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Pool Water Balancing

Pool Water balancing is not such a complicated exercise. It is simply the relationship between different chemical measurements in your pool water. Your pool water is constantly changing, year round. Everything from weather to oils, dirt, and cosmetics affect your pool water balance - in short, anything that comes in contact with your pool water. You will probably not change the water in your pool for many years. Continuous filtration and disinfection removes contaminants which keep the water enjoyable but this is does not balance your water. A pool that is "balanced" has proper levels of pH, Total Alkalinity, and Calcium Hardness. It may also be defined as water that is neither corrosive or scaling. This concept of water balance is derived from the fact that water will dissolve and hold minerals until it becomes saturated and cannot hold any more water in solution. It reminds me of that 5th grade science experiment, where you dissolve spoonful after spoonful of salt (or sugar) in a beaker, until at last - the water will dissolve no more salt into solution, and the grains just sit on the bottom of the beaker.

When water is considerably less than saturated it is said to be in a corrosive or aggressive condition. When water is oversaturated and can no longer hold the minerals in solution it is in a scaling condition. So then, balanced water is that which is neither over or under-saturated.

The cliché that "water seeks its own level" certainly applies here. Water which is undersaturated will attempt to saturate itself by dissolving everything in contact with it in order to build up its content. Water which is oversaturated will attempt to throw off some of its content by precipitating minerals out of solution in the form of scale. How do we know when our water is over or under saturated? We use a good test kit (with fresh testing reagents) to measure the chemical levels of pH, alkalinity, and calcium hardness. Any good discussion on pool water balance would certainly cover some definitions on pH, Total Alkalinity and Calcium Hardness levels in pools.

pH

pH is a measure of how acidic or basic the water is. pH is a logarithmic scale from 0-14, with 7 being neutral. Below 7.0 and a substance is defined as being acidic, while levels above 7 are said to be basic or alkaline. Everything that enters your pool has a pH value. Ever heard of acid rain? This is rainfall with a very low pH. The human eye at a pH value of 7.35, is just slightly basic. This is, coincidentally, in range with proper pH levels for your pool. To have pH in balance we adjust the water with additions of pH increasers (bases) or pH decreasers (acids) to achieve the range of 7.2 - 7.8.

If your testing (recommended daily) of the water shows a pH value below 7.0 the water is in a corrosive (acidic) condition and you will need to add a base to bring the pH into a more basic range to prevent corrosion.

It doesn't take too long for a low pH condition to weaken vinyl, strip heat exchangers and pit plaster. Conversely, if the pH is above 7.8, we are in a scaling (basic) condition and must add an acid to bring down the pH to prevent the formation of scale or calcium deposits on our tile, in the filter, or even precipitation out of solution into a cloudy water condition.

Total Alkalinity

A close cousin of pH, the level of alkalinity in the water is a measurement of all carbonates, bicarbonates, hydroxides, and other alkaline substances found in the pool water. pH is alkaline dependent; that is, alkalinity is defined as the ability of the water to resist changes in pH. Also known as the buffering capacity of the water, alkalinity keeps the pH from "bouncing" all over the place.
Low alkalinity is raised by the addition of a base (similar to pH); sodium bicarbonate is commonly used. High levels of alkalinity are lowered by the addition of an acid (similar to pH).

We recommend "pooling" the acid in a small area of low current for a greater effect on alkalinity. That is, adding an acid underwater, in a deep end corner will create a greater hydrocarbon exchange and have a greater effect on lowering TA in your pool. Acids will lower both pH and alkalinity, but walking the acid around the pool in a highly distributed manner is said to have a greater effect on lowering the pH than the alkalinity. Pooling the acid has the opposite effect.
Some manufacturers notably United Chemicals, have created acids specifically designed to lower Alkalinity strongly, while having little effect on pH.
A very important component of water balance, alkalinity should be maintained in the 80-120ppm range for "gunite" and concrete pools and 125-170ppm for painted, vinyl, and fiberglass pools. Levels should be tested weekly. Follow package label for treatment guidelines

Calcium Hardness

When we speak of scale, we are talking about calcium carbonate which has come out of solution and deposited itself on surfaces. It is a combination of carbonate ions, a part of total alkalinity and calcium, and a part of the Calcium Hardness level. The test for Calcium Hardness is a measure of how "hard" or "soft" the water is. "Hard" water can have high levels of calcium and magnesium. If these levels are too high, the water becomes saturated and will throw off excess particles out of solution which then seeks to deposit themselves on almost any surface inside the pool. They can be attracted to ladders, lights and in extreme cases deposit themselves as very small crystalline clumps - all over the pool surfaces. Calcium Carbonate scale; a "white-ish," crystallized rough nodule.
If the Calcium Hardness levels are too low, the water is undersaturated. If under-saturated, the water will become aggressive as it attempts to obtain the calcium it needs.

Such "soft-water" will actually corrode surfaces inside the pool which contain calcium (like pool plaster) and other minerals to maintain its hardness demand.
If your Calcium Hardness levels are too high you can use a product called CalTreat to correct. Designed by United Chemical Corp., one bottle per 15000 gals can reduce Calcium Hardness levels within range.

In most cases you need not worry if your calcium levels are below 500, but much higher than that and it can cause pool problems. It can also be accomplished by dilution (adding water to the pool which has a lower calcium hardness content). Levels which are too low require the addition of calcium chloride. Recommended range for calcium hardness is 200-400ppm. Calcium Hardness levels should be tested weekly with fresh reagents or strips.

The Saturation Index

Also called the Langelier Index, this chemical equation or formula is used to diagnose the water balance in the aquatic environments (pools). The formula is "SI = pH + TF + CF + AF - 12.1."
To calculate the Saturation Index, test the water for pH, temperature, calcium hardness, and total alkalinity.

Refer to a chart for assigned values for your temperature, hardness, and alkalinity readings then add these to your pH value. Subtract 12.1, which is the constant value assigned to Total Dissolved Solids and a resultant number will be produced. A result between
0.3 and +0.5 is said to indicate balanced water. Results outside of these parameters require adjustment to one or more chemical components to achieve balance.
This formula is not guaranteed; however, some readings for pH, calcium, and alkalinity which, if taken individually would be considered to be well beyond recommendations, can combine within the formula to produce "balanced water." The SI can be used to pinpoint potential water balance problems.