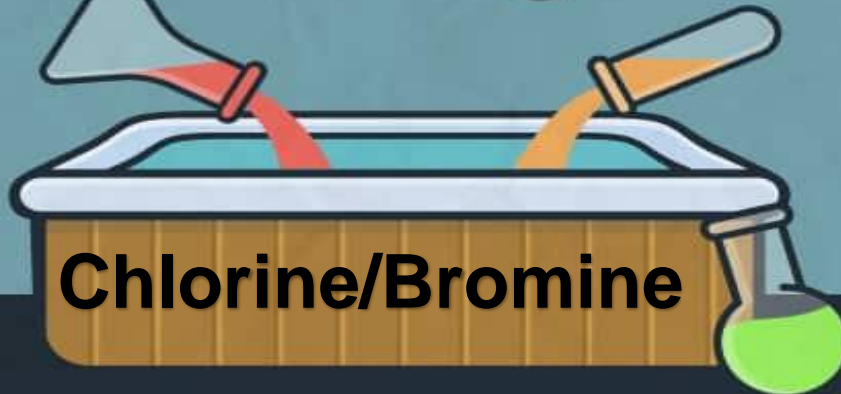


- Hot Tub - Chemistry 101



Chlorine/Bromine

WATER BALANCE

By maintaining balanced water in your spa, it will stay cleaner and provide more enjoyable uses. Problems such as corrosion and scaling can develop if the spa water is out of balance for any period of time. These problems can arise very quickly because of the small amount of hot water a spa

contains. It is easy to see the importance of having a consistent balance of the following five properties:

Take a water sample to Swim Rite once a month or after refilling the spa

- **Total and Free Available Chlorine/Bromine**
- **PH**
- **Alkalinity**
- **Calcium Hardness**
- **Total Dissolved Solids**

The spa water balance is constantly changing due to usage, location, and water addition. Swim Rite Pools has the equipment and expertise to analyze your spa water and recommend exactly what you'll need to balance your water.

Take a water sample to Swim Rite once a month for a complete analysis, or after significant make up water is added. Here are a few testing tips to keep in mind when bringing a water sample in to Swim Rite:

Test the spa water at least twice a week

- Fill sample bottle to the top. We do not need that much water but it is easier for us.
- Take the water in a water sample bottle or a plastic bag.
- Bring the sample to Swim Rite as soon as you take it; don't let the water sit around.

TOTAL CHLORINE & BROMINE

Many kinds of organic compounds can pollute a spa. The compounds react with CHLORINE/BROMINE to drastically reduce its germicidal efficiency. Once reacted, they are converted into chlorine/bromine-type compounds

FREE CHLORINE/BROMINE

Free available CHLORINE/BROMINE destroys harmful bacteria as well as algae. It also reacts with organic contaminants, which tend to dull the appearance of the water. Maintaining a "free available CHLORINE/BROMINE" level of 2-5 ppm {4-10 ppm for bromine} can help insure that the water has a sparkle and that it is also sanitized. It will be necessary to "shock" your spa water by using All spa water develops what is known as "CHLORINE/BROMINE demand" when insufficient CHLORINE/BROMINE is present. Such things as dissolved iron, bacteria of various kinds, perspiration, algae, pollen, spores and other organic materials create a "CHLORINE/BROMINE demand" in spa water. If sufficient SHOCK were added to the water to oxidize all of the pollutants present, a "CHLORINE/BROMINE demand" would no longer exist because all substances capable of reacting with CHLORINE/BROMINE would have been destroyed.

Shock a spa on a weekly basis if you have used the tub 30 minutes or less, you want to use 2 oz. of shock per every 500 gallons of spa water, if you have used it 3 to 6 times shock the spa twice a week or even more if it is heavily used.

When you change the spa water and you are using bromine in it, you need to add 2 oz. of shock and 2 oz. of BROM BANK made by SPA PURE per every 100 gallons of water or a pack of Bromo Start by Brilliance. The BROM BANK is used to establish what is called a "bromine bank", or bromine residual.

and under some conditions, nitrogen trichloride. These compounds are poor sanitizing agents, poor algaecides, and will produce objectionable odors and eye irritation.

Chlorine alone in a spa is NOT sanitary!

a non-chlorine/bromine shock such as SPA OXIDIZING SHOCK made by SPA PURE. This helps to get rid of objectionable odors and also helps to kill off any algae, which may have started to grow.



The spa should be shocked with non-chlorine at least once a week, even if you do NOT use the tub.

