

The Question of Converting to a Chlorine Generator

By Dave Huxtable, President – Mursatt Chemicals

Chlorine generation is not new technology. It has been around for a long time. Chlorine generation was first produced commercially in 1890. Just recently has it become popular in Canada for swimming pools. It has been quite popular in Australia for swimming pools for many years.

This is how it works. Electric current is passed through two electrodes immersed in a solution of salt. Hydrogen gas bubbles and caustic soda are generated at the cathode (negative pole) and chlorine gas is generated from the anode (positive pole). This chlorine gas becomes the sanitizer.

The fact that chlorine generators are producing chlorine is why they are an approved sanitizer by the PMRA. (Pest Management Regulatory Agency, a division of Health Canada).

The chlorine generator is a closed self recharging system. Once you have followed the manufacturers recommendations to reach the appropriate salt level no more salt is required. The salt solution passes through the generator where the chlorine is produced. The chlorine enters the swimming pool where it reacts with bacteria, organics and sunlight. The chlorine is used up and the by-product of this is salt. The salt stays in solution and re-enters the generator where it is turned into chlorine again. It becomes a self supporting system. The only time you need to add more salt to the water is after you have discharged the swimming pool water or from splash out.

A chlorine generator is a viable sanitation option for swimming pools.

There is no perfect system for sanitizing swimming pools. All products and systems have pros and cons. When deciding which option is best for each swimming pool you must consider the unique aspects of that pool. All swimming pools are different. No two are the same. Some of these unique characteristics include volume of water, temperature, number of bathers, circulation system, automatic pool cleaner, surrounding vegetation, pets, pool construction and shape, wind and sunshine vs. shade.

Benefits of a Chlorine generator.

The main benefit of a chlorine generator is that it is constantly generating chlorine. This removes the human element (forgetting) so the pool is always sanitized. You no longer need to purchase a daily sanitizer (chlorine Sticks or Pucks). The Chlorine generator also replaces a weekly shock treatment. You may still require a periodic shock treatment (oxidation) after a heavy bather load or storm.

Other marketing benefit statements are not really benefits at all.

1. “Non chlorine system.” Many consumers are misinformed about a salt water pool. They feel that they are sanitizing with salt and avoiding having chlorine in the pool. We know this is not true. Chlorine generators are recognized sanitizers by the PRMA because they produce chlorine.
2. “It is better chlorine.” Free Available Chlorine (FAC) is the same regardless of the product it came from. The chlorine produced from chlorine generators is the same chlorine created from using chlorine Pucks, Sticks, Shock or Liquid chlorine.

3. "The water feels softer on my skin." Any perceived notion that the water is softer is a misinterpretation of the process. Consumers put salt into their water softeners to get soft water. They put salt in the swimming pool so they think they have soft water in the pool. The salt goes into a water softener as part of the process of removing Calcium Hardness from the water. Water with a lot of Calcium Hardness is called "hard water". Water with low or no Calcium Hardness is called soft water. Soft water feels nicer on the skin. There is no salt in your water once it has gone through a water softener. Salt in a swimming pool does not reduce the Calcium Hardness in the pool. The water in a chlorine generator pool is not softer.
4. "The water does not hurt my eyes." There are two reasons for this statement. The first is as the salt level in a pool increases and approaches 9,000 ppm it will feel nicer on your eyes. This is because the salinity of your eye is 9,000 ppm. The higher the salt level the more compatible the salinity. The salt level recommended for chlorine generators is from 1,500 ppm to 6,000 ppm depending on the manufacturer. The salinity of seawater is 35,000 ppm. The second reason that a chlorine generator pool may not irritate the eyes is the lack of combined chlorine. When the free available chlorine attacks ammonia (human waste voluntary and non voluntary) the by-product is combined chlorines. Combined chlorines have a heavy chlorine smell and irritate the eyes. You eliminate combined chlorines by shocking or superchlorinating the pool water. A chlorine generator is constantly superchlorinating the pool water so there is less chance of chloramines forming. There is less chance of irritated eyes. In the average backyard swimming pool combined chlorines are not a problem. Combined chlorines are a problem at an overused undersanitized commercial pool or hotel. A swimming pool that smells of chlorine and irritates the eyes is a dirty pool. Proper maintenance avoids this from ever happening.
5. "A salt pool is more environmentally friendly." This is not the case. As a closed system that generates chlorine on the spot and regenerates itself from the byproduct should be an environmental dream. The problem is disposal of the salt in the pool water. Regular maintenance, winter drawdown and periodic emptying of the pool creates quite an environmental problem. If you put salt on the ground it does not breakdown. It will still be there 100 years from now. If you put salt in our rivers and lakes there is no reversing the increase in salinity. The City of Toronto has banned the discharge of water containing salt to the storm sewer system. As of now you can pump it to your own property with no run off, the sanitary sewer system or have it taken away by a licensed waste hauler. Most properties are too small to absorb this amount of water and the salt in the water will kill any vegetation it comes in contact with. The sanitary does not treat the salt and it still goes into the lake. The cost of a licensed hauler for 100,000 litres of water containing salt is not practical. The city of Toronto is cutting back on the salt they use on roads due to its environmental impact. They will not allow swimming pools to exacerbate the problem. There is a \$50,000.00 fine in place for anyone breaking this dumping by-law. Other municipalities in Canada have and are adopting this by-law.
6. "The chlorine generated is pH neutral so there is less effect on water balance" If you add salt to the water for a chlorine generator you are creating an environment that requires greater attention to water balance. The salt increases the conductivity of the water. This means that current can pass more readily or quicker through water that contains more salt. The quicker that current passes the quicker we get corrosion or scaling happening if the water goes out of balance. We tell people if they have corrosive water you may corrode your heater in one to two years. If you have added salt to the water this could corrode in one to two months. This is coupled with the fact that chlorine generators are "not" pH neutral. They increase the pH as they produce chlorine. The pH in Chlorine generator pools has a constant upward pressure. The maintenance of water balance is more important in a swimming pool containing salt than a regular swimming pool.

