PREVENTING FINISH DETERIORATION
TESTING FOR CYANURIC ACID

DEFINING CYANURIC ACID

Cyanuric acid (CYA) is NOT a chlorine – it has no sanitation properties. Cyanuric acid protects any type of chlorine from UV (sunlight) destruction. Cyanuric acid is referred to as "stabilizer" or "conditioner" so there are three names for the same product. When cyanuric acid is present in ideal ranges, the chlorine will remain effective 3 to 10 times longer.[1]

DEFINING CHLORINES

There are several different types of chlorine products used to sanitize swimming pools. The short list includes the following:

CHEMICAL NAME	CASUAL TERMINOLOGY
• Sodium hypochlorite	Liquid chlorine
• Calcium hypochlorite	Cal hypo
• Sodium dichloroisocyanurate	Di-chlor
• Trichloroisocyanurate	Tri-chlor; 3-inch tablets or sticks

Please notice the last two highlighted chlorines. ***Di-chlor and Tri-chlor have cyanuric acid (stabilizer/conditioner) added to the chlorine product.*** There is NO cyanuric acid in liquid chlorine or cal hypo.

When a stabilized chlorine product is used in a swimming pool, the cyanuric acid level increases. One 7-ounce tri-chlor tablet is approximately 55% cyanuric acid, so the cyanuric acid increase per pound in a 10,000 gallon pool will be 7 ppm.[2]

The percentage of stabilizer in granular di-chlor is between 50 – 58 %. The increase of cyanuric acid per pound in 10,000 gallons is between 6 – 7 ppm.[2] If 3-inch tablets are going to be used, it would be best to use a chlorine product such as cal hypo or liquid chlorine to shock, as there is no cyanuric acid in those products. When a freshly filled pool is being adjusted for swimming, cyanuric acid manufacturers suggest raising the CYA to 30 – 50 ppm. In a southern climate on a pool that will be using 3-inch tablets, the cyanuric acid level should be adjusted to 25 – 30 ppm. This will slow the rise in the cyanuric acid level in the water when 3-inch tablets are being used.

IN-LINE STACK CHLORINE FEEDERS

The convenience of dropping tablets in a tube for sanitation is popular but what must be understood is that this is a method to allow a continuous feed of chlorine into a pool when the pump is running. These feeders were not meant to be the only means of sanitation to the pool. The warmer the water, the faster the tablets will dissolve and often the chlorine tablet will not last the whole week if the adjustment knob is set on the highest setting.

Sanitation is to be done primarily by testing and shocking the pool with liquid or granular chlorine to oxidize the water. The tablets will not "shock" the pool to regain the proper sanitary properties of the water. Using a non-stabilized liquid or granular chlorine for shocking will prevent high cyanuric acid levels from increasing to a harmful level.

THE EFFECTS OF HIGH CYANURIC ACID LEVELS

The ideal level of cyanuric acid in a swimming pool is 30 – 50 ppm[3]. There are issues caused by high cyanuric acid levels such as chlorine efficiency and most importantly, the tested alkalinity, which can result in an aggressive water balance.

In an article published in 2001, John A. Wojtowicz summarizes his article on pool water balance and the effects of cyanurate:

> "Swimming pool water chemistry must be balanced in order to prevent corrosion, etching, and scaling and maintain water clarity. This is accomplished by means of the calcium carbonate saturation index (SI) which allows calculation of a measure of the degree of calcium carbonate saturation of pool water based on the temperature, pH, carbonate alkalinity, and calcium hardness (Langelier 1936, Larson 1943, Van Waters 1964). It is desirable to maintain the SI in an ideal operating range so that the water is neither corrosive / aggressive nor prone to precipitate calcium carbonate for a maximum percent of the time. However, the SI varies with time primarily because pH and alkalinity change due to addition of sanitizers and loss of carbon dioxide, necessitating periodic adjustments. Since acid addition for pH reduction consumes alkalinity, this needs to be taken into account when adjustments are made. Also, if the water contains other alkaline substances (e.g., cyanurate ion), the total alkalinity must be corrected to obtain the actual carbonate alkalinity (Snoeyink 1980, Stumm 1981) so that the correct SI is obtained, otherwise serious corrosion and etching problems can arise."[4]

Water balance is key to preventing issues with the pool equipment and interior surfaces. The effect of a high cyanuric acid level in pool water contributes to the tested total alkalinity. If the necessary adjustment is not made to the total alkalinity, the pool water will then become aggressive and start to dissolve the interior finish to satisfy the demand for alkalinity. When this dissolution of the surface starts to occur, there will be a significant loss of pigment and etching deterioration. Due to the hand-crafted application of the plaster, there can be varying differences in the amount of pigment loss from one area to the other.

To prevent this aggressive water condition, the pool water needs to be tested weekly with attention to maintaining the following ideal levels:

Free Chlorine	2 – 4 ppm
Total Chlorine	2 – 4 ppm
Combined Chlorine	0 ppm
pH	7.4 – 7.6
Total alkalinity	100 – 120 ppm

(when using stabilized chlorines such as di-chlor & tri-chlor)

Once a month, the following levels should be monitored:

Calcium hardness	200 – 400 ppm
Cyanuric acid	30 – 50 ppm[5]

Finally, take the necessary measures to ensure that the cyanuric acid levels are maintained below 70 ppm.

TEST METHOD

An easy method to determine the adjusted (carbonate) alkalinity is simply to subtract approximately 1/3 of the cyanuric acid (in ppm) from the total alkalinity (in ppm) once the CYA level in the pool water exceeds 70 ppm. For example:

> If the Total Alkalinity was 100 ppm, and the Cyanuric Acid was 100 ppm, then subtract 33 ppm (1/3 of the Cyanuric Acid) from the 100 ppm Total Alkalinity to get the result of 67 ppm Carbonate Alkalinity.[6, 7]

PRESERVING THE BEAUTY AND PROPER SANITATION

The key to maintaining the beauty of an interior finish is to test and adjust the water to the ideal ranges of proper balance. Knowing that stabilized chlorines can create an aggressive water environment that will cause pigment loss and eventual deterioration of the surface requires attention to frequent testing of all the water parameters. Good water quality along with good filtration and circulation will keep the pool water clear and safe for swimmers as well assuring the longevity of equipment and the interior finish.

[1] National Swimming Pool Foundation, Pool and Spa Operator Handbook, 2014; p. 53.

[2] IPSSA Basic Training Manual, 2016 Revised Edition, p. 95-96.

[3] APSP/ANSI Recommended Guidelines for Water Quality, 2005.

[4] Journal of the Swimming Pool and Spa Industry; Volume 2 Number 2, John A. Wojtowicz; 2001, p. 9.

[5] IPSSA Basic Training Manual, 2016 Revised Edition, p. 30.

[6] Pool & Spa Water Chemistry – Taylor Technologies, Inc. "*A Testing & Treatment Guide"*; Revised January 2013, p. 63.

[7] Pool & Spa Operator™ Handbook; NPSF, 2014, p. 66.

Submitted by Jana Auringer