SOURCE TECHNOLOGIES

PST Odor and Corrosion Control Report

Central Maryland Wastewater Treatment Plant

The STX Process

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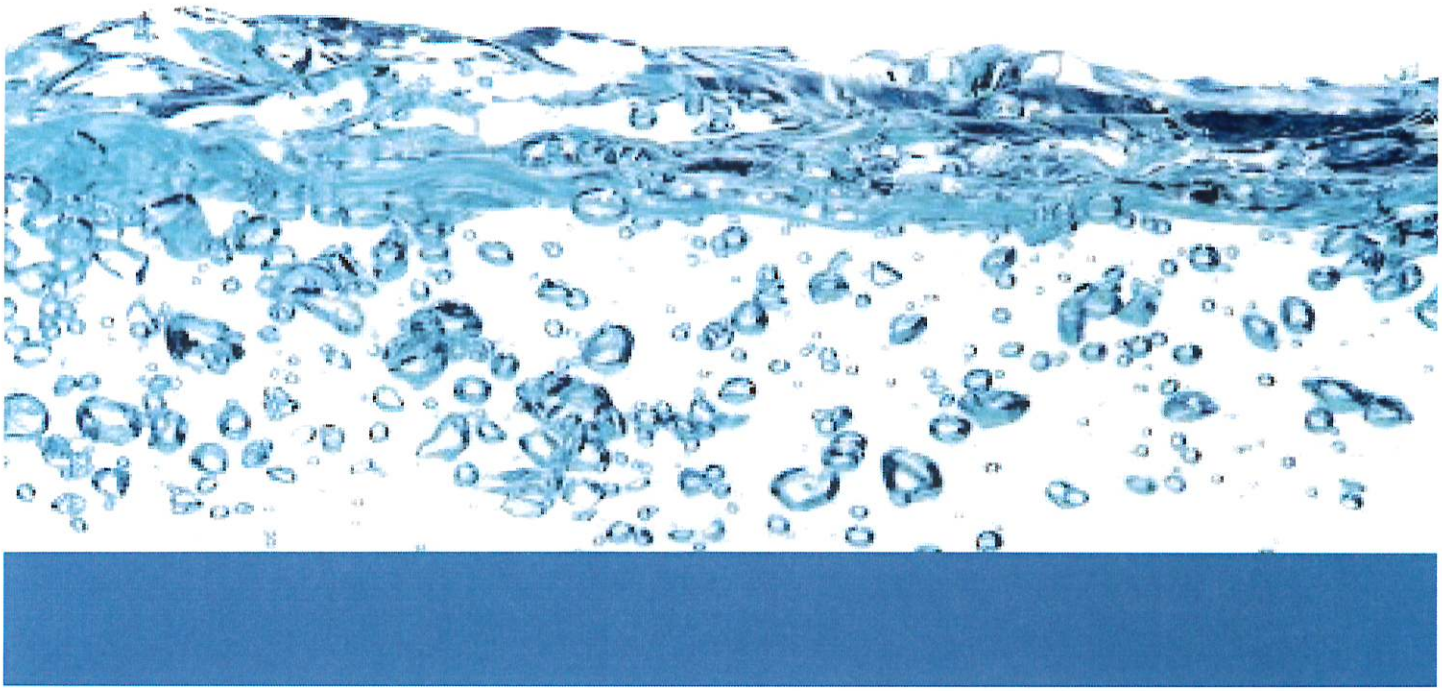


Background

Central Maryland WWTP

This Wastewater Treatment Plant (WWTP) is an activated sludge treatment plant that currently treats 114 million gallons per day (MGD) of residential and industrial sewage. Two primary gravity interceptors convey the wastewater to the WWTP, where it then waterfalls down into a wet well before proceeding to grit removal. Odor abatement chemicals are drip-fed into both gravity interceptor channels approximately 4 minutes before the influent flow discharges into the wet well. After grit removal, the wastewater is then split between numerous Primary Sedimentation Tanks (PSTs) before progressing to activated sludge basins, secondary clarifiers, and disinfection chambers.

Before recent updates to the WWTP, odor abatement chemicals were also introduced at two (2) additional locations. x-Station, where PSTs x, x, x, and x are located, and Site A, where odor abatement chemicals could be introduced into multiple channels that conveyed wastewater to PSTs x –x. These injection locations were essential to the treatment process originally, due to an inability to adequately treat sulfide at the headworks.

