Honest Pool Care 1-2-3

This method assumes you are familiar with pool chemicals, maintenance and water chemistry. It differs from your current method, but it is effective and easy to use. It works best with liquid chlorine.

1 – Test & Balance

2 – Disinfection & Oxidation

3 – Filtration & Circulation

Overview

The main things to understand about Honest Pool Care 1-2-3 are:

- pH should be between 7.5 and 7.8.
- TA (total alkalinity) should be between 60 and 90 ppm.
- TA and CYA (cyanuric acid) prevent pH decreases.
- Borates prevent pH increases.
- TA and pH are decreased with acid; aeration increases pH.
- CYA (cyanuric acid or stabilizer) should be less than 50 ppm.
- FC (Free Chlorine) must be, at minimum, 7.5% of the CYA concentration.
- Liquid chlorine does not significantly change the pH of your pool water.

Water Testing

Water balance and oxidation are the two most important considerations. To maintain water balance and have safe water, you must test. Visual test strips are useful for obtaining rough estimates of chemical levels, but quality testing with a good test kit – especially for higher levels of free chlorine and low levels of combined chlorine – is required. Liquid or tablet reagent test kits are better. Electronic, especially digital meters are more accurate. Pool stores also offer free water testing. Be advised that not all pool stores have equipment for testing borate. Borate test strips can be ordered online.

Balance Guidelines

Parameter	Range	Comments
pH	7.5 – 7.8	Very Important
TA (Total Alkalinity)	60 -90 ppm	Most Pools – 70-90 ppm Pools with SWG (salt water chlorine generator) or pools with Water Features 60-80 ppm Pools using dichlor or trichlor – 100-120 ppm
CH (Calcium Hardness)	200 – 400 ppm	200 – 400 ppm for Plaster, Pebble or Tile pools 250 – 300 ppm for Fiberglass, Vinyl, Painted pools
CYA (Cyanuric Acid)	30 – 50 ppm 60 – 80 ppm SWG	Higher levels require a higher FC level Drain and replace water if CYA is >50 ppm Minimum 60 ppm for pools with SWG
Borate	30 – 50 ppm	Use borax, sodium tetraborate pentahydrate or boric acid
Salt – only for SWG pools	3,000 – 3,200 ppm	Follow SWG manufacturer's recommendation for salt
TDS (Total Dissolved Solids)	300 to1,800 ppm Max is 1,500 ppm over starting TDS	This means about 2,000 ppm max for most pools For SWG pools the max is 1,500 ppm more than salt level recommended by SWG manufacturer.

STEP 1 –Test & Balance

Test the water for pH, TA (total alkalinity), CH (calcium hardness), CYA (cyanuric acid), TDS (total dissolved solids), borate and salt (if using a SWG - salt water chlorine generator)

Mini-STEP 1a – Adjust CYA to 30-50 ppm

If the pool is new, add CYA – 13.3 oz per 10,000 gallons per 10 ppm to bring the level up to 30-50 ppm.
If the CYA level is 30-50 ppm, go to Mini-STEP 1b.
If the pool is established and the CYA level is more than 50 ppm, drain some water and refill. The amount to drain will depend on the current CYA level. For example, if the CYA level is 100 ppm, then 50% of the water should be drained and replaced.

Mini-STEP 1b – Adjust CH to 200-400 ppm

If the CH is between 200 and 400 ppm go to Mini-Step 1c.
If CH is below 200 ppm, add enough hardness increaser to raise the level to a minimum of 200 ppm. Add 13.3 oz of hardness increaser per 10,000 gallons per 10 ppm increase.

Mini-STEP 1c – Adjust pH and TA

If the pH is 7.5 and the TA is 80-90 go to Mini-STEP 1d.
Adjust pH to 7.5, TA to 80-90 ppm (for most pools).

