The PPOA PUMPROOM PRESS- Tech Talk

PROFESSIONAL POOL OPERATORS OF AMERICA

# What is the Fuss Over Total Dissolved Solids?

TDS... is it dangerous or damaging? Another variable for pool operators to worry about? That secret cause for lousy results from our chlorine?

Maybe so... but probably not. It doesn't amount to much, really, this TDS thing. But try and tell the pool supply guy with his pool-water-print-out computer (on the counter next to the cash register), or your boss when he's heard otherwise from those who sell him stuff... So maybe TDS is worth discussing here; at least you'll be able to put some substance in your argument.

And yes, rapid TDS elevation in public pool water is becoming much more a common phenomenon these days, as more and more pool owners are switching from gas chlorine to alternative sanitation methods. Since it is more frequently found, increasing numbers of owners are expressing their concerns; and this quiet old controversy is emerging as a major battlefront among so-called pool professionals.

Before dispelling the myth regarding the "dangers" of allowing high TDS to exist, let's review the variable itself:

Total dissolved solids (TDS) is just what it says, the sum of all solids dissolved in the water. The constituents that make up TDS are varied and, for the most part, remain unknown as we simply measure the gross sum of these metals, minerals and salts. Calcium and sodium compounds dominate, while magnesium and dozens of other solubles can be founds therein. In freshly filled pools, the most common dissolved solid is calcium in some form, usually a salt or ion. As water "ages", however, the story changes.

Often confused, incidentally, suspended solids (turbulence, color ) are not measured as part of TDS. Only actually dissolved materials are measured. They remain completely invisible, as they are truly a part of the liquid.

The most prevalent solid dissolved in pool water of some "maturity" (most pools!) isn't calcium but sodium chloride, common "table salt". This is the key to the constant elevation of TDS in swimming pools. Sodium-bearing products, like soda ash (sodium carbonate), liquid chlorine (sodium hypochlorite), and dozens of other pool additives and products, not to mention human sweat and urine, are constantly being added to the pool.

Historically TDS has been slow to increase, since additions were slower and the salt accumulations in a pool were often offset by water losses. Typical values of TDS used to be below 1000 ppm, especial in younger water. Since operators often add calcium salts to newly filled pools for corrosion control, calcium may actually dominate the TDS for a short while. As water ages, however, especially in "tight" pools (those with no leaks and low backwash or other lass factors), the TDS climbs -yet is virtually all just plain salt. The rate of increase was quite tolerable back in the gas-chlorine days, usually balance by the diluting make-up requirements. But no more...

With the prevalence of liquid chlorine bleach, this is no longer the case. TDS rises often at rates of two or three thousand ppm per year. Sometimes it's faster. And routine dilution simply can't offset this tendency. TDS at significant levels, then, is here to stay as part of the water-chemistry concern of pool operators. The new, high numbers are routine; it's the level of concern and the advice which varies.

Here's where the recommendations differ. Due to biased training often received by the swimming-pool-supply industry, (folks who pass the advice on to you,) pool draining is often recommended at accumulated levels as low as 1500 ppm TDS. It is almost always recommended as values exceed 2000, certainly 3000, ppm TDS in the pool. Some "consultants" insist on such draining, disclaiming any responsibility for the health and safety of the patrons or the pool if the dilution is not accomplished! This is an erroneous, meritless and wasteful recommendation. Draining is rarely necessary even as values exceed 3000, 4000, 5000 ppm and more.

Just look at the extreme: Even seawater pools, at 32,000 ppm TDS or above, work just fine in all areas -chlorination (including ORP control), filtration, and corrosion prediction and management. Public seawater pools are clear, sanitary and manageable. A fresh-water pool operator can always use this argument with those who scream "drain" -it can't

refuted! Here's the rule for pulling the plug: Don't drain you pool unless you have a good reason to do so. And TDS alone generally isn't.