Before this WWTP began utilizing the current odor abatement solution, the STX Process, 1,320 gallons of liquid 50% H2O2 were injected daily to mitigate facility odors. The average Total Sulfide measurements taken from the PSTs while receiving this treatment were 7.9 mg/L, with a peak of 12.9 mg/L. H2S averaged 360 PPM across the active PSTs, with a peak of 743 PPM. Severe corrosion was rampant throughout the facility.

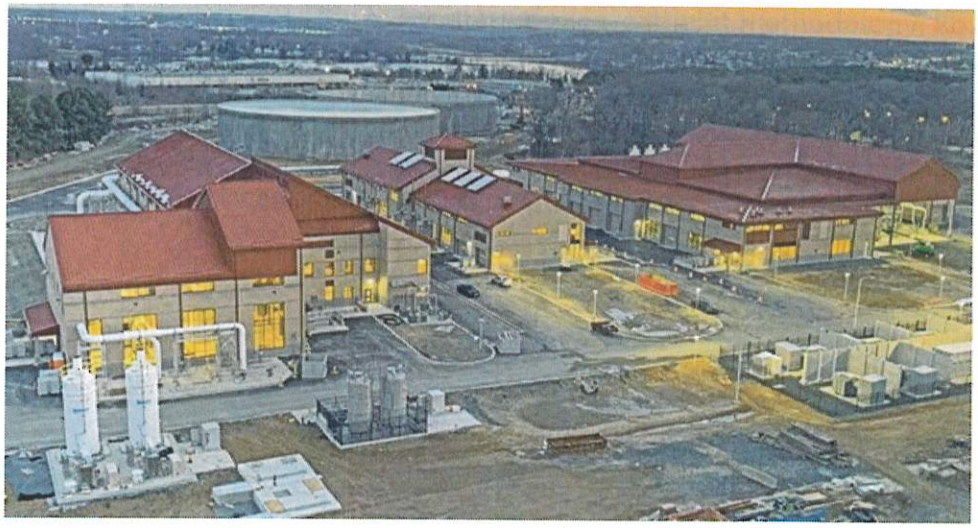
In 2013, this WWTP began piloting the STX Process. By the end of the study, sulfide averages at the active PSTs had dropped to an average of less than 0.5 mg/L Total Sulfide, with H2S averages below 5 PPM. In 2015, this WWTP switched to utilizing the STX Process.

STX Process

Central Maryland WWTP

The STX Process is a combination of the pH-neutral, organic STX reagent and 50% H2O2, which is injected at a stoichiometrically balanced ratio to the pounds of sulfide needing to be treated. Each molecule of the STX reagent is capable of destroying 40 – 50 sulfide molecules. Utilizing an oxidant for regeneration, the STX reagent fluctuates between a rich and lean state. The only byproducts of this reaction are elemental sulfur and water. This allows for the rapid destruction of sulfide and reduced sulfur compounds without needing to utilize extreme volumes of product. Additionally, because of the nature of the reagent and its reaction, this solution is safe to inject throughout the wastewater treatment process without disrupting microbial activity, pH, or impacting DO.

In 2021, Source Technologies and x Engineering conducted multiple field assessments to reevaluate the value of chemical addition utilizing injection points that were installed during the facility upgrade. Chemical feed lines were trenched upstream from the odor control pad 485 feet, where the lines then T'd off to allow the STX Process access to drip onto both of the influent gravity interceptors.



With the new injection location allowing for improved contact time (~4-minute HRT before waterfalling into the Headworks wet well), Source Technologies was able to reduce the influent Total Sulfide average from 2.75 mg/L to 0.83 mg/L by diverting all treatment to the headworks. Prior to the study conducted by x and Source, a majority of the STX Process was injected at D-station and Site-A. By altering the treatment methodology, Source was able to reduce H2S off-gassing in the main influent (reduced from 122 PPM avg to 23 PPM avg), the headworks HVAC room (10 PPM avg to 0.2 PPM avg), the Electrical Room (7 PPM avg to 0 PPM avg), and the Core Screens (206 PPM average to 30 PPM avg). Furthermore, because of the redesigned system, Source Technologies could now inject enough product into the influent stream to continue to treat beyond the headworks to the PSTs.

