

Hydrogen Peroxide Solves Bio-Solids Headache

By US Peroxide

With the use of hydrogen peroxide at the Dos Rios WRC, the San Antonio Water System solved its problems of consolidating and centralising sludge dewatering activities for their water recycling centres.

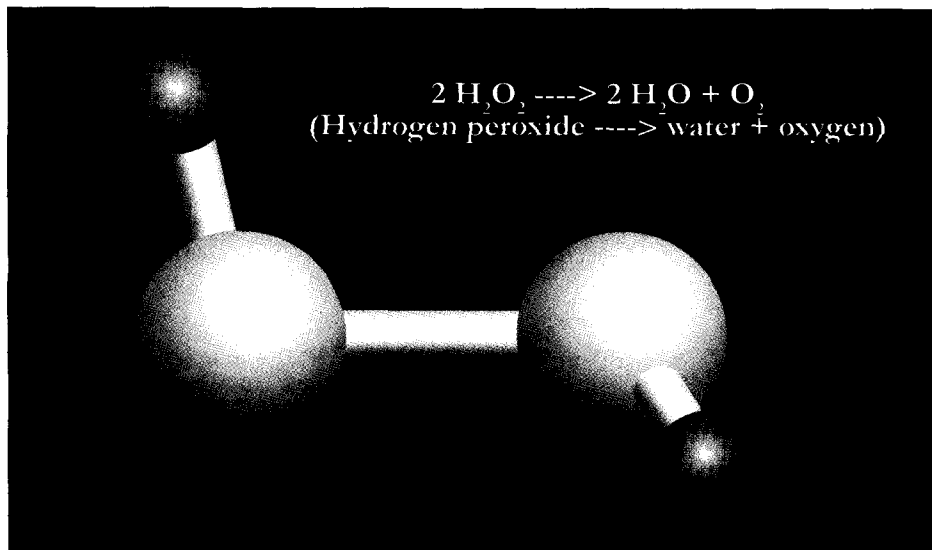
When the San Antonio Water System (SAWS) decided to consolidate and centralise all sludge dewatering activities for their water recycling centres (WRCs), they encountered several perplexing problems:

- Increased hydrogen sulphide (H_2S) odour
- A decrease in dewatering efficiency (lower percentage filter cake solids)
- And no increase in methane production, which was expected with the increasing sludge volumes

These issues resulted in a search to identify the causes and find a cost-effective and environment friendly solution, which turned out to be the application of hydrogen peroxide (H_2O_2).

The problems

Located in the nation's eighth largest city, SAWS meets the wastewater treatment



needs of over 1.2mn people through four major WRCs with a combined capacity of 225MGD. Their largest facility, the Dos Rios WRC, began receiving pipeline transfers of up to 400,00 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 sulphide odours from the belt filter presses and an unrealised expected increase in the production of methane gas.

Frederic Winter, SAWS Environmental Services Manager recalls, "We had been expecting that the 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 H_2S production within the force main. This H_2S was subsequently released to the air in the dissolved air flotation (DAF) units to the Dos Rios WRC. The next step was to address these issues.

Technology selection

Winter describes the technology selection process stating that after conducting a comprehensive research and weighing their options, SAWS decided to evaluate H_2O_2 as

a solution to the problem. H_2O_2 was used in other areas of the Dos Rios WRC, so the operators at the plant were comfortable with it. It was expected to address the H_2S odours at the DAFs and in all probability it would provide other process benefits as well." Past experience with the use of H_2O_2 in sludge treatment suggested that H_2O_2 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 the treatment of bio-solids with H_2O_2 and catalytic amounts of iron (ferrous or ferric) prior to digestion can improve volatile solids reduction and methane production. Under appropriate conditions, hydrogen peroxide in the presence of iron salts generate the hydroxyl radical (OH), an extremely potent oxidiser with an oxidation potential of 2.8 electron volts. It was suspected that since the iron used for odour 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.

H_2O_2 trial and results

SAWS initiated a full-service trial involving an injection of 50% H_2O_2 , equipment and technical applications assistance. The trial was initially set to run for 60-90 days. It was estimated that 2-3 digester sludge ages would be a sufficient time frame to measure any trends in digester performance, belt filter press dewatering deficiency and to monitor the H_2S levels in the DAF area. The H_2O_2 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 H_2S concentrations, DAF polymer usage, digester gas production and dewatering efficiency.

The use of H_2O_2 had immediate positive effects. Data collected using an Odalog H_2S data logger, placed next to the underflow weir of the #3 DAF unit, demonstrated that the DAF vapour phase H_2S was reduced from peaks of over 150ppm to non-detectable levels within 90 minutes of starting H_2O_2 dosing. The H_2O_2 dose rate to achieve these results was approximately 175mg/L based on 3000,000GPD Leon Creek sludge flow.

In addition to an almost immediate control of hydrogen sulphide, an improvement in the digester methane gas production was realised after about two sludge ages. When observing the H_2O_2 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 sludge since the addition of H_2O_2 . The economic benefits of the increased methane production and the percent solids increase in dewatered sludge offset the cost of the turn-key hydrogen peroxide odour controls program. Finally, the increase in gas production was an important consideration in evaluating the feasibility of electrical cogeneration. Regarding the impact of H_2O_2 on polymer usage, additional data and further work was required to evaluate its full impact. However, initial data and operator interviews provided supporting evidence that H_2O_2 was reducing polymer usage at the Dos Rios DAF.

Conclusion

The use of hydrogen peroxide at the Dos Rios WRC has helped to solve San Antonio Water System's problems in consolidating and centralising sludge dewatering activities for their water recycling centres.

Today, the full-service hydrogen peroxide program consistently controls hydrogen sulphide in and around the Dos Rios DAF units and blend tank. Significantly, this H_2O_2 program has also resulted in improved digester gas production (methane), as well as improved dewatering efficiency.

About the Contributor

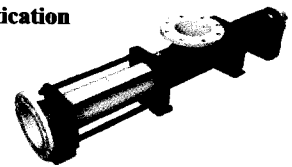
The article had been contributed by US Peroxide. They specialise in providing hydrogen peroxide solutions for environmental and industrial applications.

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