

Ferrous Sulfate

Pencco's Liquid Ferrous Sulfate:

Odor and Corrosion Control for Wastewater Systems

Description

A clear-green solution containing soluble iron. Ferrous sulfate is a high quality product manufactured to strict specifications. Pencco's manufacturing process results in a superior liquid iron product by the reaction of sulfuric acid and high-quality metallic iron.

Application

Ferrous sulfate is applied to wastewater collection systems, lift stations, headworks and internal plant processes for multiple purposes, such as odor and corrosion control, H₂S control, paper mills, WWTP & phosphorus removal.

Typical Analysis

Concentration	5%
Specific Gravity	1.15; 9.6 lbs./gal.
Free Acid	nil
pH	≥ 2.0
Appearance.....	clear-green to aqua solution

Product Handling

Ferrous sulfate is normally shipped in 4,500-gallon truck load lots in Pencco, Inc. trucks. Suitable handling materials include fiberglass, PVC, polypropylene and polyethylene.

Health and Safety

Ferrous sulfate is not classified as a hazardous material. It is transported under D.O.T. Placard 3082. Care should be taken to prevent ingestion and/or eye and skin contact. Protective footwear, gloves and eyewear should be worn. Should any solution come in contact with eyes or skin, it should be washed with generous amounts of water. Refer to the MSDS for more detailed safety information. NFPA ratings are Health - 2, Flammability - 0, Reactivity – 0, Specific - 0.

Ferrous Sulfate

Pencco's Enhanced Liquid Ferrous Sulfate: pH >4.0

Odor and Corrosion Control for Wastewater Systems

Description

A clear-green solution containing soluble ferrous iron. Ferrous sulfate is a high quality product manufactured to strict specifications. Pencco uses a proprietary manufacturing process which results in a superior liquid iron product by the reaction of sulfuric acid and high-quality metallic iron. This enhanced product is made to stringent standards to give worry free storage and less impact on alkalinity reduction when fed into the system.

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Ferrous Sulfate Use

The Benefits

Ferrous sulfate contains iron salts at a concentration of approximately 0.5 pounds iron per gallon. The iron salts can perform the following functions in a wastewater treatment plant:

Hydrogen Sulfide Removal

Ferrous sulfate, when fed at any point in the system, removes hydrogen sulfide as ferrous sulfide. It is very specific in that it only reacts with the hydrogen sulfide in solution. Ferrous Sulfate does not react with the other items in the stream and will not precipitate them out. As a result of the hydrogen sulfide removal, the following benefits are obtained:

- Odor Control:**
- * Odor reduction in the collection system, plant headworks and digester off-gas
 - * Odor reduction in the primary clarifier and digester sludge
- Corrosion Control:**
- * Sulfide removal in the digester off-gas methane reduces corrosion
 - * Assists in meeting CMOM requirements and in protecting wastewater infrastructure
 - * Prevents corrosion in the collection system

Phosphorus Removal

When oxygen is present, ferrous iron is oxidized to ferric iron, forming three cationic polymers: ferric phosphate, hydrate and sulfate. Depending on the conditions, it requires 1.5 to 2.0 pounds of iron to remove 1 pound of phosphorus.

Alkalinity Loss

In the removal of phosphorus, ferrous sulfate causes the least alkalinity loss of the metal salts, from 30% to 60% less than ferric sulfate or aluminum salts. This can become a significant factor where caustic is fed to increase alkalinity as in the area of nitrification. Normally, the pH will decrease in a wastewater stream by 0.1 to 0.2 units. When using ferrous sulfate as opposed to using ferric sulfate which can lower the pH significantly.

Sludge Conditioning

The addition of the iron molecule to the sludge particle increases the weight, compaction and compression of the sludge. The sludge blanket is more stable and is less affected by changes in hydraulic loading.

Sludge Volume Index Improvement

The weight of the ferrous sulfate aids in the settling of fine solids, which increases the settling rate.

Solids Removal

When ferrous sulfate is added, the sludge blanket in the clarifier becomes thicker and denser, thereby trapping more of the fine pin floc. This can give the benefits of CEPT without the large chemical costs associated with CEPT.

Total Suspended Solids (TSS) Reduction

Ferrous sulfate decreases TSS in plant effluent by enhancing coagulation.

Safety Assurance

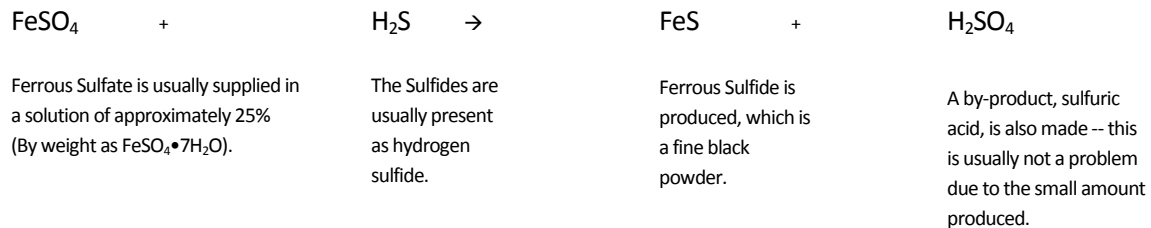
Ferrous sulfate is mildly corrosive and does not injure or irritate the skin. It can be stored for indefinite periods of time, without any changes in the quality of the product. In addition, there are no known side effects that are detrimental to the biological process of waste treatment. This is true even when large overdoses are encountered. Ferrous sulfate does not require close control or sophisticated equipment to be used for feed, and the maintenance on the equipment is a very minor item in your budget.

Hydrogen Sulfide Control

The Role of Ferrous Sulfate

Many articles have appeared in the past few years describing the use of liquid ferrous sulfate solutions for odor control. Probably the most quoted is in the EPA Design Manual for Odor and Corrosion Control, #EPA 162511-85/018, PB 88-184031, page 59, Section 3.3.3, which specifically mentions that liquid ferrous sulfate is the most widely used chemical for this application.

The Chemical Reaction is Simple:



Some Dosage Guidelines

- Removal of one pound of H_2S requires 4.5 pounds of ferrous sulfate (or 1.6 pounds as Fe or 8.0 pounds as $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$).
- Removal of one pound of H_2S requires 3.2 gallons of ferrous sulfate solution (5% Fe).
- For odor control, complete removal of H_2S from a wastewater stream is usually unnecessary. Typically, removal of 40 to 50% of the H_2S in a stream will give excellent results.