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## SeaQuest versus Zinc Orthophosphate

This case history is of a south-eastern US public municipal water supply system of approximately 60 MGD with a very long history (over 20 years) of zinc orthophosphate use along with pH (sodium hydroxide) addition for corrosion and lead/copper control. This system began to run into the problem of too much zinc in their waste water sludge and made the decision, along with



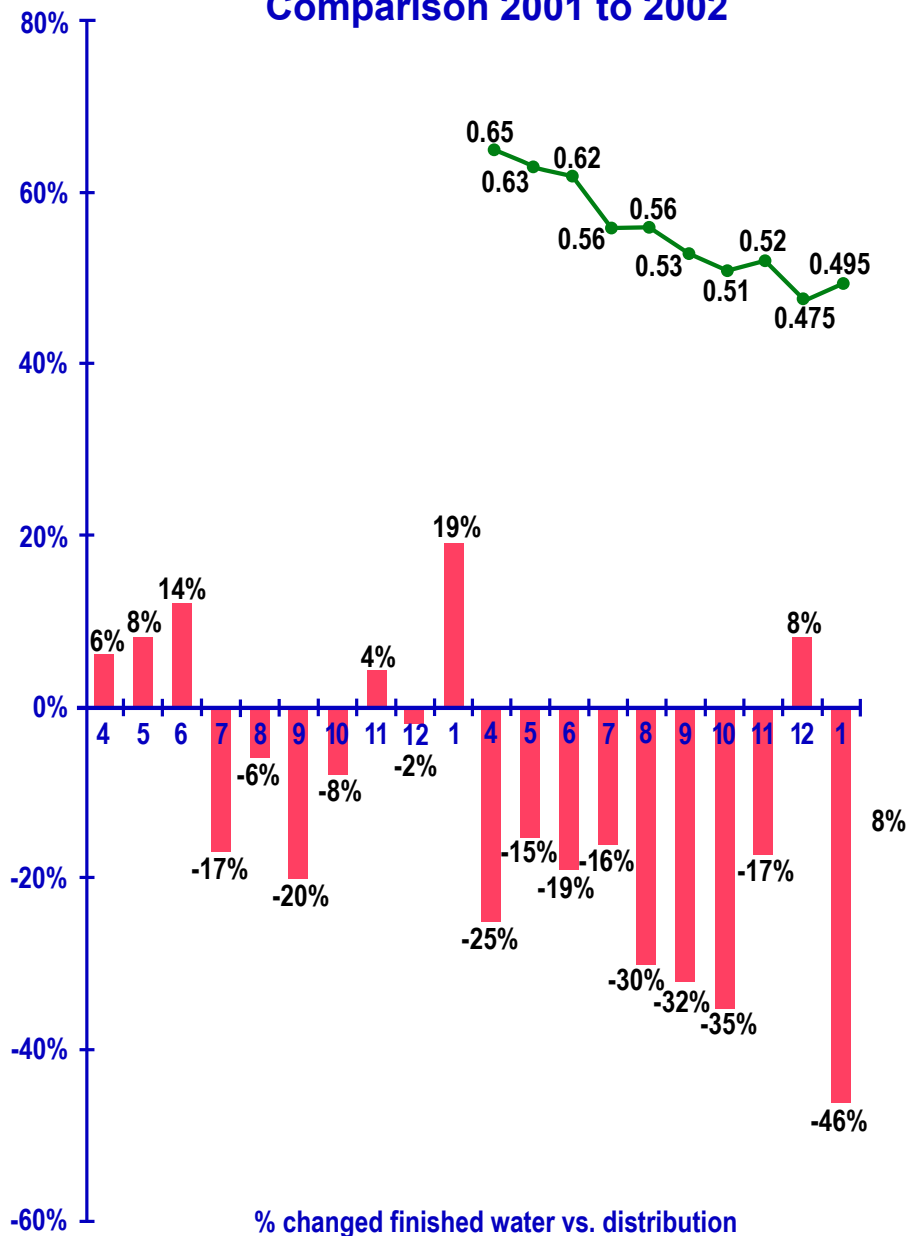
**their prominent engineering consultants to switch to a non-zinc containing drinking water corrosion control additive. After conferring with their engineering consultants who surveyed the total competitive product market, they determined that SeaQuest was the best choice given its long constant history of success in a variety of water qualities and locals.**

In the process of converting over from zinc orthophosphate, the customer allowed their supplies to drain down to a very low level, then flushed their storage tanks clean, and then filled them with SeaQuest Liquid. Water quality monitoring done daily and monthly, continued with SeaQuest use as it had been for the zinc orthophosphate, so after 12 months of use, there was excellent comparative data to insure that the SeaQuest was doing at least as good as the zinc orthophosphate, if not better. This municipality was not looking for improvement, but only maintaining what they were used to with the results from use of the zinc orthophosphate, while eliminating the zinc from their waste water sludge which was about to become a very expensive regulatory disposal matter if left unattended.

