By Terry Arko

HASA Product Training Consultant

What's the right type of chlorine to use in the pools you service? Could it be based on cost? Or could it be convenience? When considering these questions, it is vital to also consider the by-products left behind from the primary type of chlorine used in the pool.

The Main Purpose for **Chlorine Use in Pools**

All types of chlorine are designed primarily for one purpose, to sanitize and keep the pool clean, clear and safe. The main types of chlorine available for swimming pools are sodium hypochlorite, also known as liquid chlorine, calcium hypochlorite (cal hypo), and Tri-chlor tablets.

All these types of chlorine are effective at producing hypochlorous acid or HOCl which is the killing agent of chlorine in pool water. As a sanitizer the prime purpose of chlorine is to inactivate and kill germs that can cause recreational water illness (RWI). Some RWI illnesses from improperly treated pool water can include: earaches, pinkeye and skin rashes. These are primarily known as non-enteric types of ill-



Terry Arko

safe and enjoyable for users. Pool water is reactive and so is any type of chlorine. As chlorine mixes with water reactions take place in the blink of an eye. No matter the type of chlorine that is added to water, trichlor, cal hypo or sodium hypochlorite, there is an instantaneous reaction. HOCl, is a very strong destroyer of invasive germs. In fact, HOCl is created in your immune system to fight off infection. The white blood cells in your body produce HOCl as needed to deal with any invasive germs that enter the body.

The HOCl form of chlorine in swimming pools destroys bacteria and algae by breaking through the cell membrane and disrupting cellular activity. HOCl is highly



nesses because they are based solely on contact with contaminated pool water. Enteric types of RWI's are based on contaminated water entering the body through swallowing. These RWI's can include: Cryptosporidium (crypto) Giardia and E. coli. The goal of chlorine is to keep the water

effective at inactivating most enteric or non-enteric RWI's. A percentage of the chlorine added to the pool converts to the HOCl and the rest converts to a hypochlorite ion or -OCl. Think of HOCl as a strong superhero and -OCl as its wimpy side-kick. There is not a lot of germ-killing



power in -OCl. When chlorine is added to the pool there will be both the HOCl superhero and the -OCl wimp. The ratio of Hypochlorous acid HOCl to hypochlorite ion -OCl is primarily controlled by the pH of the water. The lower the pH, the

higher the HOCl percentage, the more superhero you have. As the pH increases, the percentage HOCl decreases and the -OCL increases. At a higher pH you will have to rely on the wimpy side kick -OCl to fight algae and germs.

In order to keep the pool water, the cleanest and safest we obviously want to have as much HOCl as possible. But if too

much of your chlorine is present as -OCl, you will have little effect on germs and algae. The secret is balance.

The target pH of a pool is 7.5 and at that level you will have 50% of the superhero HOCl and 50% of the -OC1. 50% of the HOCl is better than say 30% which is what you would have if the pH was at 8.

Continued on page 10



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Continued from page 9

By-Products of Chlorine Types Along with producing the germ fighting sanitizer in water chlorine also leaves a by-product in the pool.

The by-product or villain is dependent on the type of chlorine used. What by products are left from the chlorine that you use? Continued on page 16

SANITIZER	CAL HYPO 65%	TRI-CHLOR 89%	SODIUM HYPOCHLORITE 12.5%
By Product in pool water	Calcium Hydroxide	Cyanuric Acid	Sodium Chloride
pH of Chlorine	11.8	2.8	13.0
Increased Hardness	Yes	No	No
Increased CYA	No	Yes	No
Lowers pH and Alkalinity	No	Yes	No
Scale formation	Yes	No	No

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One of the benefits of membership in IPSSA is a \$50,000 life insurance policy. All you need to do is complete a Beneficiary Designation Form.

But, what happens if you haven't declared a beneficiary? You will lose control of who receives your benefits. The payment of funds will be delayed and, if the benefits are part of a probate, it could take a year or more for your loved ones to get those funds.

The good news is that, when your Beneficiary Designation Form is on file at the IPSSA financial office, the check for your life insurance benefit is issued as soon as the death certificate is received by the insurance company.

Call the financial office (888-391-6012) if you are not sure whether or not your Beneficiary Designation Form has been filed. If not, or if you want to change your beneficiary, you can download the form from the "Members Only" page of www.ipssa.com.

