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## The Handyman France Advanced Idiots' Guide to Pool Chemicals



Although for the most part pH and free chlorine levels are all that most owners need to monitor, typically using a test kit as shown on the right, there are other substances that need attention. A more complete list of readings that can, and occasionally at least should, be monitored -



1. Free chlorine (FC)
2. Total chlorine (TC)
3. Cyanuric acid (CYA)
4. pH
5. Total alkalinity (TA)

All of these levels can be measured and adjusted, though the procedures can be somewhat confusing at first. There is also **combined chlorine** that must be calculated - more of that later. *Other things are in the water, like calcium, but by and large these do not need to be checked very often. As long as tap water is used, and the above listed levels are correct, you should have no undue problems. Do not use water from a well - you don't know what's in it!*

**In order to measure items 2, 3 & 5** some fairly sophisticated instruments are needed, such as the photo on the right, and probably not worthwhile for many owners to buy. Some specialist pool suppliers can conduct these tests on water samples, and most professional pool maintenance businesses should be able to provide this service - at a cost of course.



**Items 1 – 3** all refer to the sanitiser, whilst **4 & 5** are relative to the acidity of the water. However, they are not two completely independent systems. **Chlorine** cannot work properly if the **pH** is outside the correct range; **chlorine** also needs the **CYA** level to be correct to work efficiently. The pool's **pH** can be affected by incorrect **chlorine** levels; **pH** is also affected by the **total alkalinity**. *“Realize that everything connects to everything else,”* as Leonardo da Vinci observed (Lenin also said it apparently, but we won't go there...). Temperature also plays a part. 15°+ is needed for optimum chemical efficiency.

Item 3 looks particularly nasty – **cyanuric acid (CNOH<sub>3</sub>)** sounds like some sort of poison. In fact, its' presence is essential to maintain the correct free chlorine/total chlorine balance. The level should be 50 ppm (parts per million) plus/minus 20 ppm. Here's why...

**Chlorine** is destroyed by, amongst other things, sunlight, algae and human sweat. The **chlorine** needs to be protected from the sunlight and released in a controlled way so that on hot sunny days when there is heavy use the level is maintained to deal with the viruses and other nasties that need to be destroyed. **CYA** does this. If the level is too high, the **free chlorine** will struggle to be high enough to work; if it is too low, the **chlorine** will be destroyed by sunlight too quickly and will soon be ineffective.

If the level is too low, a **CYA stabiliser** needs to be added (**stabiliser** is, in fact, **cyanuric acid**, typically in powder form). Follow the instructions on the container. *Be advised that the process can take several days.*

If the level is too high, there is no chemical available to reduce it. The only solution is to remove water from the pool, and replace with fresh tap water which is free of **CYA**. A simple maths equation will tell you how much to remove – e.g., 100 ppm = twice the amount needed, so replace 50% of the water, or maybe a little more and then add **CYA stabiliser** to get it right.

Each time you add chlorine to the pool using the bigger long duration tablets, you add **CYA**. So, as the season progresses, the **CYA** level will gradually increase. In part this is countered by replacing the water dumped during the backwash and rinse (lowering the water level to just below the skimmer during winter also helps keep the **CYA** level within range). But, particularly if you have a system that doesn't need backwashing (a filter bag system for example), you will probably need to dump some water before the start of the season. How much depends on the **CYA** reading.

Despite its' nasty sounding name, **cyanuric acid** is quite harmless at the correct levels, though you obviously wouldn't want to eat it. It should never exceed 100 ppm.

If the level is set at the start of the season, it should be OK for the rest of the season.

**Free chlorine (FC)** is the stuff that's available to sanitise the pool. 1 – 3 ppm is ideal.

**Total chlorine (TC)** is, as the name suggests, the total amount of **chlorine** and includes **combined chlorine**. The **TC** will always be equal to, or higher than, **FC**, and should never be much higher than 5 ppm.

**Combined chlorine** (not measured, but calculated) is chlorine that is effectively used up. **It should be 50% of the FC, or lower.** The formula is  $TC - FC = CC$ . The level of the **CC** is limited by swimmers using the shower before entering the pool – as well as the toilet!

**If there is a strong stink of chlorine** it's probably because the **CC** is above 50% of the **FC**. It seems perverse, but **the cure is to shock the pool with un-stabilised chlorine.**

**Total alkalinity (TA)** can be tested using an instrument like one below. If it is too low, use a **pH stabiliser (sodium bicarbonate)**. *Do not use pH+ as it will have no effect.* However...

...if the **TA** is too high, it can be reduced by adding **pH-** in quite large quantities. Obviously this will reduce the **pH** as well, but when **pH+** is used to increase the **pH** again, it will not increase the **TA**. Confusing, isn't it! This process takes a few days.

**A myth or two explained** - If swimmers suffer eye irritation, don't blame the chlorine! It's usually the pH. Human tears' natural pH is around 7.2 - 7.4, so a low pH in particular causes problems. If swimmers' hair turns green, again don't blame the chlorine! It's more likely to be copper in the water, or poor quality hair dye/shampoo. Or a rotten hairdresser. If the chlorine level is too high it can damage hair, but green hair is just a persistent urban myth. Copper levels can be tested and corrected. It isn't within the remit of the pool man to recommend hair dye though.

So, your chemical readings/calculation should be -

1. Total chlorine - 1 - 5 ppm
2. Free chlorine - 1 - 3 ppm
3. Combined chlorine - 50% of FC **maximum**
4. Cyanuric acid (CYA) - 30 - 70 ppm
5. pH - 7.0 - 7.8 (**7.2 - 7.4 is regarded as perfect**)
6. Total alkalinity - 80 - 120 ppm



**Saline pools** should have a salt concentration of around 4000 ppm, usually measured with test strips. You should not be able to taste the salt!

And you thought that water was simply H<sub>2</sub>O!