

Saltwater Pools

By Mason Guarino

By now, most people who have a pool or have been around pools in the last few years have heard about the “new” technology of using salt water in pools. Comments often include how great they are and how good the water feels. Saltwater pools do typically have a soft water feel to them, but chlorine is still needed in a saltwater pool. There are a few misconceptions, however, surrounding saltwater pools that need to be considered.

The saltwater technology was originally invented in the 1960s in Australia and brought to America in the mid-1980s. So this “new” technology is not so new. In fact, it has already been around long enough to make it illegal to connect a saltwater pool system to the city sewer system in certain parts of the country. Santa Clarita Valley, CA, has put this ban into effect to meet their state-mandated chloride limits in wastewater discharge. Other municipalities have banned the technology all together. When saltwater pools are drained, the salt is discharged into parts of the ecosystem that are damaged by the high-chloride salt, including plants, animals, and drinking water supplies.

Saltwater pools use what is called a saltwater chlorine generator. This device, in the plumbing system end of the equipment, takes the dissolved salt in the pool water and separates the sodium ions from the chloride ions using positive and negative electrical charges. The chloride ions then turn into chlorine gas that reacts with the water creating hypochlorous acid, or what is typically referred to as chlorine, in the swimming pool. However, in addition to the chlorine being created in the pool water, sodium hydroxide is also created when the sodium ions are separated from the chloride ions. Sodium hydroxide is very alkaline and will raise the pH of a swimming pool. When the pH is raised by the sodium hydroxide, the hypochlorous acid ions will separate. This separation significantly reduces the bacteria- and germ-fighting chlorine because the hydrogen ion wanders off and the hypochlorite ion starts to be corrosive to its environment, namely the pool itself. This is combatted by adding muriatic acid on a regular basis instead of chlorine. This keeps the pH level normal and keeps the hypochlorous acid (chlorine) intact and able to fight off the bacteria and germs in the pool.

As with every pool, maintenance and upkeep are essential to allowing the pool a long service life. As we all know, sometimes maintenance can be neglected. The effects of neglecting the maintenance on a typical chlorine pool will become obvious quickly—the pool will turn green and things will start to grow in a short period of time. Neglecting the maintenance on a saltwater pool



Fig. 1: Pools with salt still look the same as pools without

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Fig. 2: This is one brand of salt that is used—they all work pretty much the same. These are 40 lb (19 kg) bags; residential swimming pools typically need 25 to 30 bags (roughly 1000 to 1200 lb [454 to 544 kg]) to get a salt system started

will do the same; however, it will take much longer to see the effects and for the pool to turn green. Salt needs to be added to the pool occasionally along with muriatic acid to maintain the correct pH level of 7.2 to 7.8. When muriatic acid is not added to a saltwater pool, the pH will rise, and the pool will become low in chlorine and high in the oxidizer ion, hypochlorite. This will not be nearly as visually obvious as the pool turning green when using with chlorine. The hypochlorite is a very aggressive chemical and will begin to eat away at everything it can—the pool plaster, metal railings, heater internals, and just about anything around the pool that is susceptible to corrosion—while the low chlorine level will keep the pool from turning green.

Based on personal experience, when a residential pool is well-maintained, a saltwater system makes for very nice and soft water. The salt cannot typically be tasted because the level of salt in a residential pool is under 4000 ppm, which is the typical human taste level of salt. In comparison, ocean water is around 35,000 ppm.

The commercial saltwater pool is difficult to design, sell, and then to maintain correctly to prevent premature deterioration due to the salt. There are two different types of commercial saltwater pools. One system has a separate tank in



Fig. 3: Close-up views of a residential salt cell: (a) information it provides and the adjustments that can be made; and (b) close-up of the flow sensor which shuts the cell off when there is insufficient flow. Also shows the fins that provide the charges that separate the ions as the salt water passes through

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the equipment room containing a high concentrate of salt water that is mixed to create a low-concentration salt/chlorine-water solution. This chlorinated water solution is then injected into the pool, which is similar to the way liquid chlorine would be injected into the pool. This type of system for a large pool is quite large and takes up a lot of space in the equipment room. During the pool design process, the salt chlorination system is not always taken into account and the area for the chlorine salt-generation tank ends up under-sized and uses a smaller tank that cannot keep up with the demand of a large commercial pool.

The other commercial-style saltwater system is similar to the residential version with a generator that ionizes the molecules. This requires a very large unit. The unit is so large that it can send an ionizing electrical current throughout the entire pool and as a result, attacks anything metal, including the heaters, pump components, railings, lane line components, and lights. Thus, pools using this type of system need to be built with all-plastic components that can resist the ionizing currents. The items that cannot be plastic, such as heaters, flow meters, and other sensors, must be specifically designed for service in saltwater pools. Additionally, sacrificial anodes need to be installed to try to compensate for the ionizing current. On top of all the saltwater requirements for a commercial pool, some states and municipalities still require a backup chlorine system which is powerful enough to keep the pool online should the salt system fail. As a result, salt systems for commercial pools can be costly to install.

The alternative to a saltwater pool is the more common liquid or pelletized chlorine. However, there are also other technologies used in municipal water treatment facilities being brought to swimming pool disinfection systems. Ultraviolet (UV) and ozone disinfection are two systems that, in combination with conventionally chlorinated pools, actually maintain a lower chlorine level than with salt systems. In turn, a pool ends up with as little chlorine as legally possible. The UV system is simple. The water passes through a chamber exposed to correctly powered UV light that kills the bacteria and germs in the water system. It can even destroy the chlorine if it is turned up too high. The ozone disinfection system creates ozone and injects it into the pool water system at the pump. The ozone also kills the bacteria and germs, as well as actively breaks down non-living waste products in the pool water that can combine with chlorine, causing unhealthy by-products that can irritate the skin submerged

in the water and respiratory issues for exposures just above the water. Each of these devices greatly reduces the demand for chlorine and, when combined, can significantly reduce chlorine consumption, making it easier to safely maintain a very low level of chlorine in the pool.

A lot of these items are specific to all types of swimming pools, whether they are shotcrete, liner, cast-in-place, or any other method. However, properly placed shotcrete is the best product to withstand any of the negative effects that salt can have on the structure. Liner pools typically have more exposed metal pieces and cast-in-place pools have planned construction joints. Shotcrete pools are monolithic and the only metal portion is the embedded reinforcing bars. With a suitable concrete mixture design and proper nozzling technique, the opportunity for the chlorides in the salt water to penetrate to the reinforcement is substantially reduced. Cast-in-place pools have construction joints that have a higher chance of allowing the salt water to penetrate to the reinforcement and cause corrosion problems, especially if the waterstop is improperly placed or poorly encased. Epoxy-coated reinforcing bars can be used if there is concern regarding the salt water reaching the bars, but if not properly handled, breeches in the coated reinforcing bars in the field can actually cause more corrosion problems than uncoated reinforcing bars. Epoxy-coated reinforcement is not necessary when proper construction methods are used.

In summary, saltwater pools certainly have some comfort benefits for the user. However, the challenges in designing, building, and maintaining these systems need to be considered in the overall cost-effectiveness of the pools. Though saltwater pools do reduce the amount of chlorine needed for disinfection, alternative systems like UV and ozone can be just as (or even more) effective.



Mason Guarino started in the pool industry when he was 14, learning how to install reinforcing bar. Since then, he has worked on all phases of swimming pool construction. Guarino has been with South Shore Gunite Pools & Spas, Inc., full-time since graduating from the Wentworth Institute of Technology with his BS in construction management in 2009. Guarino currently serves on ASA's Board of Direction and is an ACI Certified Nozzleman.