



BIOSOLIDS ODOR CONTROL VIA PEROXIDE REGENERATED IRON – TECHNOLOGY (PRI-TECH®)

Project Scope

A field demonstration was initiated in February 2014 by the Suffolk County Department of Public Works (SCDPW) to quantify the impacts of Peroxide Regenerated Iron-Technology (PRI-TECH®) as a more economic approach in maintaining odor control in the solids handling phase at the Bergen Point Wastewater Treatment Plant (WWTP).

For approximately the last 30 years, the SCDPW Bergen Point WWTP has treated H_2S and reduced sulfur compound-based odors in the sludge handling phase at the facility with potassium permanganate ($KMnO_4$). The sludge handling phase includes unstabilized sludge waste from three locations: sludge from the primary clarifiers; thickened waste activated sludge; and chemical sludge from the facility's scavenger sludge collection system. The three streams are co-mingled in a 0.25 million gallon capacity sludge blend tank (SBT) that is turned over approximately every 24 hours. The blended sludge is then pumped from the SBT to belt filter presses where it is dewatered and sent via screw conveyor to trailers located outside of the solids handling building. Unstabilized sludge has many more odor causing compounds versus digested sludge so the program needed to be capable of treating odors at all stages of the solids handling operation up to and including the off-site disposal facilities.

Suffolk County explored a PRI-TECH® demonstration program in an effort to achieve equal or better performance than the historical potassium permanganate odor control program while reducing operating costs. This demonstration evaluated the use of PRI-TECH® for controlling sludge odors, composed mainly of hydrogen sulfide gas and reduced sulfur compounds (mercaptans, etc.), while maintaining the belt filter press operation.

Technology

PRI-TECH® is a proprietary odor control technology that utilizes iron salts and oxidants in a fashion that reduces sulfides to elementary sulfur and reduces sulfur compounds to non-odorous compounds. This program was implemented by adding ferrous chloride ($FeCl_2$) as the primary sulfide control agent into the primary sludge line upstream of the sludge blend tank. Hydrogen peroxide (H_2O_2) was added downstream at the sludge blend tank recirculation pumps to regenerate iron from ferrous sulfide (FeS) to either free ferrous and/or ferric iron. The H_2O_2 was also added to the online belt press feed pumps discharge piping to provide additional iron regeneration, oxidation of odorants and durational odor control. The iron also acts as a catalyst to allow the hydrogen peroxide to quickly and efficiently oxidize reduced sulfur compounds.

Solution

Odor control performance was analyzed by measuring liquid sulfide and mercaptan levels through a "shake" test in which these compounds are stripped into the vapor phase and analyzed with either OdaLog® portable gaseous hydrogen sulfide (H_2S) instruments or H_2S and RSH colorimetric tubes. In addition, H_2S was measured continuously in the headspace of the SBT with an OdaLog® vapor H_2S datalogger that had cellular transmission capability to allow for collecting data

without disturbing the instrument and to allow for alarm set points to be established. Qualitative and quantitative monitoring of the dewatered biosolids trailer staging area was also performed. After program optimization during the demonstration period and ongoing operation, there were little to no recorded sulfides or mercaptans in the treated sludge from the SBT via shake test analysis. H_2S levels were statistically similar in the SBT headspace averaging 0.2 ppm with a peak of 9 ppm under PRI-TECH® operation versus an average of 0.2 ppm with a peak of 14 ppm under the prior year's $KMnO_4$ operation.

The program monitoring was expanded beyond the plant to the outside disposal sites. Analytical methods for evaluating specific odor compounds were not available at any of the disposal sites. Durational odor control was evaluated based on subjective experiences and qualitative feedback of the operators at the disposal sites. According to operators, optimization of the program, which included the use of targeted dosing profiles, produced a reduction in odors at the disposal sites.

