Maximize Your Water Quality With Carus Blended Phosphates

AQUA MAG® blended phosphate, CARUS™ 632S and CARUS™ F-35 water treatment chemicals are among the most effective products approved for drinking water color, scale and corrosion control. Blended phosphates are used to reduce stains, discoloration, and rusty water caused by oxidized iron and manganese in source water. Blended phosphates also ensure compliance with the Lead & Copper Rule by minimizing corrosion in your distribution system and keeping lead & copper levels below the action limit of 0.015 mg/L for lead and 1.3 mg/L for copper).

COROSION CONTROL BENEFITS

- Minimize release of iron, lead, copper, zinc, and calcium from pipe surfaces
- Prevent iron corrosion and color formation from pipe surface tuberculation
- Minimize corrosion reactions and tuberculation at low dosage rates
- Effectively lowers chlorine demand from iron by-products
- Maintain system infrastructure, mains, valves, and meters

Highly Corroded Water Distribution Line

COLOR & SCALE CONROL BENEFITS

Iron Particles Cause "Red Water"

- Prevent color formation from Fe/Mn and water deterioration in the system
- Prevent carbonate scale formation from Ca/Mg hard water at threshold dosage
- Effectively lower chlorine demand stabilize system residual
- Gradually remove surface deposits and corrosion by-products in water system
- Remove protective environment of bacterial regrowth
- Increase C-Factor and fire hydrant flow rates and improve valve operations
- Inhibit general surface corrosion, microbial corrosion, and pitting

CHEMISTRY

Corrosion byproduct	+	**Phosphate Inhibitor**	⇒	**Insoluble Compound**
Copper (Cu^{+2})		+ $(PO_3^-)_n$ polymolecule	⇒	$Cu—(PO_3)_2$ film
Lead (Pb^{+2})		+ $(PO_4^{-3})_n$ orthomolecule	⇒	$Pb—(PO_4)$ film

Raw Water Cations	+	**Anionic Sequestering Agent**	⇒	**Soluble Metal Complex**
Iron (Fe^{+2})		+ $(PO_3^-)_n$ molecule	⇒	$Fe—(PO_3)_2$
Manganese (Mn^{+2})		+ $(PO_3^-)_n$ molecule	⇒	$Mn—(PO_3)_2$
Calcium (Ca^{+2})		+ $(PO_3^-)_n$ molecule	⇒	$Ca—(PO_3)_2$
Magnesium (Mg^{+2})		+ $(PO_3^-)_n$ molecule	⇒	$Mg—(PO_3)_2$

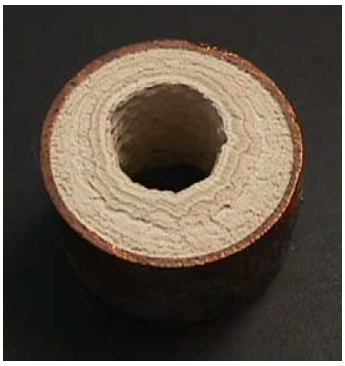
ORTHOPHOSPHATE CHEMISTRY

Main breaks, water leakage, loss of hydraulic capacity from corrosion by-products, and water quality deterioration are the primary results of uncontrolled corrosion in a water system. The EPA Lead & Copper Rule (1991), 40 CFR Parts 9, 141, and 142 was enacted to minimize the release of lead/copper by-products from plumbing, soldered joints, and brass fixtures. Application of Carus blended phosphates can easily by injected via a chemical metering pump into finished water separate from other chemical additives (chlorine, fluoride, caustic soda, etc.).

Unsafe, Corroded Lead Pipe

AQUA MAG® blended phosphate, CARUS™ 632S and CARUS™ F-35 water treatment chemicals form microscopic coatings of insoluble orthophosphate or passivate the pre-corroded pipe surface with a metallic-phosphate complex. These chemicals adapt to the water quality and system conditions adhering to iron, steel, galvanized, lead, copper, asbestos/cement, and metallic alloys. Inhibitor coatings tend to remain thin, since they are self limiting and yet very protective of the base metal or plumbing fixture, because some orthophosphate compounds are highly insoluble in water and polyphosphate chains carry an affinity for the metallic pipe surface. Carus orthophosphates provide barriers against anodic current flow and metal pipe release, while Carus polyphosphates react with metal ions ($Metal^{+2}$) released at the anode to minimize metal discoloration in the water and also react with corroded pipes minimizing oxygen transport to the surface, decreasing cathodic corrosion reactions. There are many variables to the corrosion mechanism and the inhibitory properties of Carus phosphates, but research reveals that Carus orthophosphate, polyphosphate, and blended phosphates are proven to minimize various corrosion reactions.

Phosphate ions are negatively charged particles (anions) with an electronic attraction for oppositely charged positive ions (cations) on a pipe or corroded pipe surface. When cations such as Fe, Cu, Pb, or Zn come in contact with the orthophosphate anions, they react to form a coordinated molecular structure that becomes insoluble in the water. Application of condensed polyphosphates into water supplies will delay the oxidation, color formation, and precipitation of metallic cations in a water system and also recapture iron that is being released from pipe tuberculation as rusty water.



Extreme Calcium Build-Up Restricts Water Flow

POLYPHOSHPATE CHEMISTRY

Naturally occurring iron and manganese contaminants are often detected in groundwater supplies. A growing number of water systems currently exceed the EPA Secondary Maximum Contaminant Level (SMCL) of 0.3 mg/L of iron and 0.05 mg/L of manganese. If these contaminants remain below the SMCL, or in their original soluble form they may pass undetected through the water distribution system. Above this level, soluble iron (Fe^{+2}) and manganese (Mn^{+2}) will gradually react with dissolved oxygen, chlorine, or oxidizing bacteria in the distribution system to form yellowish-orange or brownish-black colored insoluble particulates. Calcium (Ca^{+2}) and magnesium (Mg^{+2}) also found in groundwater remain soluble under most conditions, however they do react with soap to form insoluble salts (soap scum). When heated, calcium and magnesium form insoluble hard water scale.

Unsightly color, turbidity, and sediment will eventually develop in the water. Scale deposits will form throughout distribution mains unless the Fe, Mn, Ca, and Mg is chemically bound-up or suspended with a sequestering agent.

All phosphate ions are negatively charged particles (anions) with an electronic attraction for oppositely charged positive ions (cations) in the water or on a pipe surface. When soluble cations such as Fe^{+2}, Mn^{+2}, Ca^{+2}, or Mg^{+2} come in contact with the polyphosphate anions, they react in various degrees to form a coordinated molecular structure that remains soluble in the water. As a result of this chemistry, application of AQUA MAG® blended phosphate, CARUS™ 632S and CARUS™ F-35 water treatment chemicals into water will delay the oxidation, color formation, and precipitation of metallic cations in a water system.

BLENDED PHOSPHATE SELECTION

Like fingerprints, no two potable water sources are the same. Carus Chemical Company can help eliminate red and black water, prevent scaling, ensure compliance with the Lead & Copper Rule, and solve other drinking water quality headaches. By evaluating your key water quality parameters, such as pH, hardness, iron, and manganese and your treatment objectives such as elimination of red and black water and corrosion control Carus can use computer modeling to select the most cost-effective product, determine dosing requirements, and predict performance. Carus laboratory staff provides analytical services, feasibility studies, and dosage evaluations for the specific requirements of your water system.

Responsible Care®
Good Chemistry at Work

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