GUEST COLUMN

POOLS/AQUATICS

The Case of the Mystery Stain

Working With Salt Generator Pools

BY TERRY ARKO

Salt chlorine pools have become popular over the past few years. They provide great convenience. There's no hazardous chemicals on site, water is sanitized and oxidized automatically. There are little to no chloramines. Many users of salt generators claim softer-feeling water with less chemical odor and no dry or irritated skin.

Along with the report of these benefits, some have also reported strange phenomena as well. These include things like discolored water, strange stains throughout the pool that are hard to remove and prevent. Stains appearing in salt pools include:

- Black flecks on pool bottom
- Black staining on ladders and light rings
- Reoccurring stains and discoloration on light rings around steps or rails and discolored water.
- Purple haze and debris in pool water

These stains seem to be a mystery, however in salt pools with high TDS (total dissolved solids), they are due to a simple chemical reaction known as galvanic corrosion.

To understand this electrochemical reaction, a simple understanding of the technology of chlorine generators is needed.

Chlorine generators work by using a process known as electrolysis. In nature chlorine is found primarily in the chloride ion which is a component of salt found in the earth or the oceans. Electrolysis is the means of generating chemical products from their native state. A salt generator works by passing electricity through a solution of sodium chloride to produce chlorine as a disinfectant or sanitizer.

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The most popular chlorine generators are the in-line type. In these systems saltwater is circulated over electrochemical cells. The cells convert the sodium chloride to free available chlorine. The cells used in these systems are typically made of titanium. Though it may seem new, the technology of splitting molecules via electrolysis goes back all the way to the 1700s.

Galvanic corrosion occurs when dissimilar metals exist in a high-TDS solution such as a salt-generator pool. Some metals are nobler and more cathodic, meaning positive currents flow from these and they tend to steal electrons from the less noble anodic or negative metals. A Galvanic Corrosion Chart is used in industries that work with fluids and metals such as cooling towers. The Galvanic Corrosion Chart shows that the "anodic" or "less noble" metals at the negative end of the series such as magnesium, zinc and aluminium are more likely to corrode than those at the "cathodic" or "noble" end, which include

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There are three things needed in order for galvanic corrosion to occur:

1. Electrochemically dissimilar metals must be present.
2. These metals must be in electrical contact.
3. The metals must be exposed to an electrolyte (salt in solution).

In a swimming pool all three of these exist due to the high TDS from the salt content of the water. The electrochemical cells in most chlorine generators are made of titanium which is listed on the Galvanic Corrosion Chart as a nobler metal. Most pools contain some copper in the system as well in the heat exchanger or in any brass fittings or pipe that may be in the system. Copper is a less noble metal than titanium, and thus it corrodes as a result of the electrolysis in the high salt solution. This leaves black stains and debris in the pool. Copper is also rendered insoluble in the water. Copper in the water will appear as a green translucent color.

The simple solution to this problem is to find another less noble metal to use as a sacrificial anode that corrodes but doesn't cause staining. When differing metals are added to saltwater, one metal acts as a cathode. This is the nobler of the two. Titanium would be one example of a more cathodic or noble metal. The other metal may be more anodic or less noble. An example of this would be copper. Galvanic corrosion occurs because when these two metals are in saltwater with an electrical current, the weaker, less noble metal (copper) will corrode faster than normal. Also the stronger, more noble metal (titanium) will corrode much slower than normal.

It has been found in various marine industries that the addition of zinc in these types of systems prevents the corrosion of copper and stops the staining. Zinc is very low on the galvanic chart and is one of the most anodic metals found. In salt chlorine pools zinc can be added as a solid weight into the skimmer or attached in the circulation system. This slows or stops the corrosion of copper. If the water is discolored from copper, it is advised to use a metal removal product along with the zinc to remove the current discoloration and prevent reoccurrence. Most metal products on the market tend to be phosphate-based, and this too can cause problems in a salt chlorine generator. When selecting a metal product, use a phosphate-free product.

Another mystery in both salt generator and regular pools is the occurrence of a strange purple coloring and debris. This is due to high levels of cyanuric acid and insoluble copper in the water. If pH and alkalinity go low, then copper cyanurate is formed leaving a purple residue along the water line and around lights and steps. The solution here is to lower cyanuric acid down to 35ppm to 50ppm and adjust the alkalinity and pH upward. Also, the addition of zinc will help keep copper from corroding into the water.

These simple methods should help clear the mystery and remove the stains. **RM**

ABOUT THE AUTHOR

Terry Arko has over 30 years experience in the swimming pool and spa industry. Terry is both a Certified Pool Operator (CPO) and CPO Instructor through the National Swimming Pool Foundation (NSPF), and has served in many positions with the Association of Pool and Spa Professionals (APSP). He currently is the product specialist and Northwest territory sales representative for SeaKlear Pool and Spa Products. For more information, visit **www.seaklear.com**.

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