The following benefits have been noted after use of SeaQuest for one year:

- 1) Prior to SeaQuest treatment, the zinc levels in the distributed water was as high as 0.25 ppm and after one year of SeaQuest the level came down to 0.039 ppm.
- 2) The phosphate level in the finished treated water prior to SeaQuest was 0.75 ppm and after Sea Quest treatment went down to 0.50 ppm.
- 3) Prior to SeaQuest, of 1,548 sites tested over 9 months, 350 sites (23%) were showing chlorine residuals below 1.0 ppm
- 4) Since SeaQuest, these same 1,548 sites tested, only 203 sites (13%) were showing chlorine residuals below 1.0 ppm. This represents a 42% decrease in the number of sites below 1.0 ppm since the start of SeaQuest treatment.

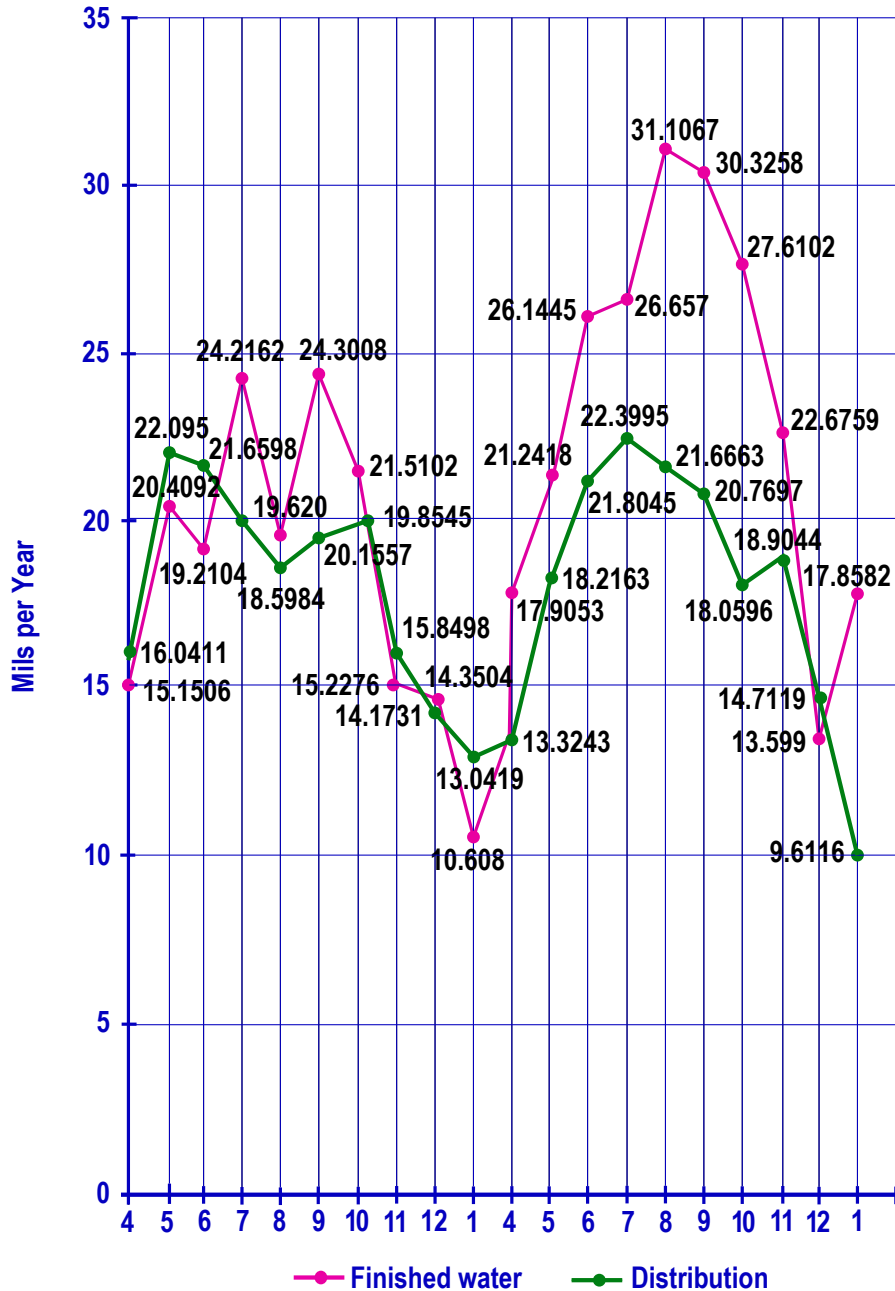
## Corrosion Rates Comparison 2001 to 2002



In the chart above, the corrosion control rate results comparing zinc orthophosphate results from 2001 with 2002 with SeaQuest treatment comparing the percentage change of finished water versus that of distribution. It is noted that after SeaQuest treatment, there was a considerable difference in corrosion rates in distribution of the SeaQuest treated water from that of the finished untreated water versus the same for the

zinc orthophosphate treated water from the prior year. This meant that SeaQuest was providing significantly greater corrosion control over what had been obtained from zinc orthophosphate. This can be seen more clearly from the graphed actual results, comparing corrosion rates of the finished untreated water to distribution with zinc orthophosphate use, with the corrosion rates of the finished untreated water to distribution with SeaQuest use.

