

AULICK

Inspired innovation.

Customized Phosphate Line for Corrosion Control, Cleaning, and Sequestration of the Drinking Water System

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Corrosion/Sequestration

Aulick is committed to innovating new technology to enhance drinking water quality from the water treatment facility to the tap. During research, three major functions were studied with respect to water treatment:

- corrosion control
- cleaning
- sequestration

CLARUS

U.S. Patent 10,011,508

In the past, these functions were conducted with one type of chemistry: phosphates. Restrictions are growing tighter each day on the discharge limits of phosphorus for wastewater treatment facilities. With that in mind, Aulick developed a chemistry with lowered phosphate concentration.

It's assumed that corrosion control in a water distribution line occurs at day one when feeding a product. However, corrosion control of a pipe can only occur once the scaling and buildup has been removed from the pipe wall. Once the pipe surface is exposed, corrosion control can occur. On a newly installed line, corrosion control can occur at day one.

Cleaning occurs immediately and is the easiest function of phosphate products. Aulick analyzed the function and the end product of cleaning. It was found that all chemistry relies on extensive flushing of the water distribution system due to poor water quality from cleaning. This shows two things; the cleaning process is occurring and sequestration is very inefficient.

Clarus - Patented Water Treatment Technology

Sequestration in the water treatment industry is mostly misunderstood.

Sequestration occurs when sequestrants form soluble complexes and inactivate the cations from re-precipitating or re-scaling.

When water lines are cleaned, the end result is a large amount of black, red, or white precipitants that require maximum flushing. If a product is cleaning properly, one should expect it to also sequester properly as well.

Clarus will control corrosion and clean the water distribution line by removing scale, tuberculation, and biofilm.

However, when developing Clarus, Aulick focused on the sequestration of heavy metals and soft metals such as iron, manganese, calcium, and magnesium to maintain a complete solubility of removed material.

Aulick has employed the latest scientific technology to bring forth the creation of Clarus, a patented technology - 10,011,508.

Clarus is the Latin word for "Clear". With Clarus technology focusing on true sequestration in the water treatment system the name is a perfect fit.

Clarus has separated itself from other general chemistry with increased temperature and pH stability.

Research and development has shown Clarus to clean, control corrosion, and sequester at temperatures over 250°F and pH levels as low as 4.6.

Technical Specifications

Components:	100% U.S. Manufactured
Appearance:	Clarus - White Powder Clarus L - Clear Liquid
Specific Gravity (Liquid):	1.30 Minimum
Product Concentration:	Clarus - 100% by Weight Clarus L - 35% by Weight
pH of 1% Solution:	5.07
pH Operating Range:	4.6 - 9
Solvency in Water:	Infinite
Certification:	NSF, Standard 60, Approved
Temperature Stability Range:	- 25°F to Above 250°F
Odor:	None
Scale/Corrosion Removal Range:	Varies with Feed Rate

CLARUS

U.S. Patent 10,011,508



United
States
of
America



To Promote the Progress

of Science and Useful Arts

The Director
of the United States Patent and Trademark Office has received
an application for a patent for a new and useful invention. The title
and description of the invention are enclosed. The requirements
of law have been complied with, and it has been determined that
a patent on the invention shall be granted under the law.

Therefore, this United States

Patent

grants to the person(s) having title to this patent the right to exclude others from making,
using, offering for sale, or selling the invention throughout the United States of America or
importing the invention into the United States of America, and if the invention is a process,
of the right to exclude others from using, offering for sale or selling throughout the United
States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2)
or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the
Maintenance Fee Notice on the inside of the cover.

Andrew Lamm

DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE

Corrosion/Sequestration

Aulick's goal is to enhance drinking water quality and preserve the integrity of the water distribution system with the use of inorganic phosphates. After extensive research, Aulick developed phosphate blends to maximize their capability to perform the basic functions of:

- corrosion control
- cleaning
- sequestration



During the research and development of Verus, Aulick kept in mind the need for the highest efficiency and effectiveness in order to utilize the lowest possible feed rate, which equates to lower chemical costs. Verus Blended Phosphates will also control copper and lead at the tap to meet or exceed the DBP Rule for THMs and HAAs.