Recent data gathered on October 22nd and again on the 27th of 2025, confirmed that the STX Process is continuing to efficiently mitigate odors and reduce the potential for corrosion at each of the active PSTs. The combined treated total sulfide average for the influent flow entering the 7 active PSTs was 0.43 mg/L. The combined treated total sulfide average taken after the flows passed over the weirs of the 7 active PSTs was 0.38 mg/L. Beyond sulfide sampling, Source Technologies' field ops team also gathered residual peroxide and nitrate levels, with peroxide averaging 5 mg/L and nitrate averaging 2 mg/L. While Source Technologies does not utilize any nitrate-based solutions at this WWTP, the City Utilities does. The use of Calcium Nitrate throughout the collection system is likely the cause of the residual nitrate readings taken at the PSTs.

Conclusion

Central Maryland WWTP

Given the average total sulfide readings from the 7 active PSTs, and the average taken from the influent wet well, the current dose rate of 200 GPD H2O2 and 52 GPD of STX injected upstream from the headworks buildings is the ideal treatment methodology for this WWTP. While dose rates could be increased to improve downstream results, returning to the previous method of utilizing D-station and Site-A would reduce the quality of control seen at the headworks without adding value to treatment at the PSTs. Even though injecting treatment into a gravity influent cannot fully abate H2S that has already off-gassed, it can greatly improve what could off-gas at the influent waterfall. A waterfall effect creates an ideal turbulent environment for generating H2S. Therefore, reducing treatment would only increase the rate at which corrosion would occur within the new facility.

To completely mitigate H2S within this WWTP would require further evaluation. Treating the influent flow more efficiently in the collection system before it becomes a gravity system and enters the WWTP would improve odor and corrosion at the headworks building. Additional benefits to the Plant may come from treating sludge production, increasing the current chemical feed rates at the headworks, transitioning from carbon and bio scrubbers to chemical scrubbers, and ensuring the existing scrubbers are sized appropriately for the volume of air needing to be treated within the facility and the influent gravity interceptors.

Appendix A

Sample Data – 10/22/25

PST - Influent	PST 4	PST 5	PST 6	PST 7	PST 9	PST 10	PST 11
Avg. Total Sulfide mg/L	0.41	0.58	0.58	0.5	0.41	0.58	0.5
Peak Total Sulfide mg/L	0.75	0.75	0.75	0.75	0.75	0.75	0.5
pH	7.0	7.1	6.8	7.1	7.2	7.1	6.8
Temp	71	72	70	69	70	71	69
H_2O_2 Residual	5	5	5	5	5	5	5
Nitrate Residual	2	2	2	2	2	2	2

PST - Weir	PST 4	PST 5	PST 6	PST 7	PST 9	PST 10	PST 11
Avg. Total Sulfide mg/L	0.25	0.41	0.41	0.5	0.33	0.33	0.41
Peak Total Sulfide mg/L	0.25	0.5	0.75	0.5	1.0	1.0	0.75
pH	7.2	7.3	7.3	7.3	7.1	6.9	7.0
Temp	71	72	71	71	68	70	73
H_2O_2 Residual	5	5	5	5	5	5	5
Nitrate Residual	2	2	2	2	2	2	2