## Coupon Information 2001 vs 2002



Additionally, the lead and copper numbers were totally non detect after being on SeaQuest for one year against some detections for the prior year with zinc orthophosphate even though they were never exceeding.

Regarding overall water quality from colored water complaints, there had not been any significant complaints prior to SeaQuest nor after one year of Sea-Quest use.

In conclusion, it is noted that all the above listed benefits represented very significant improvements in water supply and distribution piping quality, while accomplishing the main goal of reducing/eliminating zinc from the waste-water sludge. At this time, the customer is starting a program to reduce pH adjustment which will result in further improved chlorine residuals, lower chlorine demand, lower potential THM and HAA levels, and additional cost savings by reducing/eliminating the need for pH control.

## 2

### All phosphates are equal. Do you want to bet?

During the fall of 2001, this large system began testing a blended phosphate corrosion inhibitor. This corrosion inhibitor was tested because the manufacturer claimed that his phosphate would:

- a. Sequester metals (iron and manganese)
- b. Sequester hardness (calcium and manganese)
- c. Remove iron tuberculation from the distribution piping
- d. Provide corrosion protection
- e. Not require increasing pH nor alkalinity
- f. Prevent red-water complaints
- g. Be cheaper per million gallons treated than the corrosion inhibitor we were currently using

We intended on testing the product for 90 days. However, our chemical bids were due re-bidding prior to the tests being complete with the corrosion inhibitors. We decided to write a specification for the “test” blended phosphate and receive bids for our past corrosion inhibitors and the on-test blended phosphate. Five manufacturers bid on the blended phosphate corrosion inhibitor claiming to be equal to the phosphate we were currently testing, called SeaQuest. Evaluating the seven or eight chemicals that the plant uses to treat surface waters, corrosion inhibitor is the most difficult chemical test for effectiveness in a short period of time. We requested that the Board of Commissioners allow the treatment plant to test these “equal” chemicals for a maximum of 180 days each on-line. The Board approved that a test be conducted to determine the “equalness” of the blended phosphate inhibitors.

We contacted the manufacturers that the bid on this product determines their willingness to participate in the test. We sent them water quality information and asked about recommended feed dosages, desired finished pH, desired finished water quality, and test pro-



cedures to determine the level of product in the water. We asked them to participate in the test at their bid price. We asked for two-fifty pound buckets of product to perform a physical test. All five manufacturers agreed to the test and agreed to send the material needed for the physical test. We continued “testing” SeaQuest product in the plant.

We received the manufacturer’s “answers” to our inquiry about dosage rates, final water pH and alkalinity, and phosphate test recommendations. We designed procedures for the physical testing of the phosphate (solubility, ease of purging, pH 5% solution, density, lumpiness). The plant supervisor and the staff engineer opened the buckets together and checked the product for various physical properties. They also placed the phosphate in buckets marked only with a letter. This method was chosen so that an independent tester could test phosphates without knowing which product was which (as close to a blind test as possible).

There were two very important developments that need discussing immediately. After the procedures for the test were written, we still did not have the physical test product from Company A. We decided to wait more time. While waiting, the SeaQuest period was ending. We ordered the next test chemical product from Company B. Company B’s product was placed on test and Company A still had not send product to perform the physical portion of the test. After waiting one month, we performed the physical portion of the test. Company B’s product failed the solubility

## All phosphates are equal. Do you want to bet?

cont'd.

and density portion of the physical properties tests. Had we not waited for Company A's physical test material and perform the physical testing of the other products, we would have not included Company B's product in the actual in-plant test of these corrosion inhibitors. Company B's product did not fully dissolve and the mixed chemical was always cloudy. The operators disliked this product. **"Company B's product is not an equal to SeaQuest"**.