An additional benefit of the PRI-TECH® program is the potential to generate ferric iron (Fe^{3+}) coagulant when the proper amount of H_2O_2 is added, which could assist in sludge dewatering and in producing higher percent solids in the pressed filter cake. Ferric iron is generated through the reaction of ferrous iron and hydrogen peroxide. During the demonstration period and ongoing operation over the first year, polymer use rates were unaffected and an increase in percent solids was noted in the filter cake from a comparable period the previous year.

Based on the first full year of operation and documented delivery volumes of FeCl₂ and H₂O₂, the average daily operating cost of the PRI-TECH® program is \$4,461. Compared to the previous three-year average daily KMnO₄ chemical cost of \$6,230, the average savings calculates to \$1,769 per day and \$645,828 over the first full year of operation (**Table 1**). Not captured in the chemical cost savings are additional savings from decreased SCDPW operator hours realized due to the elimination of handling and managing of the KMnO₄ program and slightly higher belt filter press percent solids, which result in lower trucking costs and disposal fees.

	KMnO ₄	PRI-TECH® 1st Year	PRI-TECH® Savings
Daily Average	\$6,230 ¹	\$4,461	\$1,769
Annual Cost	\$2,273,950	\$1,628,122	\$645,828

1. Three year average chemical cost

Table 1: Field Demonstration Cost Savings Summary

Turn-Key Scope of Supply

Equipment

- Fully outfitted double-walled storage tank for Hydrogen Peroxide with a tank capacity of 8,000 gallons. The internal tank is constructed of HDPE with an integral secondary to provide 110% containment capacity. Each unit comes equipped with fill line, inspection ports, overflow pipe, breather vents, labels and placards.
- Fully outfitted double-walled storage tank for Ferrous Chloride with a tank capacity of 6,850 gallons. The storage tank is constructed of heat-traced HDPE with an integral secondary to provide 110% containment capacity. Each unit comes equipped with fill line, inspection ports, overflow pipe, breather vents, labels and placards.
- Skid mounted dual chemical metering pump assemblies with in line spares, sized to meet chemical dosing requirements and equipped with a PLC for SCADA integration, flow pacing, etc.
- All system components were pre-plumbed, pre-wired and passivated where necessary to ensure ease of installation and to maintain operations safety and product quality.

Field Services and Program Management

- USP field service personnel installed, commissioned and maintain all systems via ongoing and preventative maintenance to ensure operational reliability.
- The dedicated Program Manager provides technical application support and program optimization for the duration of the program.

Chemical Inventory Management

- USP's ChemWatch™ inventory management system provides remote monitoring capability and automated delivery notifications. This eliminates the need for the plant to place orders and prevents chemical outages.

Safety

- USP performed a pre start-up full process safety review and on-site training for plant personnel.
- Each system includes safety shower and eyewash.
- Ongoing annual safety refresher courses will be completed as necessary.

About USP Technologies

USP Technologies is the leading supplier of peroxygen-based technologies and services for environmental applications. We have been serving the water, wastewater and remediation markets for over 20 years and have offices and field service locations throughout North America. Our consultative approach to problem solving includes application assessment, technology selection and development of a tailored treatment approach. Our full service programs successfully integrate storage and dosing equipment systems, chemical supply, inventory and logistics management, and ongoing field and technical support. This approach provides cost-effective, "hands-off" solutions to our customers. USP Technologies also can provide access to experienced application partners for a turn-key program encompassing engineering, site characterization and technology selection, program implementation, execution and report generation.

Getting Started

We look forward to supporting your treatment needs, whatever the scale of your requirements. To obtain a streamlined treatment solution tailored to your specific project, give us a call at (877) 346-4262.

USP Technologies

900 Circle 75 Parkway, Suite 1330
Atlanta, GA 30339

USP Technologies - Canada

3020 Gore Road
London, Ontario N5V 4T7

Phone: (404) 352-6070 or (877) 346-4262

Email: info@usp technologies.com

Website: www.USPTechnologies.com

