

HYDROGEN PEROXIDE SOLVES BIO-SOLIDS HEADACHE



When the San Antonio Water System (SAWS) decided to consolidate and centralize all sludge dewatering activities for their Water Recycling Centers, they encountered several perplexing problems:

- ✓ Increased hydrogen sulfide (H₂S) odors;
- ✓ A decrease in dewatering efficiency (lower percentage filter cake solids);
- ✓ And no increase in methane production, which was expected with the increased sludge volumes.

These issues resulted in a search to identify the causes and find a cost-effective, environmentally friendly solution, which turned out to be the application of hydrogen peroxide (H₂O₂).

PROBLEMS AND ISSUES

Located in the nation's eighth largest city, SAWS meets the wastewater treatment needs of over 1.2 million people through four major Water Recycling Centers (WRCs) with a combined capacity of 225 MGD. In April of 2003, their largest facility, the Dos Rios WRC, began receiving pipeline transfers of up to 400,000 gallons per day of primary and waste activated sludge from their second largest facility, the Leon Creek WRC. Several negative consequences were immediately observed including a significant increase in sulfide odors from the belt filter presses and an unrealized expected increase in methane gas production.



*Two of San Antonio's Four Major Water Recycling Centers:
Leon Creek and Dos Rios*

Frederic Winter, SAWS Environmental Services Manager, recalls "We had been expecting that increased digester gas volumes would make using the gases for electrical generation economically feasible, so we had to move to find out what was going wrong or the electrical generation project would be in jeopardy. We couldn't afford a delay."

From operational experience, the problems were thought to be related to higher than normal amounts of poorly biodegradable fibrous wastes, such as lignin and cellulose that historically were received at the Leon Creek WRC. These poorly digestible materials typically demanded digester detention times of up to 40 days. When the solids began to

be transferred to Dos Rios, the long pipeline retention times in combination with the primary sludge mixture resulted in significant H₂S production within the force main. This H₂S was subsequently released to the air in the dissolved air flotation (DAF) units at the Dos Rios WRC. The next step was to investigate and implement a solution that would address these issues.

TECHNOLOGY SELECTION

Winter describes the technology selection process stating, "After conducting research and weighing our options, we decided to evaluate H₂O₂ as a solution to the problem. We use H₂O₂ in other areas of the Dos Rios WRC, so we have experience using it and our operators are comfortable with it. We knew it would address the H₂S odors at the DAFs and we also felt there was a good possibility of the H₂O₂ giving us other process benefits."

***Hydrogen peroxide was found
to be an environmentally
friendly, cost-effective solution***

Past experience with H₂O₂ use in sludge treatment suggested that H₂O₂ might help to reduce the DAF polymer usage and improve sludge dewatering efficiency. Another potential process benefit was an increase in digester gas (methane) production.

Similar wastewater industry research and development has shown that treatment of bio-solids with H₂O₂ and catalytic amounts of iron (ferrous or ferric) prior to digestion can improve digester performance, resulting in improved volatile solids reduction and methane production. Under the right conditions, hydrogen peroxide in the presence of iron salts will generate the hydroxyl radical (OH^{*}), an extremely potent oxidizer with an oxidation potential of 2.8 electron volts. It was suspected that since iron used for odor control in the Leon Creek collection system is present in the sludge, this chemistry might facilitate the oxidation/modification of some of the large organic lignin and cellulose compounds, resulting in better digestion. Essentially, it was thought that the oxidative pre-treatment would partially break down some of the refractory organic compounds, making them more amenable to anaerobic digestion.

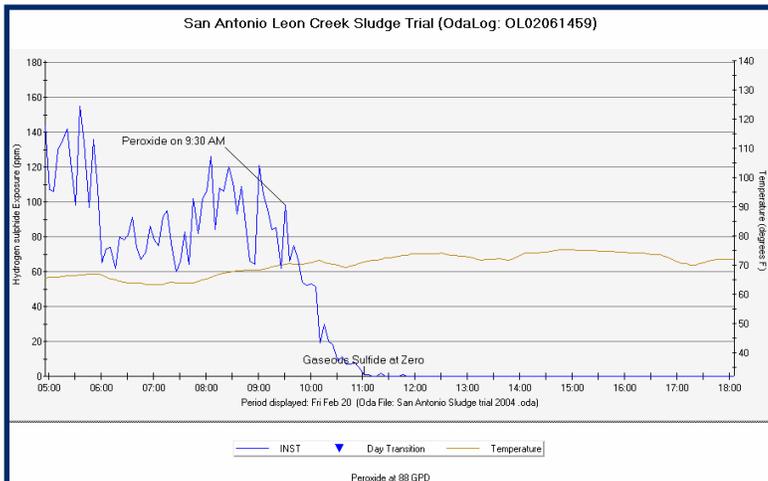
H₂O₂ TRIAL AND RESULTS

SAWS initiated a full-service trial involving injection of 50% H₂O₂, equipment and technical applications assistance. The trial began on February 20, 2004 and was initially set to run 60 to 90 days. It was thought that 2-3 digester sludge ages would be sufficient time to measure any trends in digester performance, belt filter press dewatering efficiency and to monitor H₂S levels in the DAF area. The H₂O₂ was injected into the Leon Creek force main, several minutes ahead of the DAF units at the Dos Rios WRC. Impacts to be quantified were DAF H₂S concentrations, DAF polymer usage, digester gas production, and dewatering efficiency.

Economic benefits outweighed the cost of the turn-key H₂O₂ program

The use of H₂O₂ had immediate positive effects. Data collected using an Odalog H₂S data logger placed next to the underflow weir of the #3 DAF unit demonstrated that DAF vapor phase H₂S was reduced from peaks of over 150 ppm to non-detectable levels within 90 minutes of starting H₂O₂ dosing. The H₂O₂ dose rate to achieve these results was approximately 175 mg/L based on 300,000 GPD Leon Creek sludge flow.

benefit of the increased methane production and percent solids increase in dewatered sludge offset the cost of the turn-key hydrogen peroxide odor control program. Finally, the increase in gas production was an important consideration in evaluating the feasibility of electrical cogeneration. Regarding the impact of H₂O₂ on polymer usage, additional data and further work are required to evaluate its full impact, however, initial data and operator interviews provided supporting evidence that H₂O₂ was reducing polymer usage at the Dos Rios DAF.



After dosing H₂O₂, hydrogen sulfide rapidly fell to non-detectable levels

CONCLUSION

The use of hydrogen peroxide at the Dos Rios WRC has helped to solve San Antonio Water System’s problems in consolidating and centralizing sludge dewatering activities for their Water Recycling Centers. Today, the full-service hydrogen peroxide program consistently controls hydrogen sulfide in and around the Dos Rios DAF units and blend tank. Significantly, this H₂O₂ program has also resulted in improved digester gas production (methane), as well as improved dewatering efficiency.

In addition to an almost immediate control of hydrogen sulfide, an improvement in digester methane gas production was realized after about two sludge ages. When observing the H₂O₂ impact on dewatering efficiency, the Dos Rios facility appears to have taken in a recovery of about 2% TS (from about 19% up to 21% cake solids) in its belt filter press sludges since the addition of H₂O₂. The economic

Commercial Office

500 Bishop St. NW, Suite C3

Atlanta, GA 30318

info@h2o2.com • www.h2o2.com

Inquiries call 404.352.6070