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Continued from page 10

Cal Hypo Cal Hypo is made by mixing chlorine gas with caustic limestone also known as calcium hydroxide. The by -product left in the pool after the chlorine is used is calcium hydroxide. 1.25 lbs. of 65% cal hypo will increase the calcium hardness by 8 ppm in 10,000 gallons. Calcium levels can build up and contribute to hardness and total dissolved solids in the water. When high levels of calcium combine with carbon it creates calcium carbon-

ate scale which can be damaging to surfaces and equipment. The addition of cal hypo to a pool with high TDS can lead to very cloudy water. This can be a problem especially in regulated commercial pools. To prevent the cloudiness and scale formation extra amounts of acid and scale prevention products will be needed. Also, partial draining will be required to keep TDS and hardness levels balanced correctly. This also contributes to unsightly and potentially costly and timeconsuming tile build up. **Tri-Chlor**

Tri-chlor tablets are a stabilized form of chlorine that contains cyanuric acid (CYA). The tablets are known as iso-cyanurates and are made by combining sodium hydroxide with cyanuric acid and chlorine gas. Every 8 oz. trichlor tablet contains 54% of CYA. This is the by product which is left behind in pool water. For every 10 ppm of chlorine from trichlor there will be 6 ppm

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Keeping New Employees Motivated

Continued from page 7

that will keep them happy and productive.

If you want new employees to remain on the job for a good long time, then be proactive in creating an environment that will upcoming conferences. At the 2019 International Pool | Spa | Patio Expo, taking place November 2-7 in New Orleans, attendees can pursue the following certifications: CMS, CHTT,



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serve their needs and interests. Making those sorts of adjustments is just good management.

For additional assistance training service techs, PHTA has several certification programs available, including designations for CSP (Certified Pool & Spa Professional), CST (Certified Pool & Spa Service Technician), CMS (Certified Pool & Spa Maintenance Specialist), CHTT Certified Pool & Spa Hot Tub Technician, and AST (Advanced Service Technician).

PHTA will also offer on-site training for service techs at

CST, and AST.

Sessions providing certifications in CMS and CST will be on the schedule at the Southwest Pool & Spa Show in Houston, January 22-25, 2020.

And courses providing certifications in CSM, CST, and CHTT will take place at the Pool and Spa Show in Atlantic City, taking place January 28-30, 2020.

There are also leadership opportunities available on the PHTA Service Council.

To learn more about any of these opportunities, visit PHTA.org.

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of CYA left. It is important to note that like calcium, CYA never leaves the pool. The only way to decrease high levels of CYA is by draining or using costly removers. High levels of CYA will also require more chlorine and higher parts per million in order to maintain an effective killing rate of bacteria and prevention of algae. So, this by product can really cause challenges and more expense to keep the pool clean and clear. Some other side effects of tri-chlor and CYA are that the tablets are very acidic with a pH of between 2.8 and 3.5. Because of the very low pH trichlor WILL lower both the pH and total alkalinity. Soda ash and or sodium bicarbonate will be needed to offset this effect. Also, at CYA levels of 60 ppm or above there will be an interference in the total alkalinity test. False results that are a third higher can result when testing total alkalinity in the presence of high CYA. To obtain a true total alkalinity reading the ppm of the CYA must be divided by three and then subtracted from the tested total alka-

linity reading as follows:

CYA test = 60 ppm / 3 = 20 ppm

Total alkalinity test = 60 ppm- 20 ppm = 40 ppm True alkalinity reading.

Based on this corrosive water may be present. If the service tech does not know the effect from high CYA on the total alkalinity they may not be aware of the damaging water conditions. **Sodium Hypochlorite**

(Liquid)

Sodium hypochlorite is made by combining pure chlorine liq-

uid with sodium hydroxide. The byproduct of liquid chlorine is simply sodium chloride or salt. In other words, liquid chlorine starts from salt and returns to salt. The only effect from this will be an increase of mineral dissolved solids. However, it should be noted that there is very little detriment from the increase of chlorides in pool water as compared to calcium or CYA. In the case of a salt water generator pool liquid chlorine's by product can be very helpful for shocking and replenishing salt levels. With liquid there are no damaging, toxic byproducts that complicate water maintenance. Liquid chlorine is alkaline so the total alkalinity levels should be kept at 80-90 ppm. The pH of liquid chlorine is 13 and this can lead to an increase of the pH. However, the reaction of disinfection and UV sunlight will convert HOCl to hydrochloric acid HCl and there will be a net zero effect on pH over all. So, before throwing the acid in keep in mind it may not take as much as has been suspected.