If pH is 7.5 and TA is below 70 ppm, here is how to increase only TA: Use Baking Soda

If TA is too low, add baking soda (sodium bicarbonate), not soda ash (sodium carbonate), to raise it. A solution of baking soda, regardless of concentration, has a pH of 8.3. This means that you can increase TA without increasing pH much. Adding 22.4 oz of baking soda per 10,000 gallons will raise TA by 10 ppm. If both the pH and TA are low then adding soda ash will raise them. A solution of soda ash, regardless of concentration, has a pH of 11.7. It will increase pH and TA.

If pH and TA are both too high, here is how to lower TA and then raise pH

Use Acid to lower TA and pH. Then use Aeration (not soda ash) to raise only pH.

Lower pH and TA with muriatic acid and then increase pH with aeration. Aeration is accomplished by turning on fountains, waterfalls, water features and aiming return fittings so return water breaks the surface – anything that makes turbulence or splashes. The time required depends upon the TA – plan on 6 to12 hours to decrease TA by 60 ppm. For example, if TA is 240 ppm, expect this to take perhaps as much as two days. Once in the right range the pH and TA will stabilize.

Test the pH and TA. If pH is 7.8 and TA is 160 ppm, add 3 quarts of muriatic acid per 10,000 gallons of pool water. This will decrease TA by about 40 ppm and make the pH about 6.8. Now aerate until pH is 7.6. This will require a minimum of 4 hours, depending on pool volume and aeration rate. More aeration is better. When the pH is 7.6, measure TA again; it should be about 120 ppm. Again add 3 quarts of muriatic acid. This should bring TA down to about 80 ppm and pH down to about 6.8. Aerate once again until a pH is 7.6 is reached. That's it: You're done.

Each time acid is added, the pH and TA are reduced. **Aeration raises the pH without raising the TA**. When TA is tuned precisely, the pH will rise to a level of about 7.6. If the pH exceeds 7.8 from aeration, lower TA a little more. If aerating for say 8 hours does not increase pH sufficiently, the TA is too low and more baking soda should be added. After monitoring it a few times, you will be able to obtain that ideal TA. Occasionally, a little acid may be needed, but basically the water can be considered to be well balanced.

Do not let TA fall below 50 ppm; even a small amount of acid will drop the pH sharply. If the TA is excessive, say above 200 ppm, more acid will be needed in the beginning to get the pH down. Remember, TA is a pH buffer, that is, a

pH stabilizer, and the amount of acid needed to lower the pH is proportional to the amount of TA. **It takes 25.6 fl oz of muriatic acid to reduce TA by 10 ppm in 10,000 gallons of water**. Don't add too much acid all at once in order to bring the pH below 7.0. We aerate between doses of acid to prevent large pH swings.

Mini-STEP 1d – Adjust Borate Level

If the borate level is below 50 ppm, add enough borate to raise the level to 30-50 ppm. Add 117 oz of borax (not Boraxo) per 10,000 gallons per 10 ppm or add 90 oz of sodium tetra borate per 10,000 gallons per 10 ppm.

The main reason to use borate is to keep the pH from rising. Bicarbonates (TA) and cyanurates (cyanuric acid in water) form buffer systems which prevent pH decreases. They buffer more strongly against large drops in pH. Borates are a buffer system that prevents pH increases. They buffer more strongly against large rises in pH. The minimum borate concentration needed is 30 ppm but the ideal amount is 50 ppm.

The others reasons for using borates are: algaestatic properties, reduced chlorine usage, silkier feeling water with less skin and eye irritation, and clearer, sparkling water.

Borate level only needs to be checked occasionally. This will help prevent a pH upward drift. You will need a borate test method or locate a pool store that has a test for it or you may buy some borate test strips from an online seller.

STEP 2 – Disinfection and Oxidation – Add Chlorine

FC (Free Chlorine) minimum is 7.5% of CYA

The proper amount of FC depends on the CYA level.

