USP technologies™
Solutions for a clean environment

CASE STUDY
MUNICIPAL

BIOSOLIDS ODOR CONTROL AT HOLDING TANK & BELT FILTER PRESSES VIA HYDROGEN PEROXIDE

Project Scope

A Midwest wastewater treatment plant was struggling with problematic hydrogen sulfide (H_2S) levels at two points within their facility arising from biosolids processing. The factors driving the need for H_2S control included worker safety, corrosion of electronics and concrete, implied regulatory limits and odor control. Along with normal residential and commercial flows, the facility also receives unpredictable slugs of high biological oxygen demand (BOD) wastewater from agricultural industries and handles septage hauler loads from a wide radius. USP Technologies (USP) implemented a full-service hydrogen peroxide (H_2O_2) solution with operator-adjustable dosing options to account for the unpredictable sulfide loadings and to lower H_2S to acceptable levels at both their biosolids holding tank and dewatering building.

Technology

H_2O_2 is ideally suited to remove H_2S from wastewater solids, provided that sufficient contact times are available – typically 2-5 minutes prior to the dewatering device. The efficiency of treatment depends upon the available reaction time, the initial level of H_2S and the relevance of non-H_2S odors. Under optimal conditions, effective dose ratios are about 5 parts H_2O_2 per part aqueous sulfide, and can be reliably estimated through beaker tests. The chemical reaction is as follows:

$$H_2S + H_2O_2 \rightarrow S_0 + 2H_2O$$

Background

A biosolids holding tank receives all biosolids awaiting dewatering at the plant's two belt filter presses. The tank is generally emptied every one to three days depending on biosolids generation rates correlated with industrial discharge volumes. The biosolids entering the tank, especially from the gravity thickeners, contain a significant sulfide load throughout the entire year. The holding tank employs mechanical mixing and aeration to minimize further sulfide generation, however, this causes extreme volatilization of H_2S, exceeding 500 ppm. Previous control methods, including iron salt addition and "in-situ scrubbing" using a hydroxyl ion generating system only provided limited success in achieving desired targets.

Compounding the challenge, the radicals generated interfered with the proper measurement of H_2S. From the holding tank, biosolids are pumped to a dewatering building housing two belt filter presses. The turbulence of these belt filter presses causes most of the sulfide present to volatilize. A wet scrubber was installed and used for years to control the H_2S, however, by 2014 it was at the end of its serviceable lifespan.

Solution

USP was invited to visit the facility to determine a more effective treatment strategy. Bench scale dose response tests utilizing shake tests were then conducted to determine theoretical hydrogen peroxide dosing needs and possible reaction times from several injection points. The optimal injection point was determined to be at the biosolids pump outlet, which provided approximately 3 minutes of reaction time before reaching the belt filter presses.

3/19/14 Shake Test Results

H_2O_2 Concentration (mg/L)	H_2S (ppm) at 3 min
0	141
50	67
100	20
200	15

Shortly afterwards, a full-scale H_2O_2 storage and dosing equipment system was installed. The H_2O_2 pumps were connected by relays to the biosolids pumps to ensure that H_2O_2 only dosed while the biosolids pumps were running. The program was demonstrated to be effective within the first hour of operation, with H_2S levels brought down below 1 PPM both above the belt filter presses and within the dewatering building's main room. The program continued with dosing rates throughout the first six months ranging from 1.5 to 6 gallons/hour.

In addition, the operators were trained on how to both raise and lower dosing rates based on the observed H_2S levels to mitigate variable industrial loadings. The removal of H_2S from the dewatering facility eliminated the need for a costly replacement of their wet scrubber, and the customer invited USP to co-present our success story at their state conference.

As the hydroxyl ion generating unit for the biosolids holding tank wore out, USP was asked to provide a second H_2O_2 system to oxidize the sulfide within the holding tank. The only viable injection point was directly into the holding tank and the H_2O_2 system was then wired to run only when mixing occurs to ensure the most cost-effective treatment. An initial dosing rate of 6 gallons/hour of 50% H_2O_2 essentially eliminated H_2S within the holding tank, which untreated regularly exceeded 500 ppm.

A particular challenge for optimizing ongoing operation was the constantly changing industrial loadings which made sulfide loadings into the holding tank unpredictable. To address this need, USP automated variable H_2O_2 dosing using 4 – 20 mAmp output from an Odalog® H_2S analyzer equipped with the OdaTrak® fiber optic unit. Given the extensive mixing and aeration within the holding tank, H_2S levels responded quickly to H_2O_2 dosing. On-going usage has since averaged 2 – 4 gallons/hour. Further, with the majority of the sulfide now eliminated in the biosolids holding tank, H_2O_2 feed rates at belt filter presses were substantially reduced. As a result of this robust two-step treatment solution, purchase of a new hydroxyl ion generating unit was not needed, resulting in additional cost savings.

Turn-Key Scope of Supply

Equipment	▪ One USP-1550 system and one USP-3000 system consisting of 1,550 and 3,000 gallon respectively double-walled storage tanks with 110% integral secondary containment and all required placarding. ▪ Dual pump chemical dosing modules 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 to ensure ease of installation and to maintain operational 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 are 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.

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