NATURE 2 SPA



It is important to know that just using chlorine alone in the spa is not sanitary! Chlorine in a spa can get used up within 15 minutes. If you want to use chlorine, we recommend using a Nature² SPA stick as a secondary sanitation. Nature² SPA uses an EPA-approved mineral bed technology to effectively kill bacteria safely and effortlessly. Nature² SPA works by automatically dissolving trace amounts of mineral elements into the water. Those elements act as a sanitizer to destroy bacteria and viruses. With using Nature², you can maintain .5 ppm level of Chlorine (instead of 2-5 ppm)

- 1) Drain and refill your spa. Balance the water per spa manufacturer guidelines.
- 2) Install the Nature2 Spa after water is balanced.
- 3) Add 1.5 tablespoons of dichlor chlorine to a 250-gallon spa, to burn off contaminants and activate cartridge.
- 4) Run spa according to recommendations supplied to you by the manufacturer of your spa.

1 ½ Tablespoons is approximately ¾ ounce

Hot water is an ideal environment for spreading infection

Before and After each use Add 1 tablespoon of MPS to spa per 250 gallons. **Every 4 months** Drain and refill your spa. Replace Nature2 Spa and repeat sanitizer start-up.

ALWAYS! Adjust the Total Alkalinity before the PH

Ph

The Ph of water is a measure of its acidity or basicity. Factors such as rain, dust, swimmer wastes and algae affect a spa's Ph. The Ph range runs from 0 to 14 with 7 being neutral (that is, not acidic or basic). Values less than 7 are acidic and

values greater than 7 are basic. Ph must be maintained within the recommended range to ensure bather comfort and prevent corrosion and scaling.

Ph values increase or decrease in geometric ratios, meaning that a spa water of Ph 7.2 is 10 times more acidic than one at 7.3. A water sample at Ph 7.2 is 100 times more acidic than one at Ph 7.4

To lower the Ph, Ph Decreaser may be used to adjust the Ph to 7.4. To raise the Ph, Ph Increaser may be used to adjust the Ph to 7.4.

When lowering the Ph "broadcast" the Ph Decreaser across the tub

TOTAL ALKALINITY

Total alkalinity refers to the ability of the spa water to resist a change in Ph. The key purpose total alkalinity serves to help manage or control the Ph in the spa. It does this by acting as a buffer so that when a substance is added to spa water that could affect the Ph, the total alkalinity will react to neutralize it and keep the Ph in the desired range.

when materials are added to a spa that would otherwise cause the Ph to go up or down, these changes are controlled and does not result in severe changes to spa water balance.

Total alkalinity does not determine what the Ph will be, but rather acts to help keep the Ph in the range desired.

When using PH Decreaser always have the cover at least ½ off

Total alkalinity is measured in parts per million {ppm} using a total alkalinity test kit. It is best kept in the range of 80-120 ppm. When the total alkalinity value is less than 80 ppm, the water can become aggressive, causing eye irritation, etching, and

corrosion of pipes. The Ph can also swing easily upward and downward and back again-called “Ph bounce”. If the value is higher than 120 ppm the water can become cloudy, scale forming, Ph will tend to drift upward, and cause eye irritation.

When lowering the Total Alkalinity DUMP the Ph Decreaser in the center of the tub without the blower running!

CALCIUM HARDNESS

Calcium is important since high levels are unstable, and can become even more unstable if the Ph or the total alkalinity rise above the normal levels. These unbalances can result in cloudy water and/or scale. In addition, calcium does not like warm water. As water temperature rises, calcium becomes more likely to precipitate out of solution. Calcium is actually more soluble in cold water, which is why scaling of heater equipment is so common.

With all of the difficulty’s calcium can cause, it would seem logical to use soft water in filling a spa. However, this is not the case! While high calcium levels can cause problems with cloudy water and scale, soft or low-calcium water is also of concern. Such water is aggressive and will actually remove calcium from plaster in order to satisfy its need for the mineral. If the spa is vinyl or fiberglass, the low

calcium water will actually attack metal fittings and heaters resulting in destruction of the fittings or pinhole leaks in the heater. When such corrosion occurs, it is also common for stains to appear on spa surfaces.

Calcium content is best in the range of 200-400 ppm. Unlike Ph or total alkalinity, however, both of which can be raised or lowered with reasonable ease, calcium levels cannot. Adding Hardness Increaser to the water easily raises calcium levels. Conversely, there is no simple chemical addition that can be made that will reduce calcium hardness. The only way to reduce calcium hardness levels in the spa water is through dilution with water of a lesser hardness.