CYA (ppm)	Minimum FC (ppm)	Ideal FC (ppm)	Shock (ppm)
	7.5% of CYA	11.5% of CYA	40% of CYA
20	2	3	10
30	2	4	12
40	3	5	16
50	4	6	20
60	5	7	24
70	5	8	28
80	6	9	31
90	7	10	35
100	7	12	39

Notes: Original idea for this chart from Ben Powell. This version differs. Amounts are rounded. Minimum FC 2.0 ppm. Ideal is a general term for a typical pool. Shock is for removing combined chlorine or for after very high bather loads. It is recommended that CYA level be reduced by draining and refilling water rather than maintaining FC level greater than 6.0 ppm. SWG (salt water chlorine generator pools need a minimum FC of 5% of CYA.

FC must always exceed the minimum, or algae can flourish depending on nutrients, bacteria can grow depending on other conditions and chloramines will be formed. The minimum FC shown here is the *absolute* minimum. Do not allow FC to go below it. If the algae nutrient level is low, then algae may not grow. Phosphate remover products remove orthophosphates which means that a lower FC concentration would be required to prevent algae. Using an algaecide or phosphate remover will lower the minimum FC requirement.

Most uncovered outdoor pools will lose about 2 ppm of FC every day in the summer because of UV induced degradation even in the presence of CYA. This does not include swimmer chlorine demand. Obviously this means that chlorine cannot be added just once a week. It would require 14 ppm of chlorine at a CYA level of 100 ppm CYA to last a week in sunny areas where the resulting FC would be around 4 ppm at the end of the week. Conditions may necessitate more frequent additions of chlorine. Checking the FC level daily is a good way to determine how often this is. **Shocking is unnecessary if the correct minimum FC level is always maintained.**

Which Type of Chlorine to Use

Although it may cause a momentary increase, liquid chlorine has no net permanent effect on pH. The pH of the water will go up when liquid chlorine is added but as it is used, the pH goes back down. (Note: some chlorinating liquids with a pH more than 13.0 can cause a slight increase in pH.)

Use liquid chlorine from a pool store or *use liquid bleach* from a super market or home center. The only difference is the percent of chlorine and the pH. If liquid chlorine is not sold at your local pool store, buy liquid bleach from the grocery store, chain discount store or home center. Just be sure to buy the type of bleach that has no additives, fragrance or detergent. It is best to use a liquid chlorine dispenser or small metering pump to dispense the chlorine or bleach but you certainly can add chlorine manually. You may also decide to use a SWG (Salt Water Chlorine Generator).

Cal hypo can be used. It is more dangerous to store than liquid chlorine. It too has a net zero pH effect and it increases hardness level by about 7 ppm for each 10 ppm of FC. Your CH level may rise when using cal hypo as the main chlorinating source. Lithium hypo is another alternative. It has no net effect on pH, but it is relatively expensive.

If trichlor is used, be aware that the pH and TA are decreased because of the acidic nature of the product. The TA will need to be kept between 100 and 120 ppm with a pH of 7.5-7.8. In addition, trichlor contains a significant amount of CYA. Trichlor is very convenient to use due to the tablets continual dosing. Many trichlor users are reluctant to switch because liquid chlorine requires multiple additions every week or using a liquid feeder.

For every 10 ppm of FC (free chlorine) added by trichlor, it raises CYA by 6 ppm. Considering that the average outdoor pool will lose about 2.0 ppm per day of FC, in a week just due to UV degradation, you will need 14 ppm FC which will increase CYA by 8.4 ppm per week. Add bather load to that and you can see that CYA can increase rapidly. We do not recommend using trichlor as a sole source of chlorine because the CYA can reach more than 50 ppm in less than one month.

For every 10 ppm of FC (free chlorine) added by dichlor, it raises CYA by 9 ppm. However, dichlor is not used often for regular chlorination. Dichlor is near neutral in pH so it does not affect pH. But when the chlorine is used or consumed it creates some acid so it will lower TA and pH with continued use.

Once CYA is increased to 50 ppm or more, switch to liquid chlorine, bleach or cal hypo or drain some water and refill.