7. "There is a cost saving" There is no cost savings in using a chlorine generator. You no longer need to purchase a daily sanitizer or shock treatment. You do need to purchase all other chemicals to keep the pool properly balanced and maintained. So you are comparing the cost of a new generator (\$1,500 to \$3,000) versus your current sanitation system only. Every four to five years you will need to replace the cell that generates the chlorine at a cost of \$700.00 to \$1,000.00.

There are other factors you should consider when determining if a chlorine generator is right for you.

Materials compatibility

Salt by itself is not corrosive. We can pour salt on our hand and it does not burn. It has a fairly neutral pH. When you add salt to water you produce a chloride ion. This chloride ion can be quite aggressive with certain materials.

Stainless Steel. Lower grades of stainless steel will suffer pitting corrosion in the presence of the chloride ion. This is why you will see pitting corrosion on some stainless steel pool ladders. This is also why it is not recommended that you use a chlorine generator if you have a stainless steel filter.

Aluminum will corrode rapidly from contact with the chloride ion. This is why you do not see aluminum eaves used anywhere near an ocean coast. Aluminum coping on a swimming pool that has added salt will pit and corrode very quickly.

Steel. The chloride ion will find its way through concrete to corrode the structural reinforced steel. This can be seen when you drive under the Gardiner Expressway in Toronto and you see the corroded exposed rebar and chunks of concrete that have fallen away. This is the same process that has taken out most of the concrete bridges in Montreal. You can slow this process down with corrosion treated rebar and concrete compaction but sooner or later the chloride ion will get to that steel.

Rocks and stone work.

You must select materials that are very hard with low moisture absorption rates. The swimming pool water that contains salt will penetrate into the rock. The water evaporates and the salt crystals are left behind. As these crystals accumulate they expand to the point that you will get pieces of rock popping off.

Galvanic corrosion is the passage of electric current between two metals that will cause one of the metals to corrode in order to protect the other. One metal will sacrifice itself to the other. This is why we would put magnesium sacrificial anodes in the old SK steel filter tanks. The magnesium anode would sacrifice itself (corrode) so that the steel filter did not. Metals are ranked on a galvanic series from the least noble (magnesium), those that will corrode the most, to the most noble (platinum), those that will corrode the least. In the swimming pool environment this can become quite significant. As we discussed earlier adding salt to the water increases the speed that electric current will flow through the water. The salt therefore will increase the rates of galvanic corrosion. This can be seen on a swimming pool ladder where the bolts of the ladder are a less noble metal than the ladder material. The bolts will corrode as they sacrifice themselves to the ladder. This type of corrosion can also be seen on light niches and stainless steel face plates. Galvanic corrosion is avoided or controlled by having the swimming pool properly bonded during construction. Bonding equalizes the electrical potential of all metals hooked up

to it so that no metal is less noble than another thus stopping the corrosion. Placing a sacrificial anode in a pool skimmer or hanging from a ladder will not protect any metal from galvanic corrosion.

Erosion is not corrosion but it may remove a corrosion film exposing fresh metal to corrode. Flow rates of 7 to 8 feet per second will erode copper piping. When we add salt to the swimming pool water we drop these flow rates down. Copper piping will erode at flow rates in excess of 2 to 3 feet per second with elevated salt levels. This is a concern for any heaters or heat exchangers with copper anywhere.

Evaporation and water features. Many swimming pools today are constructed with spill over spas, sheer decent waterfalls, vanishing edges and waterfalls over rock formations. As the water flows over these there is some evaporation. When the water evaporates any solids in the water are left to accumulate. When we add salt to the water we are increasing the solids in the water. We are increasing the amounts of solids left behind. These build ups are difficult to remove and detract from the look and appeal of the water feature.

Summary

Chlorine generators are an effective daily sanitizer. Before any consumer decides to purchase this system they should carefully consider the unique aspects of their swimming pool and its compatibility with salt. They must also consider how they are going to dispose of the water from their pool in an environmentally friendly way.