There are approximately 18 phosphates certified for use in drinking water. With the possibilities available, there are two major types for potable water treatment; orthophosphates and polyphosphates. There are four orthophosphates; 1 liquid and 3 white powders. Polyphosphates are more complicated by subtypes; namely pyrophosphates and polyphosphates (which may be condensed or linear). Each component functions differently with respect to pH, solubility, thermal stability, color control, corrosion control, and reversion rate.

While phosphates function to clean and attack the corrosion problem, linear polyphosphates also exhibit the capability to sequester heavy and soft metal ions with a valence of +2, which includes iron, manganese, calcium, and magnesium. Sequestration of iron and manganese cations prevent color formation by binding the +2 cations to prevent their oxidation to colored cations. The binding of calcium and magnesium cations (sequestration) acts to soften the water, also improving water quality.

Verus Blended Phosphates

In order to inhibit corrosion in metal pipes of the water distribution network, pipes must be clean of scale, tuberculation, and biofilm.

Once clean, the phosphate will apply a protective coating to passivate the metal surface.

New piping also requires treatment to inhibit the onset of corrosion. PVC pipes do not corrode, however, this process does foster the growth of biofilm. The proper phosphate blend will prevent biofilm formation that causes an increase in chlorine demand in the distribution system.

Care was taken during the development of Verus regarding versatility to pH. This is due to variation in pH of water during processing and independent of pH in different locations in the plant.

Verus Blended Phosphates are fully functional within the regulatory pH limits of 6.0-9.0.

Temperature stability is critical in phosphates. The most critical area in the water distribution system is the home water heater. To maintain a clean and efficient water heater, the lines must be kept clean of calcium deposits.

The issue of reversion of polyphosphates back to orthophosphates was taken into consideration by selection of phosphate components that exhibit the best chemical stability.

In consideration of product quality, one must know that chemical stability varies with water temperature, so selection should be made based upon the two opposing variables of sequestration capacity and molecular structure stability. Verus has maximized the molecular chain length of its phosphates without hindering the molecular structure stability.

Verus 2575 - Technical Specifications

Components:	100% U.S. Manufactured
Appearance:	Verus 2575 - White Powder Verus 2575L - Clear Liquid
Odor:	None
Density:	Verus 2575L - 11.4 lbs. per gallon
Specific Gravity (Liquid):	1.30, Minimum
Product Concentration:	35% by Weight Minimum
Ortho/Poly Ratio:	25/75
pH Operating Range:	6-9
Solvency in Water:	Infinite
Temperature Stability Range:	- 25°F to Above 250°F
Scale/Corrosion Removal Range:	Varies with Feed Rate



NSF, Standard 60, Approved

Verus 3070 - Technical Specifications

Components:	100% U.S. Manufactured
Appearance:	Verus 3070 - White Powder Verus 3070L - Clear Liquid
Odor:	None
Density:	Verus 3070L - 11.4 lbs. per gallon
Specific Gravity (Liquid):	1.30, Minimum
Product Concentration:	35% by Weight Minimum
Ortho/Poly Ratio:	30/70
pH Operating Range:	6-9
Solvency in Water:	Infinite
Temperature Stability Range:	- 25°F to Above 250°F
Scale/Corrosion Removal Range:	Varies with Feed Rate



NSF, Standard 60, Approved

Verus 5050 - Technical Specifications

Components:	100% U.S. Manufactured
Appearance:	Verus 5050 - White Powder Verus 5050L - Clear Liquid
Odor:	None
Density:	Verus 5050L - 11.4 lbs. per gallon
Specific Gravity (Liquid):	1.30, Minimum
Product Concentration:	35% by Weight Minimum
Ortho/Poly Ratio:	50/50
pH Operating Range:	6-9
Solvency in Water:	Infinite
Temperature Stability Range:	- 25°F to Above 250°F
Scale/Corrosion Removal Range:	Varies with Feed Rate



NSF, Standard 60, Approved

Verus 7030 - Technical Specifications

Components:	100% U.S. Manufactured
Appearance:	Verus 7030 - White Powder Verus 7030L - Clear Liquid
Odor:	None
Density:	Verus 7030L - 11.4 lbs. per gallon
Specific Gravity (Liquid):	1.30, Minimum
Product Concentration:	35% by Weight Minimum
Ortho/Poly Ratio:	70/30
pH Operating Range:	6-9
Solvency in Water:	Infinite
Temperature Stability Range:	- 25°F to Above 250°F
Scale/Corrosion Removal Range:	Varies with Feed Rate



NSF, Standard 60, Approved