Test Source Water

When choosing the main *Continued on page 21*



Saltwater Pool Troubleshooting

Continued from page 6

may not be able to maintain a free chlorine residual. Common causes for this issue are not running the cell long enough, having an undersized cell, scale accumulation on the plates of the cell, problems with water balance, or the life condition of the cell. Because the electrolytic cell only generates chlorine while the pump is running, ensuring the pump is running for enough hours a day is critical for chlorine generation. Another issue that can lead to low chlorine residual is the use of a cell that is too small for the pool. If a cell is undersized, it may not be able to produce enough chlorine to maintain a 1-4 ppm chlorine residual, even with ample pump run time and setting the cell for maximum output.

Scale deposits can also impact how well an electrolytic cell produces chlorine. As the pH of a saltwater pool increases, scale is more likely to occur. Once scale accumulation is substantial, scale build up will reduce the ability of the cell plates to pass electricity through them. Electricity, through electrolysis, is the key to chlorine production. The more scale that builds up on a cell, the less chlorine is produced.

There are two types of calcium scale that can form: calcium carbonate and calcium phosphate. The formation of each scale is influenced by many different factors. Calcium carbonate scale is the most common type of scale formed within any pool environment and makes up the majority of scale found on chlorine generator cell plates. Calcium carbonate scale formation is influenced by three main factors: water temperature, pH, and concentration.

Different water balance parameters lead to the formation of calcium phosphate. Calcium phosphate scale is not driven by high pH, so the impact of rising pH inside the cell does drive the formation of this type of scale. However, higher concentrations of both calcium and phosphate in the pool will cause increased risk of scale formation. It is imperative to use a scale inhibitor product to help prevent scale in chlorine generator pools. In addition, some manufacturers warn against high phosphate levels to prevent the small amount of calcium phosphate scale that may form in the chlorine generator. Adding a phosphate remover into the pool maintenance routine will help reduce problem causing phosphate-based scale and improve cell efficiency. In addition to cell run time, size, and scaling, there are other parameters that can affect the production of chlorine in a saltwater pool. Improper salt levels can cause damage to the cell, as well as inhibit the production of chlorine. People often make the mistake of thinking that when chlorine levels are low, simply adding more salt will fix the issue. Usually that is false. Many pools with the correct salt level have low chlorine residuals because of the other issues we have previously discussed.

Finally, the age of the cell also will impact chlorine residuals. The electrolytic plates in the cell are coated with a metal call ruthenium.

This metal is necessary for electrolysis, and subsequently necessary for generating chlorine. As the coating wears away with age, the ability of a cell to generate chlorine also decreases. Often a lack of chlorine is due to an aged cell that should be replaced.

One of the most common issues seen in saltwater pools is algae. Saltwater pools are susceptible to algae just like a traditional chlorine pool. Maintaining a proper free chlorine residual and pH balance is key because many saltwater pool owners choose not to add a preventative algicide as part of their routine maintenance plan. High pH reduces the effectiveness of chlorine and provides a carbon dioxide rich environment which can lead to the increased probability of algae growth.

In addition, all of the previous causes of low chlorine residual discussed can contribute to an increased chance of getting an algae bloom in a saltwater pool. Most algicides are compatible with saltwater pools and are a great product to add to any saltwater maintenance routine or when troubleshooting algae problems.

To close, here are some final thoughts on saltwater pool troubleshooting. Saltwater pools provide a premium experience to pool owners. However, some maintenance must occur to prevent problems from occurring. These problems are the same issues that are often found in traditional chlorine pools and are resolved by similar activities. There are some issues that are specific to saltwater pools and require specific products or actions to resolve them. Ultimately, providing clear and beautiful pool water is the goal for any pool owner. Saltwater pool owners are no different.



About the author:

Alicia Stephens is the Education and Training Manager for Biolab, Inc. In her 19 years with Biolab, Alicia has focused primarily on Education, Training, and Development, as well as technical support and new product research and integration. Currently, Alicia supports all education and training initiatives for the Biolab Pro Dealer division.

IPSSAN0519

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chlorine sanitizer for service pools it is important to know if the source water is soft or hard. Naturally soft water is low in minerals and has a lower total alkalinity, pH and hardness. In soft water areas liquid chlorine or cal hypo may be preferred to help add a mineral increase to the water. If cal-hypo is used it is important to keep track of the calcium hardness as it will increase over time from the use of the cal hypo and from evaporation during summer months. In areas of hard water tri-chlor may be considered due to its lower pH. Where tri-chlor is the primary sanitizer it will be vital to test CYA levels at least monthly and to monitor CYA levels to between 30-50 ppm. If CYA levels are not managed and exceed past 50 ppm maintenance levels of free available chlorine will need to be increased. The increase in chlorine is needed to effectively sanitize and prevent the growth of algae. Expert research has shown that it takes a free available chlorine to CYA ratio of 7.5% To determine the correct ppm of free chlorine needed to effectively kill germs and prevent algae multiply the CYA level by 7.5%.