STEP 3 – Filter and Circulate

The pool pump needs to be run for a sufficient amount of time to filter all of the water. With new energy-saving pumps and older pumps in use, it can be difficult to say how long pumps should be run. However, we recommend that the water have at least one turnover per day. A turnover is the time is takes for the pump to pump a volume of water equal to the volume of the pool. For example, if the pool is 12,000 gallons and the pump flow is 50 gpm (gallons per minute) then it will require 240 minutes (12,000 gallons ÷ 50 gpm = 240 minutes) or 4 hours to attain one turnover. If the pump is a new variable speed pump, the flow may be 18 gpm. This will require 666 minutes (12,000 ÷ 18 = 666) or about 11 hours to attain one turnover. However, 11 hours on slow speed will use less electricity than 4 hours on high speed.

Circulation of water in the pool is important. Not only is it necessary for filtration but it may be necessary for dispensing chlorine or other chemicals. Many chlorinators and chemical dispensers require water flow to add chemicals. They must be run a sufficient amount of time to add the appropriate amount of chemicals. In addition, circulation in the pool is important because it brings new free chlorine to all parts of the pool. When the water is not moving, free chlorine can be used up by bacteria and algae in an area. If the water is not moving and bringing new free chlorine to that area then bacteria and algae can grow.

How Much Chemical to Add

Chemical	Effect	Dose Amount per 10,000 gallons
Liquid Chlorine 12.5% (Pool Stores)	Raise FC 1 ppm	10.2 fl oz
Liquid Bleach 5.25% (Groceries, discount chains, home centers)	Raise FC 1 ppm	24 fl oz
Sodium Bicarbonate	Raise TA 10 ppm	22.4 oz
Liquid Muriatic Acid (31.4% HCl)	Lower TA 10 ppm	25.6 fl oz
CYA (cyanuric acid)	Raise CYA 10 ppm	13.3 oz
Calcium Chloride 100%	Raise CH 10 ppm	13.3 oz
Calcium Chloride 77%	Raise CH 10 ppm	17.3 oz
Borax	Raise Borate 10 ppm	117.25 oz
Sodium Tetra Borate	Raise Borate 10 ppm	90 oz
Salt	Raise Salt 10 ppm	13.3 oz

Enjoy This Easy Way to Chemically Treat Pools

Once you have completed all the above STEPS, your pool balance should be stable and only minor adjustment to pH, TA and FC should be necessary. When you first start using Honest Pool Care 1-2-3 you should test the water for pH, TA and FC two to three times a week. It will help you learn how often to add chlorine. It will also show you if the pH is drifting up or down. Remember, if the pH is drifting up, the TA is too high. Try increasing it by 10 ppm. If the pH is drifting down, the TA is too low. Try lowering by 10 ppm.

Below are some additional information for those who are curious. If you are not one of those curios people, enjoy your pool and tell your friends about Honest Pool Care 1-2-3 and how easy pool care can be otherwise, read on.

Notes:

Water can be acidic, balanced or alkaline. If water is not balanced, it can harm swimmers, the pool and the equipment. If acidic, corrosion can occur. If alkaline, scaling can result. Each of these reduces the effectiveness of chlorine.

The five most important parameters to keeping the water balanced: Temperature, CH, TA, CYA and pH.

Calcium Hardness: The lower the CH, the calcium concentration in the water, the greater TA and pH must be for the water to be balanced. The higher the CH, the lower TA and pH must be for the water to be balanced. **Your first step is to test the CH of the pool water.**

If it is less than 100 ppm, add calcium chloride (hardness increaser) to increase it to 200-300 ppm. (See dose amounts in chart.) If the CH is more than 200 ppm, no further adjustment is necessary; just write it down. CH concentration is used to determine the correct TA and pH levels. Calcium should be added once to bring CH above the minimum recommended concentration of 200 ppm. CH level does not change much in pools. New plaster and the use of cal hypo for chlorination will significantly increase CH.

