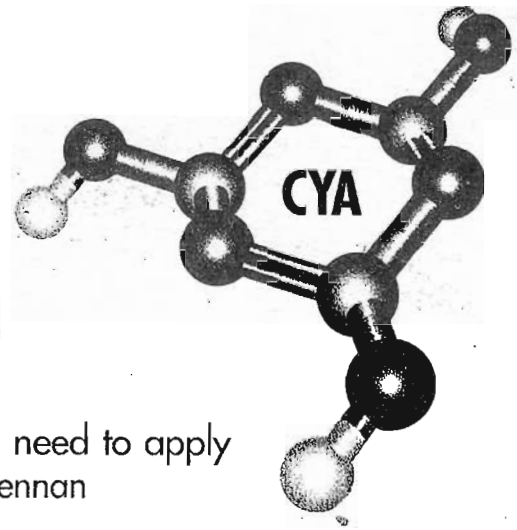
The Correct Approach



If you use cyanuric acid to stabilize pools and spas, you need to apply a correction factor. Here's how it works. | by James P. Brennan

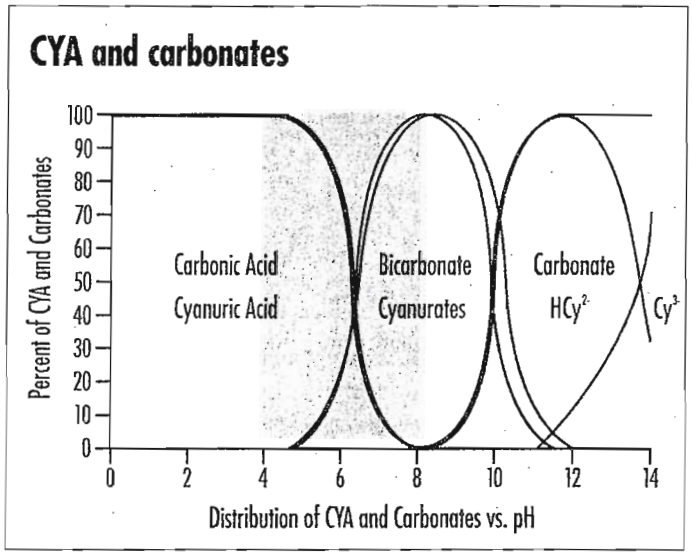
Most operators know that total alkalinity tests are a critical measure of water's ability to resist changes in pH and stay balanced. Maintaining proper alkalinity also prevents corrosion. But if you use cyanuric acid or certain types of sanitizers, you may not be getting an accurate alkalinity reading — unless you apply a correction factor.

Stabilized pools and spas use CYA as a chlorine stabilizer (so-called conditioner) to minimize the loss of free chlorine due to the action of the sun's ultraviolet rays. In these pools, cyanurates are frequently present in high concentration, along with carbonates and bicarbonates. The typical TA test kit, however, measures the presence of all dissolved materials more alkaline than approximately pH 4.5 and does not distinguish cyanurates from carbonates/bicarbonates.

That gap can interfere with measurement of the actual carbonate alkalinity necessary for establishing the correct calcium saturation index, or CSI — a pool's first line of defense against corrosion, etching and scaling.

Getting an accurate reading is further complicated when chlorinated isocyanurates (trichloroisocyanuric acid or dichloroisocyanurate) are used to sanitize pool and spa water. Besides adding free available chlorine, these sanitizers also contribute CYA with each application. And the higher the pH, the more cyanurate is produced, further upping the "total alkalinity."

Because the alkalinity component of the CSI is based solely on carbonate alkalinity and TA testing cannot distinguish cyanurates from carbonates/bicarbonates, calculating the index in the presence of high cyanurates will produce erroneous results.



MIRROR IMAGE This chart shows the similarity in buffering between CYA and carbonates, especially in the range from pH 4-8.

Fortunately, a simple factor can be applied to correct the total alkalinity results for the effect of cyanuric acid and provide a good indicator of the actual carbonate alkalinity. The factor was first developed by John Wojtowicz who is now a consulting chemist for Chemcon in Goodyear, Ariz.

It works like this: Simply measure the amount of stabilizer in the water and subtract one-third of the CYA measurement from the TA test kit reading. The resulting total approximates the true carbonate/bicarbonate alkalinity in the water. However, there are a few caveats. The factor of one-third only gives acceptable accuracy if the pH is between 7.2 and 7.8. Also, if the cyanuric acid level is over 90 ppm, it's necessary to use a two- or four-fold dilution to increase the accuracy of the test.

Here are a few examples: Let's say the stabilizer measurement was 75 ppm and the total alkalinity was 80 ppm; then the corrected value of the alkalinity is 55 ppm. Because:

$$TA - \tfrac{1}{3}\ CYA = Actual\ TA,$$

we get

$$80ppm - 75ppm/3 = 55ppm.$$

In this example, the alkalinity as first measured was within allowable limits. But after the value is corrected for the interference of cyanuric acid, the corrected TA now is too low. The water is not balanced and is less able to protect the pool or spa surfaces from pitting, etching and corrosion.

Remember, every time stabilized chlorine is added, some cyanuric acid is also added to the water. Over time, as the CYA level continues to rise, the overall impact on alkalinity increases. Because the only means of lowering the cyanuric acid level is to replace water, a point could be reached where the above correction factor approaches or equals the total alkalinity and dilution must be accomplished. This means that the water's carbonate alkalinity, one of the two major components for proper saturation, could be zero.

For example, if the TA were still 80 ppm but the CYA increased to 240 ppm then, using the correction:

$$TA - 1/3\ CYA = Actual\ TA,$$

now we get:

$$80ppm - 240ppm/3 = 0ppm.$$

Balanced water is essential to bather comfort and water clarity. It is also the key to longer-lasting pool and spa surfaces and equipment. Operators need to test and control pH, total alkalinity and hardness to maintain balanced water — and adjust for conditions that interfere with accurate measurements. AI