



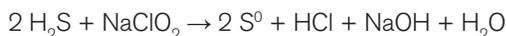
BIOSOLIDS ODOR CONTROL VIA SODIUM CHLORITE AND CALCIUM NITRATE

Project Scope

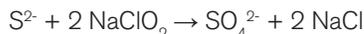
In upstate New York, a wastewater treatment facility historically utilized potassium permanganate to control odors at two locations in their biosolids processing operations. The first location was into the waste activated sludge (WAS) fed to a gravity belt thickener. The second location was into a mixed stream of primary sludge and thickened WAS blended in holding tanks and pressed before incinerating. In October 2014, the plant's incinerator went down. Pressed solids were hauled off-site for disposal in a landfill. The plant began to receive odor complaints from the truck drivers and the landfill personnel, so the treatment rate of permanganate was doubled. This attempt at durational odor control was unsuccessful and the cost was \$480,000 per year. The plant had been using a nitrate product for durational odor control in its collections system and learned from a nearby plant about USP Technologies' successful application of a sodium chlorite based oxidant blend (chlorite) for immediate odor control supplemented with a nitrate solution (nitrate) for durational odor control. USP Technologies (USP) was then brought in to trial a similar solution.

Technology

Chlorite oxidizes hydrogen sulfide and organic odors without producing any harmful by-products such as chlorinated organics. Chlorite is very fast reacting, on the order of seconds, with hydrogen sulfide and organic odor compounds. As a result, it can be added directly to the sludge in the feed lines prior to the presses. The chemical reaction at neutral-acid pH:



and at alkaline pH:



Neutral-acidic conditions are favorable, as it only requires 3 mg/L sodium chlorite per 1 mg/L sulfide.

Like permanganate, chlorite is not as effective at durational odor control, so nitrate was selected to perform this role. Sulfate reducing bacteria, under anaerobic conditions (as is the case in sludge holding tanks), typically use sulfate as a source for oxygen. When nitrate is present, however, the bacteria will preferentially select nitrate as its source of oxygen, preventing the sulfate from being reduced to sulfide and subsequently preventing the formation of hydrogen sulfide gas. Also, with an alternative oxygen source, other common bacteria can now consume dissolved sulfide ions and oxidize them back to sulfate and/or elemental sulfur, further reducing sulfide available to form hydrogen sulfide gas.

Solution

USP replaced the two potassium permanganate dosing locations with chlorite, and a separate nitrate dosing location was installed at the presses. Three 1,000 gallon tanks were installed for chlorite as well as a 14 gph diaphragm chemical metering pump at each dose point, which was interlocked into the plant's SCADA system. At the gravity belt thickeners, the H₂S levels were typically low but there are other problematic organic odors which are effectively oxidized with chlorite. At the belt filter press, H₂S gas levels were higher (35-55 ppm) since the primary and waste activated sludges fed to the press typically sit in holding tanks for anywhere from a day to two weeks. The plant has ventilation hoods above each press that bring the gas to a scrubber, but the odors in the room were still strong enough to cause discomfort to the operators in the vicinity.

An H₂S monitor was hung at the press for continuous monitoring of H₂S. Once the chlorite feed system was installed, sulfide in the sludge was able to be effectively oxidized, reducing the H₂S gas at the press from 35-55 ppm down to 0-3 ppm. Figure 1 shows the effect of the chemical program. Additionally, as the data towards the right hand side of the graph depicts a point in time when the chemical feed was lost (a valve was closed).

When not incinerated, the dewatered solids are hauled off-site for disposal at a landfill. The potassium permanganate provided very little, if any, odor control once the solids were loaded into the trucks, leading to many odor complaints. The addition of nitrate at the belt filter press via a 2,500 gal storage tank and dosing system proved

to be effective as it completely eliminated further odor complaints. It is the plant's plan to stop using their incinerator in March 2016, at which point nitrate will be used continuously.

Switching odor control treatment programs has provided many benefits to the wastewater treatment facility. Financially, the plant saves \$1,000 to \$4,000 a month using chlorite compared to potassium permanganate. Furthermore, the plant was receiving powdered permanganate in pails, having to mix it into solution multiple times per day. By switching to chlorite, operators no longer have to make up solutions, saving 1-2 man hours per day and reducing operators' risk of chemical exposure. Additionally, operators no longer need to carry, store and dispose of the contaminated pails.

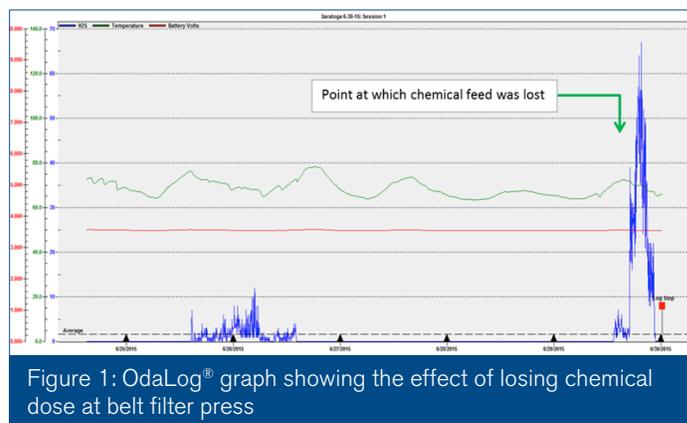


Figure 1: OdaLog® graph showing the effect of losing chemical dose at belt filter press

Turn-Key Scope of Supply

Equipment

- Three 1,000 gal storage tanks for chlorite and one 2,500 gal storage tank for nitrate.
- 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 are pre-plumbed and pre-wired 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.
- Plant was directed to install a safety shower within close range of the chemical storage tanks as required by safety protocol.
- 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.

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