Our next test chemical was a product from Company C. Company recommended a feed rate of 0.71 ppm of ortho PO<sub>4</sub> residual. This feed rate yielded a product feed of 3.4 ppm Company C recommended an optimum pH of 7.0 to 7.5 and stated "pH adjustment with caustic soda is an option". No recommendation for final water alkalinity was made however. The process consultant that was hired by us to perform the SDWA Assessment recommended a final water alkalinity of at least 50 ppm to reduce corrosion potential. **"Company C's product is not an equal to SeaQuest."**

The next chemical to be tested was Company D. The supplier recommended a finished water pH of 7-7.5 and a finished alkalinity above 30 ppm. Again, the consultant we hired recommended a minimum of 50 ppm. **"Company D is not an equal to SeaQuest"**

To assist in attaining the required TOC reduction, both plants utilize acid-alum their primary coagulant. This product has additional sulfuric acid to break down the organic carbon and allow floc to form. However, using acid-alum causes a significant reduction in the water quality. This reduction in alkalinity will generally result in

lower pH levels. The main plant generally begins with less alkalinity than the secondary plant and thus must add soda ash to raise the pH and increase the alkalinity. We generally feed about 20 to 30 ppm of soda ash. At the normal feed rate, we do not attain a finished water pH of over 7.0. To attain a 7.0 finished water pH would require a much higher feed rate of soda ash resulting in more treatment cost. SeaQuest states that their product provides protection at a low pH level, consequently the water does not need alkalinity adjustment. The EPA's National Secondary Drinking Water Regulations' pH range is 6.6 to 8.5. We can meet that level with the amount of soda ash that we currently use. To reach the 7 or 7.5 Company A and Company B vendors suggested they would require doubling and sometimes tripling the current feed rate. We currently do not add alkalinity at the secondary plant because the finished water pH is generally above the SDWA level of 6.6. **With all products other than SeaQuest, pH adjustment will become necessary if we are to adhere to the 7 to 7.5 pH suggestion. We must continue to adjust at the main plant, however, if any product other than SeaQuest is used, more upward adjustment will be needed than we currently attain.**

In conclusion, Company A was not tested because the vendor never sent the material to perform physical testing. Company B had elevated corrosion rates at the recommended dosage. They are not considered an equal. Company C recommended finished water of 7-7.5 and the extra cost of soda ash makes the use of this product more expensive than using SeaQuest. **The SeaQuest product outperformed the other test chemicals and is recommended as the corrosion chemical for use at both plants.**

**(For names of the other companies, please e-mail Aqua Smart, Inc. directly.)**



# 3

## Do electromagnetic devices work on calcium salts? (as reprinted from the Opflow, February, 2003)

“First, let’s look at magnetic or electromagnetic water treatment units. Numerous related Internet sites fall into three classes: those promoting a particular brand of water, those established to debunk the entire idea of magnetic treatment of water (and other uses), and a few that try to address the issue from the scientific viewpoint.

According to some magnet vendors, magnets can be used to improve blood circulation, increase automobile mileage, improve plant growth, soften water, prevent tooth decay, and even increase the strength of concrete. A few of these claims are backed by experimental evidence, but most are not.

There is almost no scientific evidence that these devices consistently work. Some scientific investigations have found some level of effectiveness in electromagnetic devices used to reduce the amount of tenacity of scale, but none are able to report the reason for the achieved effect. Attempts to reproduce results nearly always fail, probably because other uncontrolled factors influence the results.



Several studies show electromagnetic devices may have an effect on the type of scale and the attachment of that scale when applied to industrial boiler water, possibly from an interaction between silica and the calcium carbonate scale deposits. However, these studies seldom provide conclusive scientific evidence.

Consumer Reports conducted a two-year, side by side study of water treated by one brand of domestic magnetic treatment device compared to untreated water and found no difference in scale formation in parallel domestic water heaters. I found no studies that show that electromagnetic devices are effective in domestic, first-use water applications...”

# 4



## Thought of the month

The best product of choice is not always the cheapest. Remember above all else, you get what you pay for.

# 5

## News from over there

SeaQuest is finding its way into more and more desalination systems as this type of water supply becomes even more established as a water source in specific parts of the world short of ground and surface water. The reason is simple. It works. There is not other product that can function at the variable pH ranges produced with desalinated water and the low to non existent alkalinity other that SeaQuest. If you are servicing a desalination unit anywhere in the world, call Aqua Smart for further information.



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## Anyone know the answers?

- 1) What is the log removal or inactivation required for viruses?
- 2) The quantity of oxygen that can remain dissolved in water is related to what water quality parameter?
- 3) The capability of water to resist a change in pH is called what?

## Anyone know the answers:

- 1) 4.0 log
- 2) Temperature
- 3) Buffering capacity

### Editor's Note:

We have attempted to provide our readers with topics we believe to be of interest based on numerous questions and responses which have been posted on the AWWA Discussion Forum, Water Technology Forum, and other drinking water forums. We welcome all responses, recommendations, and suggestions on related topics you wish to see discussed.

E-Mail Us with your comments & suggestions: [AquaSmart1@aol.com](mailto:AquaSmart1@aol.com)

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