When adding chemicals, do NOT have the blower running

TOTAL DISSOLVED SOLIDS

Total dissolved solids {TDS} are normally the least worrisome factor. TDS is the sum of all materials dissolved in the water and normally runs in the range of 250 ppm and higher. TDS is comprised of many different chemical compounds, which means that the issue of how much is too much actually depends more on what they consist of, than how much there is.

For example, ordinary salt is extremely soluble and is therefore unlikely to cause a problem, whereas, as we have seen, calcium compounds can be a

problem even at fairly low levels. In general, when TDS exceeds approximately 1500 ppm, problems may begin to occur.

At elevated levels, TDS can lead to cloudy or hazy water, difficulty in maintaining water balance, reduction in sanitizer activity and foaming. Unfortunately, the only way to reduce TDS is to drain the water replace it with fresh water.

Add ONLY one chemical at a time with at least 15 minutes before the next chemical is added.

PREGNANT WOMEN SHOULDN'T STAY IN A SPA LONG

Pregnant Women who enjoy relaxing in the hot tub shouldn't stay in more than 10 minutes in a spa when the water is 104 degrees, says a study published in the 1990's.

Too much spa time can raise a women's body temperature enough to cause malformations in the fetus, said the study, appearing as a letter in the New England Journal of Medicine.



To reach this conclusion, the researchers conducted an experiment on 24 young, non-pregnant women to see how long it takes for their inner body temperature to reach 102, the point that can be hazardous to the fetus.

They found that some people heat twice as fast as others do. In a 104-degree tub, some women's bodies reached 102 in as little as 12 minutes, while others took 23 min.

FACTS ON FILTER CLEANING

Filter cartridges use non-woven fabrics to trap spa debris. As spa water is circulated, it passes through the filter where all types of debris such as organic matter, bather waste, scale and rust are trapped and eventually removed via hosing off a cartridge filter. However, only hosing off the filter

Chemically clean your filter every 2 weeks

cartridge is, removing only what can be seen, like washing your hair without shampoo. Filter cartridges are cleaned by soaking in a filter cleaner and then rinsed with a garden hose. Cleaned cartridges are about 65% to 75% as effective as new cartridges.

1. **Clean the filter at least 3-6 times per water change.**
2. **Never soak the cartridge in chemical solution more than 24 hours.**
3. **Be sure too thoroughly rinse the filter before returning it to service.**
4. **Allow cartridge to dry before returning it to service. This will allow the fibers to expand and fluff up thus providing more effective filter area.**

Hosing off the cartridge without using a filter cleaner is like washing your hair without shampoo!

CIRCULATION AND FILTRATION

The more the spa is used and the warmer it is, the more the filter needs to run. Filtration should be good enough to filter out fine particles of dirt, this helps to keep the spa water clear. The more particles that the filter can remove, the fewer chemicals you should need to add. Proper filtration will remove most of the suspended debris from your spa. However, filtration alone is not enough. Chlorination is required to disinfect spa water. The proper combination of filtration and sanitizer is necessary to keep spa water sparkling clear.

Then amount of bacteria doubles every 24 hours in a filter cartridge!



HOUSEKEEPING

Along with keeping your spa water balanced, you will also need to take good care of the spa itself. Here is a brief list of the things you will need to do that will prolong the life of your spa because it is well taken care of.

1. Clean your cover every other week with a Spa Cover Cleaner, especially on the water side.
2. Clean your spa shell at the waterline regularly with Spa Surface Cleaner.
3. Clean your spa filter at least once every 2 weeks with Filter Cleaner.

Water needs to be changed every 6 weeks to 3 months

FYI

Never let the spa water temperature rise above 104 degrees.



- Never let the spa water temperature rise above 104 degrees Fahrenheit. Temperatures higher than this can place undue strain on the cardiovascular system.
- Limit spa use to no more than 15 minutes. Longer exposure can cause physical damage.
- Persons with diabetes, high blood pressure, heart disease or other cardiovascular conditions should consult their Physician before using the spa.
- Persons with open sores or any type of infection should not use the spa. The hot water is an ideal environment for spreading infection, especially if sanitizer levels are not properly maintained.

WATER CHANGING GUIDELINES

It is important to understand that a spa is a small body of water. Constant use of the spa means that bathers will leave large amounts of dirt, perspiration, body oils, deodorant, make-up and other various contaminants behind in the spa. The following formula is meant to help you determine how often your spa water will need to be changed to keep it healthy. Considerations for determining how often to change water and clean a spa:

1. Overall Use-Based on a 15-minute maximum soak time: 6 to 16 ounces of waste contamination each 15 minutes spent in the spa by any one soaker.
2. Size of Spa-How much contamination a spa can take is directly proportional to the number of gallons in the spa.
3. Temperature-Rate of contamination factor, the higher the temperature, the **faster** the contamination. (104 degrees F maximum).