pH: pH is the measure of acidity or basicity of the water. In common use, the pH scale is 0 (highly acidic) to 14 (very basic or alkaline) with 7.0 being neutral. Values below 7.0 are acid and values above 7.0 are base. The pH of the human body usually is 7.4 – 7.5. Accordingly, recreational water is maintained near this range. We recommend the pH range of 7.5 to 7.8. It is important not to believe, that simply because the pH is 7.5, the water is balanced. If the CH is too low, any plaster or equipment in contact with that water will be corroded. If the TA is too high, scale forms on the pool walls, the equipment and the plumbing. Large deviations from the ideal reduce the effectiveness of chlorine. Thus it is very important to maintain an ideal pH in balanced water.

Total Alkalinity: Total Alkalinity acts as a pH buffer, resisting pH changes in either direction. However, TA resists downward changes better. High levels of TA make it difficult to change pH when adding acid or base. However, high TA requires a low pH for balanced water. Conversely, relatively little acid is needed to change the pH when the TA is low. The lower the TA level, the higher the pH must be for balanced water. Clearly, pH and alkalinity are related.

The key for obtaining balanced water without pH drift, is maintaining optimal TA level. If the pH rises over time, above 8.0, the TA has to be decreased. If the pH drops over time, say, below 7.2, the TA level is too low. However, if the pool has a lot of aeration (waterfalls, fountains or anything that causes turbulence), then the ideal pH and TA will be different than for pools with no aeration. By fine tuning TA, you can balance the pH accurately, and adjustment only rarely will be necessary.

Proper TA: Obtaining and maintaining the correct TA level is dependent upon the existing CH (calcium hardness). If CH is approximately 200 ppm, TA will have to be 80 ppm for balanced water with an ideal pH of 7.6. If CH is 300 ppm, TA should be about 70 ppm with a pH of 7.6.

Another Way of Lowering TA and Raising pH:

Use muriatic acid to decrease TA, aeration to raise pH.

1. Add enough acid to lower pH to 7.0-7.2
2. Aerate until pH is 7.6 (may take 6-12 hours depending on pool gallons and starting pH and TA)
3. Test TA (Total Alkalinity)
4. Repeat 1 & 2 until desired TA (60-90 ppm) and pH (7.5) are reached.

Chlorine Exposure

Understand that in the presence of 30 ppm CYA, 97% of the chlorine is bound to the CYA. If there is 6.0 ppm of free chlorine in the water, this means that 0.18 ppm (3% of 6.0) is not bound to CYA. This is equivalent to about 0.2 ppm free chlorine with no CYA. Here, there is sufficient chlorine held in reserve such that it is not depleted by high organic contamination, such as urine and sweat. At least 16 ppm free chlorine (in the absence of CYA) was required for eye irritation based on eye irritation experiments.

Commercial or Public Pools

The Honest Pool Care 1-2-3 method was designed for residential swimming pools, not commercial or public pools. The latter two are subject to all local, state and federal codes, regulations and guidelines.

Resources

For more detailed information on CYA please see “Cyanuric Acid: It Controls Your Pool” by Robert W. Lowry

For more information on aeration for raising pH, please see “Using Air and Acid to Get Perfect pH and Alkalinity Quickly” by Robert W. Lowry

The following are useful for innovative and useful calculating help:

- Acid Dose Calc – calculates the amount of acid needed to lower pH and then calculates a new total alkalinity based on that dose
- Chem Dose Calc – calculates the exact dose of any chemical for any pool
- Chlor Dose Calc – calculates the chlorine dose for any pool
- Chlor Conversion Calc – calculates the conversion of one type of chlorine into any other type
- Ozone Sizing Calc – calculates the size ozone generator in grams per hour for any pool
- PPM Calc - calculates a ppm for any size pool and the ppm increase for 1 lb of added chemical
- New Sat Index Calc – calculates the Saturation Index for any pool with adjustment for CYA