





# Chlorine to Saline

## THE SAFETY & COST BENEFITS

by Steve Pearce

**Swimming pool sanitization depends on chlorine, but it doesn't depend on the use of bulk chlorine.**

Chlorine kills algae and bacteria in pool water by disinfection, and it chemically destroys chloramines and dirt. However, it's a highly dangerous, toxic chemical that can cause fires or discharges of dangerous gases if it's mishandled. Mishandling can occur, for example, when pool personnel—usually a lifeguard or member of the custodial staff—inadvertently mix chlorine with muriatic acid, which is used to balance the pH level of pool water. Improper storage can result in a chlorine gas discharge that could lead to shutting down a pool facility, and possibly an entire building, until remedial action is completed.

Further, when algae or chloramines reach unhealthy levels in pools, one of the remedies is to shut down the pool and super-chlorinate the water. This involves raising chlorine levels 5 to 10 times above normal. For indoor pools, special care must be taken to ventilate the space properly and prevent ill effects for anyone in the building. This can put a pool out of action for several days, resulting in economic consequences.

Clearly, keeping a pool properly sanitized safely and cost-effectively is a matter of chemistry and economics.

### Basic Pool-Water Chemistry

The chemistry part revolves around having the right amount of chlorine in the pool and making sure its pH is properly balanced. Typically, the chlorine should be 3 to 6 parts per million (PPM) of the pool water to ensure it kills bacteria and prevents algae growth. Combining chlorine and water creates hydrochloric acid, and that's what sanitizes the pool.

During use, however, the balance between acidity and alkalinity can be upset. Constant monitoring of pH levels is required to know

when to add other chemicals, such as muriatic acid. When chlorine in its concentrated form comes in contact with muriatic acid, this creates the possibility of forming a dangerous gas or causing a fire. While all pool personnel should be trained in properly handling both chemicals, some people forget their training or are prone to having an accident if they are rushing to do too many things in too short a time.

On-site safety issues associated with chlorine and muriatic acid can be eliminated by using salt to produce bleach to sanitize pools. In practical terms, pool operators know that liquid chlorine is commonly used in pools as a sanitizer, typically as sodium hypochlorite (NaOCl), which is the chemical equivalent of bleach. On-site batch chlorine generators produce that same end product using salt as their raw material instead of chlorine, and they add a few benefits.

Salt-generated chlorine should be pH-neutral, with generators having the ability to control the pH of the chlorine at a range of 7-8. This eliminates the need to add muriatic acid, and along with the elimination of chlorine, it eliminates the safety concerns.

### Safety and Cost Considerations

With salt replacing chlorine, there is no need to build and maintain separate storage facilities for that volatile chemical. Indeed, some municipalities are mandating a move away from chlorine because of the safety factor and the costs to overcome it, or they are mandating separate storage facilities built to local codes. Restrictions can be imposed on when chlorine deliveries can be made, the types of delivery vehicles used and the routes they must follow, all to protect buildings and public safety.

Additionally, required storage facilities will require periodic inspection, again based on local ordinances, and there will be costs for those inspections and any resulting repairs to a facility.

In the pool itself, if the chlorine level gets too high in the water, it could release enough gas to affect breathing, especially in poorly vented indoor pools. Allergic reactions are rare, but in addition to breathing difficulties, some swimmers can experience skin irritation, and chloramines can cause red eyes and a strong chlorine odor.

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The people who work at any pool that uses chlorine need to be mindful of myriad safety factors. Breathing chlorine gas can knock out a person or even cause death in extreme circumstances. Chlorine must be handled with appropriate personal protection equipment to avoid respiratory exposure or contact with the skin. Labels on chlorine containers advise to never mix chlorine with any other chemicals, and workers must be sure to use dedicated scoops. They must also be sure to close containers tightly after using them.

The cost of bulk chlorine in any form—liquid, tablet or granular—can vary widely depending on market conditions. The salt used to produce on-site chlorine has been stable for many years. For the past few years, on-site batch chlorine generators have been able to produce a gallon of bleach for about one-third the cost of chlorine. The cost saving becomes greater when you factor in the reduced costs to transport and store the salt.

Any pool manager considering a move to a saline-based, on-site batch chlorine generator should be aware that the cost of the equipment may be slightly higher, but that should be offset



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by the lower costs for the raw material and for transportation and storage. Units are sized based on the number of gallons of water they treat, and a unit can serve multiple pools as long as it can produce enough chlorine.

### Enhancing Sanitization

With pool water subject to increased bacteria and foul odors from chloramines caused by swimmers' sweat and urine, ultraviolet light (UV) systems provide a secondary treatment that can prevent excessive contaminate buildup from an overtaxed chlorination system. Because UV systems work only when water passes in front of them and not continuously

on the entire pool, they cannot be used as a stand-alone measure.

It should be noted that the most advanced UV systems use dual-output lamp technology to meet two needs at the same time. While UV is produced at 254nm, ozone is also produced at 185nm, adding to the sanitization of the water flowing through the chamber. This additional sanitizer helps reduce the amount of chlorine a pool requires. System sizes are based on the flow of gallons per minute past the light, and they can be slightly oversized if desired to ensure effective chloramine containment.

UV systems have been especially effective in competition pools, where the extra exertion

of swimmers can add a considerable burden to the sanitization system during a meet. And when combined with an onsite batch chlorine generator, there is no need to risk any safety problems from trying to add more chlorine during the height of competition and accidentally mixing chlorine and muriatic acid while trying to adjust the pH.

For colleges and universities that maintain pools both for athletic competition and recreational swimming, replacing bulk chlorine sanitization systems with salt-based systems—and adding UV—can pay quick dividends in stabilizing water quality, operational safety and hours of operation.



**ABOUT THE AUTHOR:** Steve Pearce is the Co-Founder and Group Executive Vice President of ChlorKing, Inc. and oversees all business activities. He is actively involved with NSF (National Sanitization Foundation), which is responsible for codes and policies directly related to the commercial swimming pool industry.

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