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Phosphates used in washing detergent – "Headline News" 'About half the states in the USA, and some countries in Europe, have limited, or banned, the use of phosphates in laundry detergents'.

As a result they are likely to be phased out of inclusion in washing detergent in the future. Why do we need to care about this?

"STPP" stands for Sodium Tripolyphosphate, one of the group of compounds known as complex phosphates. Why is STPP important? Well, after WWII, synthetic detergents gradually replaced natural soap products for use in washing machines. The detergents had the advantage of using surfactants, or sudsing agents, that were not as liable to being inactivated by hard water mineral ions as soaps were. However, surfactants are only a fraction of the mixture we call a laundry detergent. To replace other actions of a natural soap, compounds known as "builders" are added to detergent formulations.

These builders function in several ways. They increase the alkalinity of the wash solution, which helps the surfactant activity and also helps to emulsify fats and oils in the soiled fabrics. They also help to "break" clay-types of dirt from the fabrics, and combine with it to help prevent it from re-depositing on the fabrics. They also function to combine with hard water mineral ions, thus "softening" the water.

As with many things, some compounds are better at being a "breaking" function than others. A common builder is sodium carbonate. It has high alkalinity and also is good for breaking soil from fabric. However, it will form an insoluble compound with the hard water mineral ions, and also with mineral ions in the soil they release from fabrics. This insoluble compound gets re-deposited on fabrics and washer parts. On fabrics it can look like white lint, or powder. On washer parts, it can form a rock-like scale which can be harmful to the washer mechanisms often referred to as scale.
Here is where complex phosphates come in. These work because not only do they have all the virtues of water softening and breaking of precipiting breakers like sodium carbonate, but they also do not form a precipitate with mineral ions. Rather, they form what is known as a "complex" with them, which stays in solution and is easily rinsed away. Complex phosphates can occur in several different types of compounds. The most common used in powdered detergent formulations has been STPP or sodium tripolyphosphate. This compound works well to lift minerals like calcium, magnesium, and iron from fabrics as well as soften water, without forming a precipitate. STPP has one weakness, and that is that over time, with exposure to water, it will decompose into a mono-phosphate, or "orthophosphate", called trisodiumphosphate, or TSP. TSP is often used for cleaning hard surfaces where a precipitate is not a problem, but due to its precipitate formation is not favoured for laundry use. Many dishwashing detergents contain complex phosphates; for this reason the boxes usually are tightly sealed in foil faced packages, and have advice printed on them to store them in a cool dry place. This is intended to help prevent moisture from getting in and converting the complex phosphates to monophosphates.

After WWII, detergent manufactures started adding complex phosphates to laundry detergents. However, several environmental issues raised their heads in the 60's and 70's regarding detergents. One problem was the use of non-biodegradable surfactants. These would cause the appearance of persistent suds on streams, rivers, and lakes, which was a graphic indication of man-made pollution. It was relatively easy, however, for the detergent industry to switch to biodegradable surfactants that worked

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just as well as the non-biodegradable surfactants.

Another problem was the eutrophication (depletion of oxygen in water) of some lakes and water ways by excess algae growth. Phosphate is one of the three major essential plant nutrients. Since it does not migrate out of soil very easily, it is generally the most limited nutrient in fresh water bodies. In other words, nitrogen and potassium, the two other major essential plant nutrients, can be in water in abundance, but if phosphate levels are limited, then algae growth will be suppressed. With untreated municipal sewage entering water ways the phosphate concentrations can go up and enable algae growth to the point where oxygen in the water is depleted and fish die.

Now, the situation is more complex than a simple link between phosphates in laundry detergents and eutrophication. That's because phosphates are also an essential nutrient for humans, and a large part of the phosphates that enter the waste stream are from human bodily functions. Additionally, phosphates are still allowed in dishwasher detergents, and over fertilizing of gardens, lawns, and agricultural fields can add more to the fresh water ecosystem. There is also some opinion that focusing solely on phosphates as a solution to pollution ignores the deleterious effects of high amounts of nitrogen and other contaminants in waste waters. Additionally, sewage treatment plants can remove phosphates from waste waters, and the recovered phosphates can be used in animal feeds or as fertilizers.
In any case, the upshot has been that about half the states in the USA, and some countries in Europe, have limited, or banned, the use of phosphates in laundry detergents. In the US, however, in most areas phosphates are still allowed in laundry detergents for institutional or commercial laundries - a testament to the clear cleaning value that complex phosphates add to the laundry process. And of course phosphates are still allowed in dishwasher detergents throughout the USA, another recognition that their function is difficult to replace with other compounds. In Europe and increasingly in the USA, compounds such as zeolites (aluminium silicates) and phosphonates (a form of phosphate not thought to aid algae growth) are being used as substitutes for complex phosphates in laundry detergents. However, many powdered detergents simply use sodium carbonate as the main builder, with some sodium silicate to help protect washer parts, and some modified paper pulp, known as CMC or carboxymethylcellulose, to help prevent the redeposition of soil back onto fabrics. Also, more sophisticated laundry detergents have newer and patented chemicals to help address the functions once served by complex phosphates. Some of these newer chemicals are much more toxic than the phosphates they replace, and in early cases, an attempted substitution resulted in holes being eaten in some fabrics!

Which brings us to another widespread use of complex phosphates. Being an essential nutrient to both plant and animal life, complex phosphates have very low toxicity. In fact, STPP was once added to meat and fish products to maintain a soft yet firm, appealing texture. It was also even added in toothpastes. Without phosphates in your diet, your DNA would disintegrate, and your muscles would be unable to move. So, despite the bad name that phosphates have got over the years, they are in fact essential to all life.

If you are fortunate enough to live in an area where phosphates are still legal you will not be aware of the loss of the value of phosphates because those that are noticed that white clothing suddenly became much harder to clean with their favourite laundry detergent which removed phosphates from its formulation. STPP makes a big difference in cleaning heavy clay soil from many clothes, as well as keeping whites cleaner and brighter. STPP does not fade colours and rinses away easily. It is also somewhat milder than sodium carbonate (it buffers at a lower pH), which means it can be more gentle on clothes while being a superior cleaning agent.

So, in a nutshell, that's "STPP": a non-toxic, superior laundry cleaning compound. Where permitted, STPP can be the laundryman's - and laundrywoman's - best friend.