

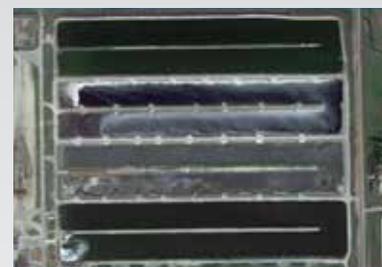


## HYDROGEN SULFIDE ODOR CONTROL IN LARGE PONDS

### Project Scope

A sugar processing facility was experiencing hydrogen sulfide (H<sub>2</sub>S) odor issues in their process water stabilization ponds due to anaerobic conditions. The facility's four identical ponds are 2,500 feet long, 400 feet wide and up to 12 feet deep, with a finger dike down the middle making each pond C-shaped. Each pond can hold approximately 80 million gallons when completely full. Anaerobic conditions develop in the lower layers of these ponds, leading to H<sub>2</sub>S generation and volatilization. The facility faces stringent seasonal perimeter ambient air quality standards for H<sub>2</sub>S concentration and is subject to escalating fines with every violation.

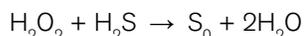
In addition, the pond treatment needs are highly variable as high chemical oxygen demand (COD) slugs and/or factory upsets mean that treatment decisions need to be made in real-time, based on measured and expected levels of sulfide, dissolved oxygen, ORP, COD, pH and temperature. Previously, the facility had been utilizing various chemicals, including peracetic acid and catalyzed hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) in totes to mitigate H<sub>2</sub>S, however, the facility was experiencing difficulty maintaining control of the H<sub>2</sub>S and was concerned with violating their permit. Given the large surface area and volume of the ponds it was essential that a cost-effective control method be identified and implemented. USP Technologies (USP) was contacted to provide a long term, viable solution.



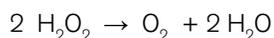
Process water ponds

### Technology

Hydrogen sulfide (H<sub>2</sub>S) is a colorless gas with the characteristic foul odor of rotten eggs; it is heavier than air, poisonous, corrosive, flammable, and explosive. Many facilities, such as this sugar processor, have limits imposed on H<sub>2</sub>S emissions. Sulfide is generated by sulfate reducing bacteria (SRB's) in the anaerobic layers of the ponds. H<sub>2</sub>O<sub>2</sub> treats H<sub>2</sub>S by creating a zone of oxidation in which sulfides are oxidized before being released to the atmosphere. The reaction is as follows:



Sufficient dosing of H<sub>2</sub>O<sub>2</sub> also prevents the formation of H<sub>2</sub>S by boosting dissolved oxygen and creating aerobic conditions hostile towards SRB's per the following reaction:



### Solution

The sugar facility conducted an extensive survey of possible control methods and evaluated options on a lab scale prior to pilot testing. H<sub>2</sub>O<sub>2</sub> was found to be the most cost-effective sulfide control agent in the ponds because of its low H<sub>2</sub>S treatment cost, ability to preferentially oxidize sulfide, including iron sulfide (FeS)

present in the water, permitting long-acting sulfide control by regenerating free ferrous iron (Fe<sup>+2</sup>) to bind more H<sub>2</sub>S.

USP provided a program demonstration in 2014, which first involved bringing in tanker truck quantities of H<sub>2</sub>O<sub>2</sub> and pumping this directly into the ponds through fabricated floating distribution nozzles. The desired amount of H<sub>2</sub>O<sub>2</sub> was pumped into specific sections of the ponds, which had anaerobic conditions prevailing, and then the truck would move on to the next section requiring treatment. This provided improved mixing, a lower cost of treatment per gallon, better sulfide control and lowered staff labor costs.

