Information Release
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Phosphates: Facts and Myths

During the current decade, phosphate removers for algae control in swimming pools have become widely used and *also misused*. Phosphates (also denoted as PO_4) are known nutrients to help increase plant growth rates such as in algae. However, there are several debates (and confusion) regarding phosphates in pool water. *The first debate* focuses on the acceptable level of phosphates in pool water to minimize algae growth. Several vendors of phosphate remover products state that the maximum level should be 125 ppb (parts per billion) or .125 ppm (parts per million). Others state that phosphates are not a concern until they exceed 1000 ppb or even higher. *The second debate* centers on how phosphates actually enter into pool water. Some say they enter from the source water, fertilizers, wind blow dirt / dust, plant debris, or even rain water. Other's state that cities treat their municipal water sources with phosphates. And finally, others claim that phosphate based scale and stain products are the primary source of phosphates. Who's right in these debates? Where is the credible data to support each other's claim? To help make sense of these debates, let's try to explore some facts and some myths about phosphates.


phosphate atoms

The first debate focuses on optimum phosphate levels to minimize algae growth. A simple experiment was performed to test the 125 ppb and 1,000 ppb theory. One quart size jar was filled with distilled water (no PO_4) and another quart jar was filled with tap water. To this jar, approximately 1,000 ppb phosphate was added. Both jars (lids left off) were placed in indirect sunlight on an outdoor patio table. In about 7 or 8 days, both jars developed green algae on the surface. This experiment was repeated several times with similar results. Try this test yourself and draw your own conclusion. Our conclusion: algae growth rates were unaffected at each phosphate level and phosphates are not likely a problem until they reach very high levels above 1000 ppb.

The second debate pertains to the most significant source of phosphates in swimming pool water. Again, let's separate some facts from myths. First of all, unless you live in an older city such as New York, Chicago, or St. Louis, less than 15% of municipal cities still add polyphosphates (SHMP) to reduce pipe corrosion. Second, most water samples collected from California to Florida revealed that many source waters contain only 20 to 100 ppb phosphates.

phosphate hard rock

For example, and to the surprise of many, Phoenix metro water contains only 50 ppb PO_4 (spectrophotometer analysis). Regarding fertilizer phosphate contamination, one pound of fertilizer containing 10% phosphorous would add 600 ppb PO_4. Although this is high, one pound of fertilizer added to a pool is highly unlikely. Last but not least, since phosphates do not atomize into the atmosphere, rain water is not a source of phosphates – period. The debate further states that soil, dust, and organic debris are also a large source of phosphates in pool water. To test this theory, another rather simple experiment was conducted. Soil samples were collected from vineyards in the San Joaquin Valley (the largest agri-producing county in the world). Two large 2000 ml beakers were filled with distilled water – without PO_4. The proportional equivalent of 100 and 500 pounds of soil were added to each beaker to replicate similar amounts that would have been added to a

20,000 gallon pool. Each beaker was agitated to allow absorption of phosphorus from soil into the water. After adequate contact time, analysis of each sample revealed: the 100-pound soil equivalent sample beaker only released ~ 800 ppb of phosphorous and the 500-pound soil equivalent sample beaker tested to contain only ~3500 ppb of phosphorous. While these levels of PO_4 may seem high, we actually expected a much higher level of PO_4 (such as 10,000 – 30,000 ppb) considering the large amounts of phosphate-rich soil used. Our conclusion: wind-blown dirt and organic debris cannot be a significant source of phosphates in normal pool water because the amount of dirt required to achieve high levels of PO_4 would be unrealistic in a normal pool environment.

So you ask, what is the principal source of phosphates in pool water? The answer appears to be pointed at an earlier claim - scale and stain products. These products are widely used for stain lifting, new pool startups, salt cell de-scaling, and general scale control. Many scale and stain products were tested. Most products contained a phosphonic acid. A typical 30% formulation tested releases about 1350 ppb phosphates and the most concentrated product releases approximately 2700 ppb into chlorinated pool water after about seven days.

In final conclusion, there is no evidence to support increased algae growth rates in swimming pool water below 1000 ppb. The largest source of pool phosphates appears to be from scale and stain products and not environmental. In the last few years, the use of phosphates in consumer and commercial products has sharply declined especially due to costs which nearly jumped 775% in 2008.

The author's recommendation: take phosphates out of pool water when they exceed 1000 ppb (300 ppb is a sufficient reduction level). If needed, use a low or non-phosphate scale-stain product, maintain adequate chlorine levels, keep pool water pH within proper range, and use an algaecide especially for pools with persistent algae blooms.

P.S.: To reduce high treatment cost, test and treat for phosphates annually and only remove phosphates if they exceed 1,000 ppb. At this point, go back to the basics of proper pool water treatment to keep costs under control.

Marvin J. Rezac Jr.
Technical Director
McGrayel Water Technologies
EasyCare® Products

1-800-289-7660, ext. 230
email: mrezac@mcgrayel.com

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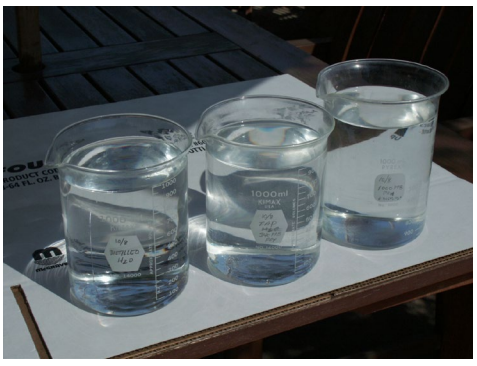

Jar testing to determine optimum phosphate levels for algae growth.