

# innovations

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Salt chlorination systems use seawater to eliminate chlorine and related safety issues



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# Salt chlorinators may be a way to deliver more to the bottom line with less. *By Steve Pearce, Group Executive Vice President, ChlorKing and Peter Coletto, President TGMG Inc.*



When cruise ships go to drydock for retrofits or maintenance work, it might be a good time to replace the chlorine sanitisation system with a salt chlorination system for on board recreational water facilities (RWF).

The technology uses the seawater lines already in place on ships to raise the salinity level of fresh water pools, jacuzzis, – and even on board water parks – to 3,000 to 5,000 parts per million (PPM), about 10% of the natural concentration in seawater, which is sufficient for sanitisation. When tied to a toroidal control system, the system measures the salinity and injects seawater to maintain levels required for sanitisation.

Salt chlorinators use electrolysis, a 200-year-old technology, to eliminate the need to purchase, store on board or handle chlorine or bromine. The process converts salt to free chlorine to sanitise the water. In modern commercial RFWs, small amounts of salt are added to the RWF water, which then passes over a series of electrically charged plates that produce the chlorine. On modern cruise ships, the raw material is the open sea.

In addition to sanitising recreational facilities, saline-based systems create softer, more natural-feeling water. Passengers using saline-sanitised facilities won't have to contend with a burning sensation in their eyes and on their skin that is common with chlorine, and the water will not leave the same sticky feeling on skin and bathing suits. If nothing else, that will free passengers from constantly having to wash out bathing suits – a real benefit for families.

## Salt chlorination process

In operation, saline water passes through a chlorine-generating cell in a self-contained unit, which can be installed where the old chlorination system was located. As low-voltage electricity is applied to the metal plates within the cell, the system produces chlorine, which is pumped back into the pool to kill bacteria, algae and germs. After

it kills contaminants, it reverts back to salt and is recycled through the chlorinator to begin the process again.

Pools fitted with saline chlorination systems require monitoring with the same equipment as used for chlorine-based systems. Occasionally, salt will have to be added to replace what is lost to splash-out, overflow and filter back-washing. Toroidal probes, which require no calibration or cleaning, enable the salt levels to be automatically maintained and controlled in a saline pool to ensure that the salt chlorination system operates as designed.

The toroidal system should clearly display the actual PPM of salt in the water and the water temperature in the pool. Low salt levels will cause a number of problems, including shorter lifespan of the cells and lower chlorine production.

Adding a saturated salt feeder and pump totally automates the addition of salt into the pool based on any pre-set level required. A complete salt chlorination system should have the ability to add fresh water to the pool and reduce toroidal conductivity sensor levels when desired or at a user selected level. An operator should also have the ability to pre-set parameters to use the system's reverse polarity to remove buildup from the plates. An additional benefit is that seawater adds calcium and alkalinity to the water naturally, reducing corrosion and the overall cost of operation.

Systems are sized according to their capacity to produce a specified number of pounds of chlorine per day. For example, the production range of two to 28 pounds per day will sanitise pools ranging in size from 2,500 to 1 mill gallons. However, they are all compact with a maximum footprint of 20 in x 20 in for the power supply and 13 in x 28 in for the cell housing. Newer systems are 50% smaller in size and 33% lighter in weight than previous models. Their compact size and lighter weight shorten installation time. Chief Engineers and their staff should be able to handle a system's installation.

Salt chlorination systems have fewer moving parts and maintenance requirements than traditional

chlorine systems and a smaller carbon footprint. They are engineered specifically for the harsh environment of commercial RWF systems and are capable of operating 24/7/365 and should last 10 years or more when properly maintained. Setting an optimum reverse-polarity operation schedule will handle the most important system maintenance needs, which should lead to lower lifecycle costs when compared with the replacement costs for units that are not designed for heavy-duty commercial use.

## Safer environment

Eliminating the need to buy, ship, store and handle chlorine – or even bromine – will eliminate many headaches and create a safer environment on board. Straight chlorine in any form is unstable, requiring properly ventilated storage and proper, cautious handling at all times. The potential for serious problems, including a fire at sea and hazardous gas, is prevalent when chlorine or bromine is accidentally mixed with acid. It doesn't take a big mistake to create a lethal situation at sea.

Chlorine gas has a pungent odour, much stronger than the odour experienced in swimming pools. According to the Centres for Disease Control and Prevention (CDC), when people are exposed to it, they can experience:

- Blurred vision
- Burning sensation in the nose, throat, and eyes
- Coughing
- Chest tightness
- Difficulty breathing or shortness of breath if high concentrations of chlorine gas are inhaled
- Nausea and vomiting
- Watery eyes
- Wheezing

Additional problems are associated with swimming pools. Chlorine is added to pool water from an enclosed location, which may not have ideal ventilation. Further, pools use acid to balance the pH in the water so that the chlorine can work effectively. In all too many cases, the work is done

by people who may not be properly trained in handling both chemicals. Any mishandling can result in the release of chlorine gas in an enclosed area, and effects can be exacerbated if ventilation is inadequate. In a worst-case scenario, mixing chlorine and acid will create a dangerous, noxious gas or cause a fire.

Safety problems have cost factors. Any incident at sea will carry passenger-safety risks and it will have a negative impact on a cruise line's brand. An accidental, unlawful discharge of chlorine as a hazardous material can result in fines and other penalties, depending on the jurisdiction in which the discharge occurs.

## Enhancing sanitisation

Ultraviolet (UV) light systems add a second level of protection against pathogens in the pool water. They also drastically reduce the level of chloramines, which can often overwhelm indoor pool areas. UV systems are an effective secondary treatment. When water being recirculated to the pool passes the systems, the lights are able to kill contaminants instantly.

Low-pressure amalgam, dual-lamp systems provide cost-effective protection for pools. Low-pressure amalgam systems require only 20-amp electrical service and target specific wave lengths. The 185 nm (nanometers) wavelength creates ozone, which oxidises pool water to provide required sanitisation with lower levels of chlorine, and the 254 nm wavelength sterilises pathogens, such as cryptosporidium. Crypto can force the shutdown of a pool, necessitating a shutdown for cleaning, super-chlorination and sometimes draining.

UV systems work with chlorine or saline-based sanitisation systems to extend the safety and cost-efficiencies of saline-based systems.

Tests of saline-based chlorination systems on 10 cruise ships have shown a saving of 20% - 25% on pool sanitisation expenses and an return on investment (ROI) of 18 months or sooner. With some 90% of ship passengers using RWFs, and with an increased emphasis on keeping passengers on the ship to increase revenue streams, there's an incentive to maximise the recreational water experience while cutting costs to protect margins.

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Compact ChlorKing Chlor SM salt chlorination systems for ships require minimal space. Maximum size for the power supply, shown here, is 20 in x 20 in.

Salt chlorination systems for sanitising on board recreational water facilities, including pools, jacuzzis and spas, can reduce operating expenses, enhance safety and avoid unlawful discharges of hazardous materials to water.



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