing provides better sanitation and cleaner water. Because this aids the sanitizer in the pool, where ozone and UV cannot act, it contributes to their mission of lowering chlorine levels.

It also can reduce the up front costs of a system, says Russell Roark, president, Advanced Control Logix, Colfax, Ca., West Coast distributor for medium-pressure UV systems. His company sizes UV systems based on flow rate; the lower the size, the lower the cost.

“You have to provide enough contact time with the ultraviolet radiation to kill all the bad stuff going by. So the slower you move the water through it, the smaller the unit you can purchase and the cheaper your system is going to be,” he says.

It must be stressed that the difference in sanitization between low-speed and high-speed pumping is a matter of time, not total volume of water sanitized, which is the same in both cases, but the time factor seems to have an effect.

“More turnover time helps,” says DeBrum. “We have a number of [variable-speed] pumps that customers use with ozone systems, and they are running them 18 hours a day, and have seen very good results. And they’re reducing their amperage draw and electrical consumption by half, too, which is huge.”

One such customer is Skip Phillips of Genesis 3, DeBrum says. “He had one of the first Whisper-Flo pumps installed

on his pool along with a ClearWater Tech system and a salt chlorine generator.”

“That salt generator, as far as I understand from the last time I talked to Skip, hardly ever runs. He really doesn’t use it too much or too often — only if there’s a party or something like that. He’ll have it kick on for a little bit just to catch up, so to speak. But for normal use for his family of four, the ozone keeps up with the sanitization just fine.”

Phillips has an in line system which monitors ORP (oxidation-reduction potential — a measurement of the water’s ability to oxidize contaminants in a pool) enabling him to adjust sanitization to external conditions.

“So if ORP drops off the map because of a high load,” says DeBrum, “a secondary system [such as his chlorine generator] jumps in and helps to bring the ORP back up to its set point.

“More and more folks are understanding ORP and using it in residential systems,” he adds. “Whether that’s handheld or as in Skip’s case, an in line system which gives him that number all the time.”

How They Work

As a rule, oxygen atoms float around in pairs and can only be split up by force — this is done by application of an electric arc or UV light through air in a chamber. With the O₂ molecule split, some of the single oxygen atoms will combine with other unsplit O₂ molecules to form O₃, or ozone.

This newly added oxygen atom is like a third wheel, weakly bonded to the other two, and thus their lives together are short and unstable. It is lost in reaction very quickly as it oxidizes pool water impurities at its injection point, thus the need for some kind of long-lasting sanitizer, which can linger throughout the pool where it cannot reach. UV systems, on the other hand, use a lamp that emits light of a certain wavelength, which kills a wide range of organisms. As the water passes by, it is exposed to the light, and the bugs are killed.

More expensive, medium-pressure (pressure refers to the vapor pressure inside the lamp itself) UV units emit a broader spectrum of light than low-pressure units, and kill a wider range of bugs. Type of

vapor and vapor pressure determine the UV wavelength spectrum emitted.

A big selling point for UV, says Roark, is that it destroys chloramines. “This is why UV really shines on indoor pools.

“I’m sure you’ve walked into a building with an indoor pool. What you often smell as soon as you walk in are chloramines. And the problem is not just the smell and irritation of the chloramines; they completely destroy your HVAC system. If you install medium-pressure UV, within 24 hours, the difference is night and day because of the destruction of the chloramines. The chloramines and their smell are just gone.”

Cost Calculations

While indoor and upscale pools are a growing market for UV and ozone, the mainstream pool market remains elusive. DeBrum sells some ozone systems for mid-priced projects, but the bulk of the business is in the high end.

“We do have systems for those markets that are lower dollar, but we tend to be attracted to the high-end market, where there are more dollars invested into the pool,” he says.

Middle-income pool owners can be put off by a combined system that requires both up front and ongoing costs. “Some of them are thinking, ‘So I’ve got this up front cost for the ozone system, and I still have to put in a little bit of chlorine?’”

The cost calculation comes down to the goals of the customer and the size of the pool. “If you want chlorine-free, that takes more ozone and costs more. If the customer just wants to use a little bit of chlorine, we have packages that are fairly inexpensive that can meet that need.”

The builder plays a large role in the formulation of those goals, of course. And while more builders recognize and offer the benefits of ozone and UV, others still do not feel comfortable with the technology. DeBrum says his main clients are builders who are looking for options which enhance a pool project, “who know that it takes a little more work to understand it so they can propose it to their customers.”