Cyanuric Acid Removal - Chlorine

onBalance – Que Hales, Doug Latta and Kim Skinner

The major loss of chlorine in outdoor swimming pools is due to the breakdown by ultraviolet sunlight, with subsequent off-gassing. Cyanuric acid is used in these pools because of its ability to shield chlorine from this photolysis. This benefit may be offset by a slight but measurable decrease in the rate of algacidal and antimicrobial activity, and a downward shift in the calcium carbonate saturation index. Historically excess (>100ppm) cyanuric acid concentrations have been addressed by dilution (draining part or all of the water from the pool and replacing it with fresh water). There is now a need for more conservation-conscious alternatives that do not involve the water loss associated with draining. This series of papers presents our evaluation of some of these methods.

As used in manufacturing processes that require removing cyanuric acid from water, this hyperchlorination method was described in 2001 in the Journal of the Swimming Pool and Spa Industry by John Wojtowiz of Chemcon. It is based on the heterocyclic amine ring structure of cyanuric acid/cyanurate. This organic structure is oxidizable. The primary oxidation byproducts when using hypochlorite include nitrogen gas (N 2 , which offgasses), carbon dioxide gas (CO 2 , some of which offgasses and some which forms carbonic acid in solution), as well as some nitrates, chloride and water. Here is what onBalance tried:

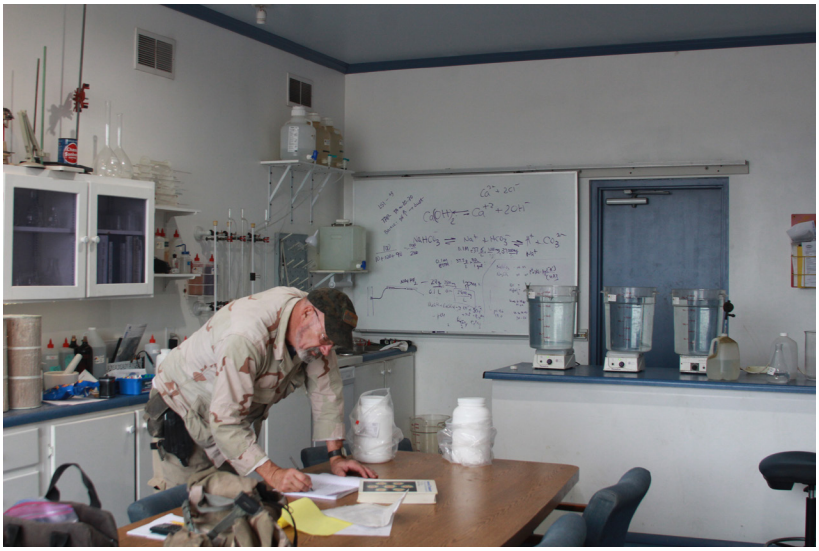
1. Determine cyanuric acid concentration.
2. Calculate dose by using the formula:
   ($Volume_{gal}$ / 30,000) x (8x excess CyA) = Quarts 10.3% (pool strength) sodium hypochlorite to add.
3. Add the calculated dose and blend it thoroughly into the pool water. This may be achieved by brushing, circulation, etc.
4. Adjust the pH to 9-10 using sodium carbonate (soda ash).
5. Wait (Allow the reaction to proceed. May be hours to days.)
6. Re-test the cyanuric acid in the pool until the target concentration has been reached.

Points of interest:

- When onBalance evaluated this method in our lab, in the onBalance demo pools and in residential swimming pools in our preliminary investigations we were able to achieve as much as 90% reductions in CyA after the requisite reaction/contact time (as measured by standard turbidity test).
- The actual concentration of chlorine is a variable. Increasing amounts of chlorine over longer periods result in greater CyA reductions. The target is 8 times more chlorine than cyanuric acid.
- In most cases the target reduction should be to achieve the “ideal range” of 20-30ppm CyA concentration in the pool.

Strengths: Simplicity, economy, no need to filter, vac, etc.
Weaknesses: It takes a lot of chlorine. For example, with a standard 15,000-gallon pool and a cyanuric acid level of 100, it would take about 60 gallons of liquid chlorine to bring the cyanuric acid down to 40 ppm. It requires more time than the other methods. There is the potential to bleach organic components in the pool and oxidize heavy metals. Care should be taken in colored pools, where the plaster pigments may be organic or when the pool water contains appreciable amounts of copper or iron that could be precipitated.

Hyperchlorination Using Bleach - Residential Pool



Hyperchlorination Using Bleach - Lab