SANITIZER SYSTEMS FOR AQUATIC FACILITIES

The purpose of a sanitizer for swimming pools/spas is the destruction of pathogenic bacteria through disinfecting of the water.

Gas Chlorine - Cl_2

Elemental chlorine is 100% pure, not a compound, and available in pressurized tanks/cylinders. When this product is entranced in water two products are quickly produced, Hypochlorous Acid (HOCl) and Hydrochloric Acid (Muriatic Acid), the latter causing a very low pH environment. Gas chlorine is drawn under vacuum into the return water stream where it is mixed with the filtered water. Gas chlorine has lost favour due to the source water containing lower levels of total alkalinity/calcium hardness and accidental discharges. Managing and administering gas chlorine is a serious business and should be handled by qualified trained personnel only. Since gas chlorine is heavier than atmosphere it must be stored above ground level, in a separate room with a low level exhaust ventilation system. Gas chlorine is an inorganic and therefore dissipates rapidly on outdoor pool applications, unless utilized with cyanuric acid (stabilizer). Gas chlorine is still the most cost-effective sanitizer and is still in use today.

Sodium Hypochlorite – (Liquid Chlorine)

Liquid chlorine is a compound of gas chlorine, water and caustic soda to produce a product with 12 – 15 % A.C.C. (available chlorine content when compared to gas chlorine). A yellow liquid with a very high pH value neighboring 13. Sodium hypochlorite is easier to handle and injected into the filtered return water utilizing a chemical feed pump. Whether in bulk/carboys liquid chlorine looses its strength from the moment it's manufactured and can release up to 25% of it strength in one month, even under proper storage. It is an effective and inexpensive form of chlorine. This product is an inorganic requires cyanuric acid (stabilizer) for outdoor applications.

Calcium Hypochlorite

Calcium hypochlorite is a compound of chlorine, calcium and other inert products, with a 65 % A.C.C. This product has a high pH value of 12 in a 1% in a water solution. In the past calcium hypochlorite was shunned as a daily sanitizer because it was perceived to increase the calcium level too high. In recent years with the lower levels of calcium in source water, calcium hypochlorite has gained popularity. Granular calcium hypochlorite can be mixed in a slurry feed system and injected by a chemical feed pump into the filtered return water. Tablet/puck forms of calcium hypochlorite can incorporate the principal of spray technology. Water sprays on to the grids of the briquette tank making contact with the calcium hypochlorite tablets. The tablets will be in contact with the water for a brief period of time creating a chlorinated solution, which will fall into the discharge tank. The chlorinated solution is then drawn by the vacuum from the discharge tank and introduced into the recirculation system. This increased level of calcium in pool water has reduced the amount of re-grouting between tile, reduced staining, and repairs to marcite finishes. The increased calcium level in spa water prohibits the formation of surface foam. Calcium hypochlorite is a very stable product with predictable results.

Lithium Hypochlorite

Lithium hypochlorite is a compound of chlorine, lithium and other inert products, with a 35 % A.C.C. This granular product has an elevated pH level of 10.7 in a 1% water solution. Lithium hypochlorite is popular because of its' solubility and safety (does not support combustion, making it a safer product in storage). This product is also an inorganic and requires the addition of cyanuric acid (stabilizer) in outdoor applications. Lithium hypochlorite can be mixed in a slurry feed system and injected into the filtered return water via a chemical feed pump. The operational costs are higher than gas chlorine, sodium hypochlorite and calcium hypochlorite.

Stabilized Chlorine

These compound chlorines are primarily for outdoor water applications. Both products have a portion of stabilizer added to chlorine to inhibit loss to U.V. and requires the addition of cyanuric acid (stabilizer) initially for outdoor applications. The stabilized granular has a pH value of 6 in solution and can be mixed in a slurry feed system and with a chemical feed pump injected into the filtered return water. It can also be added through a dry hopper feed system where it falls into an eductor, mixed with water and drawn through a vacuum into the filtered return water. The stabilized pucks/tablets has a pH value of 2.9 in a 1% solution and can be placed in a sealed chemical feeder where a portion of the filtered return water is diverted into the chamber for mixing, then pressurized back into the return water line.

Bromine

Bromine for swimming pools/spa is an organic compound available in either tablets or granular form. Bromine on outdoor applications cannot be protected from the destruction of ultraviolet (UV) with the use of stabilizers. This product provides a low pH value of 4.0 – 4.5 in a 1% water solution. Unlike chlorine based products, bromine can provide sanitizing capabilities through a wider range of pH values. Bromide salts require the presence of another oxidizer to release the active sanitizer and can be added to a body of water as a "bank" of salts. The tablet formula of bromine includes the "activator" to be part of the compound and released into the water.

Ozone

Ozone is one of the most powerful oxidizers available for water applications. There are two methods of producing ozone, corona discharge and ultraviolet. Corona discharge generates ozone by exposing dry pressurized air to high voltage electricity and then generally introduced into a contact tank, mixing with the pool water. This has the greatest output production, but also the highest costs. The second method is Ultra violet, whereby air is passed a chamber where it is exposed to the ultra violet light tube. The ozone is then drawn into the filtered water return, usually by a venturi action where it mixes by agitation.

Ionization

Ion generators comprise the introduction of two metals through an electrical current. Copper ions are released which kills/inhibits algae growth and silver ions provide the disinfecting levels. These systems still require levels of sanitizers to be used in commercial applications.

Chlorine Generators

Chlorine generators require the use of salt and through electrolysis provide a chlorine product. There are two methods, one is using the pool as a chemical solution tank, whereby the water is "banked" with salt and as it passes through the chamber electricity converts the solution into chlorine. The newer systems incorporate a brine tank where salt and water is mixed and exposed to electricity, then the chlorine produced is drawn into the filtered return water.

Bromine/Ozone Systems

This is a combination system whereby the "spent" bromine salt is regenerated by way of ozone back into active bromine therefore reducing the operational costs as well as removing other contaminants.

Which is the best system for your pool?

All these systems will provide levels of sanitizer for the destruction of pathogenic bacteria. There are a number of factors involving the decision of a sanitizer for an aquatic facility.

Consideration for the source water you are filling with. You should know the values of total alkalinity, pH and calcium hardness since this is the same water you will be adding continuously to your facility. What effects will the sanitizers have on these levels and what other chemicals will be required to compensate for these differences?

Operational costs, which includes the purchase price of the chemical, transportation costs, storage & handling costs and the cost of other balancing chemicals to offset the effects from the sanitizer. Calculate all of the costs involved to provide to the same benefits for comparisons.

Safety is a large consideration given the fact that your employees will be involved in the refilling process, storage and handling. Will your personnel require specialized training for the chemicals you prefer?

Ease of application of the desired product for your facility. Do you need large or expensive equipment for the addition of this chemical? What maintenance is required for this equipment and what is the life expectancy and replacement cost of this?

Since every product you add to a pool/spa water will have a desired reaction, consider the other counteractions that will take place. Such as scaling heaters, metal stains on surfaces, extreme foaming problems, deteriorating paint finishes, loss of grout between tiles and even the long term effects on the building structure and it's components. Nothing is perfect but if you do your homework, you will keep you waters sparkling, customers delighted and management will be very pleased with the operational cost savings.