Draining and dilution is the most effective way to manage high CYA levels. If draining is not an option, it may be recommended to switch to liquid chlorine when the CYA level reaches 50 ppm. The use of liquid as a primary sanitizer will not contribute any additional CYA to the pool. There are liquid chlorine dispensing options to use to support daily sanitization. When draining becomes an option and CYA can be lowered *Example: CYA of 50 ppm x 7.5\% = 3.75 ppm of free chlorine needed to ensure proper disinfection of water. See chart below.*

The Effects of CYA on Free Available Chlorine

1 Conserve	079	1.2
15ppm	95%	1.2 ppm
30ppm	75%	2.25 ppm
50ppm	30%	3.75 ppm
75ppm	15%	5.6 ppm
L00ppm	7.5%	7.5 ppm

quality.

30 Years of Experience 30 Years in Business

water and understanding the effect

of various chlorine by products

can be very helpful to the pool

tech to help ensure chlorine effec-

tiveness, cost per use and water

Peter Haverlation

Continued from page 1

take a summer vacation. Their discussion developed into a "vacation plan", which permitted members to take one- or two-week vacations and translated into being able to spend more time with their families. This eventually evolved to what is known today as "sick route coverage", which is the route coverage you rely on today during illness or injury - members covering routes for their fellow members within their chapter's borders, usually at no cost to the ill member.

The IPSA grew, with additional chapters starting up in both Southern and Northern CA. As Peter explained it, in 1981 the organization split into two groups (IPSA. AND CAL-IPSA) because of a rift among the board.

In 1986, a reunification committee was formed, and Peter served as a member. The goal of the committee was to find ways to better serve the pool service technician. The outcome from those discussions in February 1988, after 2 years of hard work, was the establishment of the INDEPEND-ENT POOL AND SPA SERVICE ASSOCIATION (IPSSA).

When IPSSA formed, there was an immediate recognition of strength in numbers. Manufacturers started taking notice of IPSSA and its members and began offering education to the pool service industry. IPSSA members began taking courses through the various manufacturing companies better their industry and to helping each other. By focusing on professionalism and learning how to better serve their customers, pool service technicians shed their image as just guys wearing flip flops and a tank tops.

Peter explained that one of the foundations of IPSSA is and always has been comradery by coming to chapter meetings. He quickly learned that chapter meetings were one of best ways to talk about things that happened out in the field and learn from peers. Also, Sick route coverage has always been a cornerstone of IPSSA and the biggest asset, helping thousands of members' families keep food on the table and a roof over their head. All these benefits happen because of the simple act coming together once a month to talk about their experiences out in the field and, maybe, pick up a tidbit on how to handle situations or repair equipment. It was the fact that they dedicated time to talk freely among each other. I asked Peter what he thought about IPSSA today and whether he considered it based on the same foundation? He answered by saying that IPSSA has somewhat evolved. He feels that members/pool service technicians are better educated, but that personal assistance and advice from other members in times of trouble is what separates IPSSA from all the other service groups. Years ago, equipment was not as sophisticated as it is today. He went on to further state that although today pool technicians can access YouTube to learn how to repair something, there is still a huge benefit to peerto-peer interaction and the perspective you get from peer-to-peer interaction.

Peter feels he evolved over time, just like IPSSA. When Peter first started in the business, he remembers that he used a paper clip to diagnose a heater. Now, he diagnoses with meters, which requires a lot of continuing education to keep up with continually evolving equipment and manufacturer updates. Peter believes in education so much that he teaches at the Western Pool & Spa Show.

The class Peter taught was, "There is more to know than pushing a pole".

Peter also serves as the president of the Western Pool and Spa Show and officer positions over his 40 plus years with IPSSA. He also expects that service techs need to stay current about the equipment they install or repair. The main benefits of training will help decrease your repair time and ultimately help a tech make more money.

So, what have we learned by speaking to Peter? Well, we still think of sick route coverage as the cornerstone of IPSSA; we still have times when we don't agree with the BORD; and comradery and peer-to-peer interaction are still very important to everyone, no matter their age or experience in business.





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