Wait a minute. What about the scientific-sounding references to losses in chlorine effectiveness as TDS rises? Well, like so may phenomena discussed by pseudo-technical experts, it's true to a very small degree -and who cares. Something called ionic strength or ionic pressure is elevated, decreasing slightly the amount of HOCl remaining associated at any given pH... (Are you following this? The "free" chlorine is comprised of slightly more OCl-) Compared to 400 ppm TDS, a level of 4,000 ppm increases ionization, thereby reducing chlorine's "work value", by an amount equivalent to the tiny loss you'd see with a bit over one-tenth rise in you pH! Our health departments, requiring two to ten times more chlorine residual than we usually need, take care of any loss to TDS we might experience.

So is there any really appropriate reason to drain, or partially drain, and refill a pool? Sure, there may be a number of em. Finding a high cyanuric-acid stabilizer level is one of the best reasons, having nothing to do with TDS. If TDS does find itself at the top of your reasons list, however, draining's elective, not mandatory. Period. Dilution of older water is often elected, for taste reasons alone, as levels of TDS reach four to five thousand ppm. At levels nearing 10.000, salt crystals form readily around puddles on the deck, and even your patrons' towels begin to feel a bit like sandpaper. Salt stalactites might form at drip-leak sites in the equipment room. The salty taste is truly obvious. So if manifested salt is a bother, (and if local water-conservation controls allow,) dilution may be in order after all.

Oh yes, if there's an "ionizer" device on the pool for enhanced water sanitation, electrical conductivity increases greatly with TDS and the machine's manufacturer demands dilution before de-plating, staining, and excess ion generation occurs. This creates an unacceptable paradox, and it's often the ionizer, not the water, that goes.

Some final conversation on TDS... TDS has so small an effect on the calcium saturation index that, in pool applications, it is generally ignored in the calculations. As the TDS increases, however, water gets slightly more aggressive. The rule here is: Subtract a tenth of a CSI unit (.1) for each 1000 ppm TDS above the first 1000. The rule doesn't hold as TDS climbs through, say, 5000 or so, where a half tenth or less should be subtracted per thousand. No matter how high it gets, all you need to do is compensate by raising other CSI factors. Your should never need to set the pH higher than about 7.8; compensate elsewhere, if necessary. Using a hundred parts additional calcium hardness is a good place to start. Observe your conditions and make adjustments accordingly; you're playing corrosion control by feel as TDS starts to match the water in the Bay...

Now some odd chemical constituent mixed in that mysterious "total" of TDS might in some pools create unusual conditions or reactions that seem unsatisfactory, and draining or diluting may be easier than exhaustive chemical analyses and high-prices consultation. Virtually any of the chloro- or bromo-unmentionables, products of incomplete organic oxidation which may accumulate -in, say, an indoor pool which hasn't been drained for forever -may cause non-specific or unidentifiable irritation or "phantom chloramine" which doesn't yield to superchlorination. In brominated pools of all types, bromate development in virtually unmeasurable quantities is another good example. Reason enough to drain? Yes. Measurable part of the TDS? No. In these cases, TDS is simply an index of water's age; what makes the meter move on the TDS meter is not the stuff you may have concerns over. Here's another case of operator judgment, formed over time through educated observation.

But what if you can't drain and want to? What if the complaints about salty flavor are unbearable, the ionizer's getting hot, and the brine shrimp are multiplying in the deep end? There are other ways to reduce TDS. One of the snazziest is the use of de-salting equipment, like they do in Saudi Arabia. Just pump your water through one of these hefty machines for a while and viola! TDS is coming down! Pretty neat -and it beats draining your pool! (Better put the hardness back quick, however...)

Here's a tried and proven technique -you can psyche the swimmers out, by telling them you've switched to a salt-based chlorine that's safer and better... and it'll make them swim faster and float better too! You'll never hear a complaint about taste again.

So that's about all there is to it. In almost every case -we're talking 95% or better -TDS is simply no concern at all. It's probably good to know the various numbers -you want to be an informed operator or manager who can explain the taste or why you hold the pH a little higher now... Just make it another column in you log book, to be checked monthly and discussed freely, They'll thank you really know your stuff.

~Kent Williams