

## The Use of Iron Chlorides to Control the Formation of Struvite

The control of struvite formation in wastewater treatment is very important for efficient operation and reduced maintenance. Struvite formation in anaerobic digesters and down stream sludge handling systems can cause loss in plant efficiency by plugging pipes and reducing pump capacity.

### FORMATION

Struvite (magnesium ammonium phosphate hexahydrate) is formed under anaerobic conditions when ammonia, phosphate, and magnesium are present at an elevated pH. The pH increases as the activated sludge decomposes under the appropriate conditions. As the sludge is concentrated, the struvite reaches super saturation in the decanted liquid and will deposit in pipes and holding vessels. Although other complex salts can be formed under these conditions, the main concern is struvite precipitation.

### HOW DO IRON CHLORIDES WORK?

Struvite formation can be controlled by the removal of one of its constituents. An economical method is to remove the phosphate ion by injecting ferric chloride at any of several locations. The ferric cation will react with the available phosphate anions to form an insoluble salt, which remains in the sludge cake.



Using atomic weights and the above equation, you can calculate the theoretical amount of ferric ion required to remove phosphorous.

$$56 \text{ lbs Fe}^{3+} / 31 \text{ lbs P} = 1.8 \text{ lbs Fe}^{3+} / \text{lb P}$$

ferric chloride is 34.4% iron on a dry weight basis, it will require:

$$1.8 \text{ lbs Fe}^{3+} / .344 = 5.23 \text{ lbs dry FeCl}_3 / \text{lb P}$$

Another benefit of ferric chloride addition is that the overall phosphate content in the treatment plants recycled water will also get lowered. If ferric chloride is added at the headworks of the plant, additional benefits of greater TSS and BOD removal may be realized in the primaries.

## DETERMINING A DOSE RATE

The following steps may be taken to determine the correct dose rate.

1. Determine the phosphate concentration.
2. Identify the injection point that will allow the best mixing and contact time with the influent to the solids removal facility.
3. Determine on a laboratory scale the iron chloride dosage needed to reduce the phosphate levels below saturation.
4. Conduct a plant trial.

For more information, please, visit our website at <http://www.orcawt.com> or send inquiries to [info@orcawt.com](mailto:info@orcawt.com).