



Advancing Phosphate Removal with SafeGuard™ H2O Ferrate Technology

Wastewater utilities are increasingly facing phosphorus discharge challenges. Elevated phosphate levels drive eutrophication, degrade ecosystems, and prompt increasingly strict regulatory requirements. At the same time, utilities must navigate rising chemical costs, supply-chain vulnerabilities, operational constraints, and sustainability goals. The AMS SafeGuard™ H2O in-situ ferrate reagent generation system is positioned as a transformative solution that addresses these pressures simultaneously.

In this Q&A, Rick Bacon, CEO of AMS, explores the drivers shaping phosphate management and how SafeGuard H2O is redefining treatment approaches for modern utilities.

Why is phosphate removal such a critical issue for the water sector today?

Rick Bacon: Phosphates are one of the leading contributors to eutrophication in natural waters. They act as fertilizers, accelerating algal growth. When those algae bloom, they consume oxygen and create “dead zones” where aquatic life simply can’t survive. Many of these algal species also produce toxins that threaten human health and render lakes and rivers unsuitable for drinking or recreation.

Wastewater treatment plants are a major point source of phosphates, and regulators around the world are tightening discharge limits to combat this problem. The stakes are high because protecting waterways means safeguarding ecosystems, public health, and future drinking-water supplies.

How have utilities traditionally removed phosphate, and what limitations do these methods have?

Rick: Traditionally, plants have relied on two approaches: ferric or ferrous salts, and electrocoagulation. Both have fundamental drawbacks.

Ferric salts, such as bulk ferric chloride or ferric sulfate, are manufactured from scrap metal dissolved in strong acids or chlorine. This makes them hazardous to handle, difficult to store, and prone to containing impurities. Their bulk delivery also introduces carbon emissions, supply-chain risks, and pricing volatility.

Electrocoagulation, while conceptually attractive, forces the entire treatment flow across steel plates inside the generator. For any sizable plant, that translates into massive footprint requirements. The plates foul over time, which creates variability in reagent dosing and can produce harmful byproducts unless maintained rigorously. This high-maintenance reality makes it unsuitable for many remote or lightly staffed facilities.

What is SafeGuard H2O, and how does it address these challenges?

Rick: SafeGuard H2O is an automated, on-site reagent generation system that produces ferrate on demand, using a certified iron precursor and an electrolytic process. It was designed to combine the strengths of ferrate and the principles of electrochemical generation—without inheriting the weaknesses of bulk chemicals or flow-through electrocoagulation.

Because SafeGuard H2O generates a concentrated, high-purity reagent on site and on demand the process dramatically reduces footprint. The result is a reliable and sustainable solution that removes dependence on bulk chemicals and brings greater reliability to plant operations.



SafeGuard H2O Ferrate Technology offers wastewater utilities a cost-effective, sustainable solution for phosphate removal.

How does the technology integrate into existing wastewater treatment operations?

Rick: One of the advantages of the SafeGuard H2O system is that it is compact, fully automated and remotely controllable which can be particularly attractive to smaller or rural plants with limited staffing. This allows for easy integration into existing infrastructure. It includes real-time monitoring of phosphate levels at both influent and effluent points and uses those measurements to adjust dosing automatically.

With SafeGuard H2O, the ferrate reagent is generated as a concentrate that can then be injected into the treated flow at various locations in the wastewater process.

How does ferrate compare to other traditionally used oxidants?

Rick: Ferrate is one of the most powerful oxidants available. When compared with commonly used oxidants like chlorine, ozone, etc., ferrate offers both stronger oxidative capability and a cleaner reaction profile.

It rapidly breaks down a wide range of challenging contaminants, including complex organic matter and organophosphate compounds. What really sets ferrate apart is that its oxidation reaction produces non-toxic iron byproducts that act as coagulants. So, in one step, you get oxidation and coagulation.

When generated on-site at high purity, as with SafeGuard H2O, ferrate performance is reliable and predictable. You avoid issues like storage degradation or hazardous handling. This consistency is essential for utilities trying to meet very low phosphorus limits.

What are the environmental and economic benefits for utilities adopting this technology?

Rick: The benefits fall into several categories.

Economically, utilities can achieve significant cost savings, often up to 60%, because they eliminate the purchase, transport, and storage of bulk chemicals. Carbon emissions also drop, since truck deliveries disappear and the system operates at low power with a small footprint.

From a safety standpoint, operators no longer need to handle a corrosive chemical or manage the risks associated with hazardous bulk chemical inventories.

Finally, full automation and remote monitoring of the ferrate generation process, along with real-time insights into phosphate levels, reduces operator burden, allowing even small or decentralized plants to maintain consistent, compliant performance.

How does AMS help utilities validate and demonstrate this technology?

Rick: We know that evaluating new treatment technologies can be costly and time-consuming. To help utilities de-risk the process, we offer small-batch generation systems and frozen ferrate samples for bench-scale testing. That allows operators to see the reagent's performance with their own water quality before committing to a full-scale installation. It is a practical way to demonstrate results without the heavy upfront investment typically required for demonstrations.

What role do you see SafeGuard H2O playing in the future of wastewater treatment?

Rick: Phosphate removal isn't going away. Regulations will continue to tighten as we better understand the ecological and public-health impacts of nutrient pollution. Utilities need solutions that are not only effective but also sustainable, economical, and operationally resilient.

SafeGuard H2O provides a clean, automated, non-hazardous treatment approach that aligns with decarbonization goals and modern plant operations. It reduces chemical dependency and improves confidence in treatment performance.