Building off of the success of the tanker treatment method, USP developed an engineered storage and dosing equipment system for H<sub>2</sub>O<sub>2</sub> on each of the four ponds. This allows for treatment to be conducted whenever and wherever conditions warranted. Each of the systems have two floating manifold dosing lines, dubbed Peroxidons™, into which H<sub>2</sub>O<sub>2</sub> and pond water are pumped. These lines stretch along the



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length of each half of the C-shaped ponds, with outlets spaced to distribute H<sub>2</sub>O<sub>2</sub> across the surface of the entire pond. In addition, on each pond 6 – 8 additional dosing lines were installed that allow for concentrated treatment of hotspots including dead zones and the incoming flows. As a result, performance, ease of operation and cost-effectiveness could be improved with the ability to target treatment to specific sections of the pond.

Overall, USP's full-service hydrogen peroxide program has saved the plant a significant amount of money in fines and operations. USP also maintains a consistent presence on-site, aiding in the

daily collection of water and air data, which unburdens plant staff and improves the sulfide control decision-making process. In a collaborative and results-focused approach, USP continues to work closely with plant staff to find ways to improve the program's effectiveness and to continue lowering the overall cost of treatment.

Treatment results include significant reductions in H<sub>2</sub>S, increased dissolved oxygen, cost savings compared to previous year's solutions, reduced in-house labor associated with pond treatment and improved safety over tote handling.

## Turn-Key Scope of Supply

### Hydrogen Peroxide, 50%

- Standard grade, delivered in bulk quantities of up to 4,400 gallon tank truck loads

### Engineered Storage & Dosing Systems

- Multiple USP bulk storage tanks with integral secondary containment
- Multiple USP skid-mounted dosing modules, custom pre-wired, pre-piped and shop tested for ease of installation and start-up reliability, including:
  - Diaphragm metering pumps with suction and discharge piping
  - Standard fittings include back-pressure regulator, pressure relief valves, degassing solenoid, calibration assembly and leak detection
  - Power and communications panels are included with electrical tie-ins and emergency shut-off switches
  - Housed in a protective environmental enclosure with internal sump for spill containment
- Over 40,000 feet of dosing lines
- Multiple recirculation pumps
- Multiple Peroxidons™ – specially designed floating manifold system which provides for even distribution & mixing of peroxide/DO throughout the storage pond
- Multiple peroxide dosing lines – customized to treat hotspots, dead zones, influent and other trouble areas in each pond

### Chemical Management

- ChemWatch™ advanced controller provides real-time remote monitoring including dose rate verification, variance alarming, tank levels, leak detection and internet accessibility
- Deliveries are scheduled as required to maintain continuous operations
- Delivery alerts to site personnel when product is needed

### Safety

- Safety shower & eyewash stations
- Operating manuals & proper placarding
- Training for hydrogen peroxide, including equipment orientation

### Technical and Applications Services

- Hydrogen peroxide applications support, including daily water and air data, program optimization and monthly reports
- Maintenance of storage and dosing systems
- Preventative maintenance service visits
- Process troubleshooting

## About USP Technologies

USP Technologies' ongoing mission is to help customers meet their water quality objectives by providing eco-efficient solutions that reduce and recover cost, energy, resources and space. Through a collaborative method of working closely with customers to solve problems, we are dedicated to developing innovative, sustainable and cost-effective solutions that successfully meet the highest standards of environmental stewardship. Our consultative approach includes application assessment, technology selection and field implementation of a custom engineered treatment solution. Our turn-key programs seamlessly integrate storage and dosing equipment systems, chemical supply, inventory and logistics management, and ongoing field and technical support. USP Technologies has been serving the water, wastewater and remediation markets for more than 20 years and has offices and field service locations throughout North America. We are the largest direct supplier of peroxygen-based technologies for environmental service applications and we manage hundreds of successful full-service chemical programs that treat over 1.0 billion gallons of water per day.

## 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

1375 Peachtree Street NE, Suite 300 N  
Atlanta, GA 30309 USA

### USP Technologies - Canada

3020 Gore Road  
London, Ontario N5V 4T7

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

**Email:** [info@usptechnologies.com](mailto:info@usptechnologies.com)

**Website:** [www.USPTechnologies.com](http://www.USPTechnologies.com)