It is easy to consider that the smaller a spa is and the more use it gets, the sooner the body of water will need to be changed. Each spa with any given number of gallons can only take so much contamination before operation problems start to develop. These problems can include: loss of water clarity, soaker discomfort and inadequate test results. In addition to these, filter media and elements are plugged more rapidly and disinfection is reduced to a minimum efficiency rate. To keep these problems from affecting your spa, use the following formula to help you make an educated estimation of the bather load contamination rate in the water.

BATHER LOAD CONTAMINATION= 1/3 GALLONS DIVIDED BY # OF BATHERS = DAYS TO EMPTY.

If 500 is your gallonage spa, divide that by 3, which = 167, divide that number by the average number of bathers per day (every 15 minutes of usage = per person is a user) equals the number of DAYS UNTIL the water needs to be drained **EXAMPLE (500 ÷ 3) ÷ 2 = 84 Days**

How to Perform a System Flush on Your Spa

System Flush is a chemical that is used to clean all Biofilm from the surface and internal parts in your spa. It is safe for use in any whirlpool, spa, or even fountain. Spa System Flush uses an “earth-friendly” formula without soaps, detergents or alcohol.



1. A system flush takes place prior to draining the existing water.
2. Remove filters and cover
3. Pour all but 2-3 ounces of SeaKlear System flush into your hot tub water.
 - a. If you have diverter valves / “zones” for the jets in your tub, be sure to open the different zones in order to flush all areas of your spa.
 - b. Run your jets on high several times during the flushing period.
 - c. Your tub will foam. The system flush will generate a large amount of foam as it removed films, organics, etc from the internal plumbing. Be prepared for remediation of the foam if your tub is indoors.
4. Let Circulate 12-24 hours.
5. Drain water, cleaning the inside shell as it drains. Use the reserved system flush to aid in removing any dried-on debris. Rinse well.
6. We recommend performing a system flush every time you drain the tub. With frequent flushing, the length of time and amount of system flush you need to add to the tub will diminish. (1/2 bottle of system flush and a minimum of 1 hour of flush time)
7. While performing a system flush on your hot tub, it is also a great time to clean your filters. Start by using a hose or sprayer to remove large debris on filter and between pleats. Allow filters to dry. Once dry, submerge the filters in a mixture of filter cleaner and hot water. Let soak for 24 hours. Rinse well. Let dry then return them to spa.

Having friends over to use your spa is like taking a bath with them. How close are you with them?

HOW TO SANITIZE YOUR SPA

We recommend sanitizing your spa every time you drain. This procedure is intended to describe how to decontaminate a spa infested with both bacteria and bacterial by-products. Some signs of possible infection include: slime formation, cloudy water, musty odors, fecal contamination, bather rashes, flu-like symptoms suspected to have originated from spa use. In order to properly decontaminate your spa, you must take the follow steps:

1. Remove Filter, chemically clean the filter with Brilliance Filter Cleaner or Replace the filter with a new one.
2. Drain the Spa.
3. Refill the Spa to ½ inch above the “high water” mark.
4. Add at least 100 ppm of Chlorine to the spa.
5. Cover the spa.
6. Circulate the water at a maximum rate for 30-45 minutes.
7. While water is circulating, turn the blowers on and off every 5 minutes.
8. While spa is draining, rinse sides several times.
9. Clean spa with either Baqua Spa or Brilliance Surface Cleaner.
10. Remove Excess water
11. Refill, replace filter, balance, start-up.

In order to deliver 100 ppm of Chlorine use the following measurements:

Dosages are in ounces for dry products and fluid oz. for liquid products

Chlorine Source	Spa Volume (gallons)								
	100	150	200	250	300	350	400	450	500
Sodium Hypochlorite - 12% bleach	15	22.5	30	37.5	45	52.5	60	67.5	75
Sodium Hypochlorite – 5.25%(household bleach)	35	52.5	70	87.5	105	122.5	140	157.5	175
Calcium Hypochlorite – 65%	2.2	3.3	4.4	5.5	6.6	7.7	8.8	9.9	11
Lithium Hypochlorite – 35%	3.8	5.7	7.6	9.5	11.4	13.3	15.2	17.1	19
Sodium Dichlor – 56%	2.5	3.75	5	6.25	7.5	8.75	10	11.25	12.5

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