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Phosphoric Acid Substitute

Why a substitute?

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Technical Article

Phosphoric Acid: Why it should no longer be a “preferred” acid in our industry

For a number of years phosphoric acid has been marketed as a safer alternative to the historically “common” hydrochloric acid. Hydrochloric acid is an extremely volatile acid that not only acts very aggressively with many building products but also emits a vapour that does almost the same damage as the liquid itself. The vapour is also very harmful to the user making the use of masks and filters compulsory. Phosphoric Acid on the other hand does not have the same problems regarding vapour emission hence being “safer” to use. Along with this it is also less aggressive in its interaction with many building materials especially natural stone where it is less likely (you need much stronger concentrations) to set off adverse reactions with soluble minerals such as pyrite and vanadium to name a few.

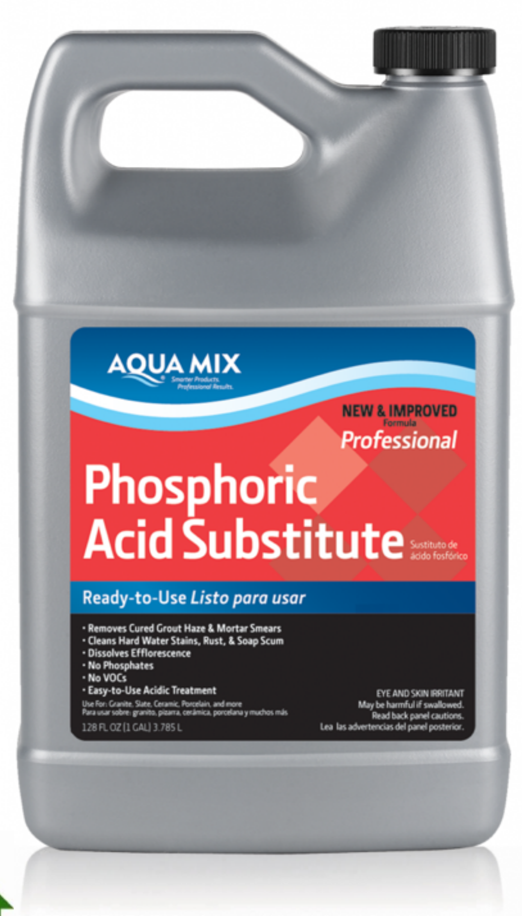
However with “green” issues and the environment under more scrutiny than ever before chemicals are increasingly under the microscope, to see if and how they damage environments. The environmental impact of phosphoric acid and phosphates in general has been investigated for a number of years and now with relatively clear results, regulation has started regarding the use of these materials. So what are the environmental impacts of phosphates which have led them to be increasingly banned across the globe?

Cyanobacteria bloom created by excessive phosphate pollution

The impact of phosphates such as phosphoric acid is on our water system and specifically as a water pollutant. Eutrophication is a natural process whereby a body of water becomes rich in nutrients such as phosphates and nitrates from natural run off, that in favouring plant life over animal, can in an extreme case pollute the water and destroy a lake or river. It is the human use of phosphates that accelerates and changes this process unnaturally. The water environment in our lakes and rivers is a very fragile ecosystem. Nutrients are generally available in very low concentrations and are in turn continually consumed by living organisms where this fine balance allows pollutants to diffuse rapidly rather than building up. The nutrients are also consumed by algae and rooted weeds, the weeds providing shelter for fish larvae and zooplankton, both of which eat algae and are in turn eaten by larger fish. It is a very finely balanced system.

However when high concentrations of phosphates are loaded into this system the balance is upset. The zooplankton population is the first causality with growth impeded. This then allows the algae population to increase dramatically. When this happens the high density floating masses of algae cut off the supply of light which causes the weeds to die. The decomposing weeds along with the ever increasing algae use up the dissolved oxygen which then kills the fish due to lack of shelter and of course oxygen. The water in the river or lake is well on its way to a major pollution catastrophe. This ultimately affects us because we rely on sources such as rivers and lakes to provide us with potable water. The oxygen deprivation and chemical saturation take a long time to simply fade away. The pollution lasts a long time often travelling through future generations of humans and animals exposed to the polluted water. This cycle of pollution is a well documented fact and is the reason why phosphates (including phosphoric acid) are now heavily regulated and banned in many regions around the world.

So what do we do in an industry such as the tile and stone industry where phosphoric acid has so many important applications such as the removal of minerals and cementitious contamination? The answer is to substitute the phosphoric acid (a mineral acid derived by chemical reaction from inorganic minerals) with an organic acid. Examples of common organic acids are citric acid, acetic acid and formic acid to name a few. In short organic acids are organic compounds with acidic properties. The main ecological advantage of organic acids is that they do not pollute the waterways like phosphates. However many see them as relatively ineffective when it comes to their performance of removing the traditionally encountered contaminants. In fact there has been relatively widespread scepticism regarding their performance when compared to inorganic acids such as phosphoric acid.



This scepticism is mainly the result of the fact that so few organic acids have been used commercially in our industry and the few that have, have certainly not been well researched or formulated. However with the ever increasing regulation of phosphates (and many other inorganic acids) and the push for "greener" products, organic acids are becoming commercially available that have the same (if not better in some instances) performance as their inorganic counterparts. Custom through their Aqua Mix brand, for instance, developed "Phosphoric Acid Substitute" which totally replaces their current Phosphoric Acid Cleaner. The performance of this new product is exactly the same as the old, including having no harmful vapours. However its main point of difference is that it is not a water pollutant and so fits into the companies overriding philosophy of manufacturing products that are sensitive to the environment. The introduction of Phosphoric Acid Substitute is an example of Customs' Green Build strategy where all products both new and old are measured against their environmental impact both as a formula and manufacturing process. The bottom line being that minimizing a products environmental impact is a non-negotiable characteristic of all research and development for new Custom materials.
This strategy is starting to take hold in our industry as well as many others as the importance of protecting our environment has now become widely acknowledged as the most important issue of our generation.

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