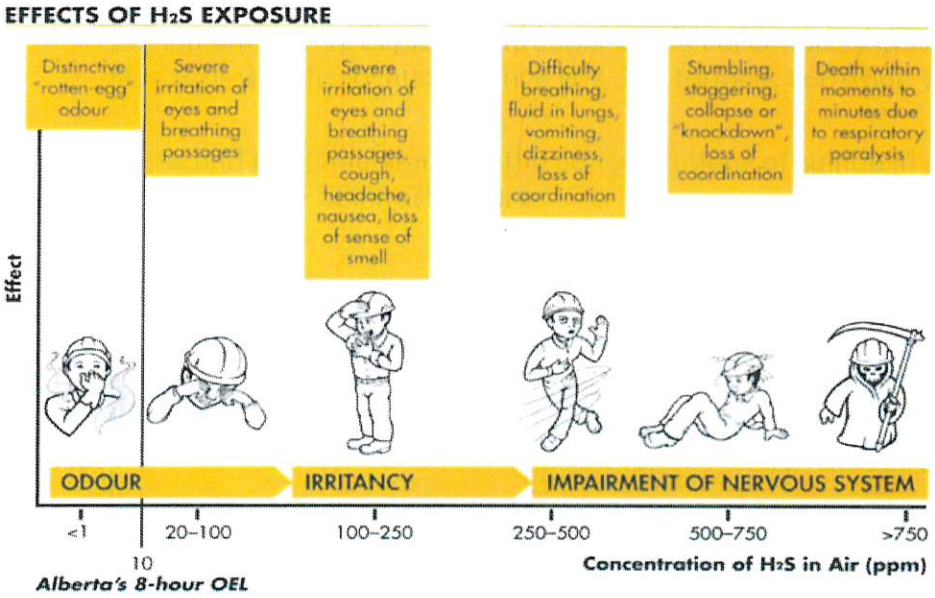
Sample Data – 10/27/25

PST - Influent	PST 4	PST 5	PST 6	PST 7	PST 9	PST 10	PST 11
Avg. Total Sulfide mg/L	0.33	0.58	0.25	0.5	0.41	0.25	0.5
Peak Total Sulfide mg/L	1.0	0.75	0.25	0.5	0.75	0.25	0.5
pH	7.2	7.2	7.0	7.1	6.9	6.9	7.1
Temp	70	71	71	72	71	71	73
H_2O_2 Residual	5	5	5	5	5	5	5
Nitrate Residual	2	2	2	2	2	2	2

PST - Weir	PST 4	PST 5	PST 6	PST 7	PST 9	PST 10	PST 11
Avg. Total Sulfide mg/L	0.5	0.41	0.41	0.33	0.41	0.58	0.41
Peak Total Sulfide mg/L	0.5	0.75	0.5	1.0	0.5	0.75	0.75
pH	7.3	7.0	7.3	7.2	6.8	7.0	6.9
Temp	71	70	72	71	70	71	72
H_2O_2 Residual	5	5	5	5	5	5	5
Nitrate Residual	2	2	2	2	2	2	2

Appendix B

Effects of H_2S



One of the methods for determining sulfide loading in solution is to use a portable colorimeter device and the methylene blue method. This test helps identify how many milligrams per liter (mg/l) of sulfide are in solution. 1 mg/l of S= can form up to roughly 250 parts per million (PPM) H_2S . Gas detection equipment can be deployed throughout the collection system to determine the concentrations of H_2S in specific locations. Once H_2S has formed, corrosion will occur.

Depending on turbulence and pH, understanding the concentrations of sulfide in solution can help determine the life expectancy of infrastructure.

Effect of Sulfide on Infrastructure Life Expectancy

Target: 3' diameter concrete pipe (1" cover")
*neutral pH scenario
*Source of chart EPA website

Effect of Sulfide on Infrastructure Life Expectancy

Sulfide (mg/L)	Life Expectancy
0.5	>50 yrs
1.0	25-50 yrs
1.5	25 yrs
2.0	10-25 yrs
2.5	10 yrs
3.0	10yrs
4.0	5-10 yrs
7.0	5 yrs
>7.0	< 5 yrs

Source Technologies, LLC

Odor and corrosion from wastewater is problematical whether occurring at the treatment plant or in the collection system winding through neighborhoods. While most of the general public recognizes hydrogen sulfide (H_2S) as the "rotten egg" smell associated with sewage treatment, facility managers know H_2S is a far more destructive and corrosive compound for wastewater treatment facilities and the collection systems that feed them. Additionally, H_2S is not only a costly nuisance, it can be a serious health and safety problem as well.

Source Technologies, whose principals have long been involved with environmental remediation and municipal wastewater treatment, formed the company to deploy the latest cutting edge technologies that apply to municipal wastewater treatment facilities, industrial pre-treatment activities and environmental restoration.

Under the leadership of CEO Suzie Richards, Source Technologies is proud to be a provider of one of the most powerful, comprehensive and cost-effective odor treatment technologies in the municipal wastewater market space. Our family of advanced oxidation and catalyzed oxygenation technologies are "green", best-in-class, scalable and simple to operate.

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