CASE STUDY

CHESTERMERE SDOX®

CASE STUDY: CHESTERMERE SDOX® | CONTROLLING ODOR AND CORROSION IN COLLECTION SYSTEMS

Like many smaller municipalities, the city of Chestermere, Alberta – population 24,000 – does not treat its own sewage; rather, it is sent via a pressurized sewer (forcemain) collection system to the larger city of Calgary, which treats the waste at their municipal wastewater treatment plant.

SITUATION

Chestermere's extensive collection system conveys the raw wastewater from residential homes, commercial buildings, and industrial facilities to the neighboring city of Calgary for treatment – a 3.3-mile (5 km) distance. During this journey, anaerobic conditions within the collection system can lead to the formation and atmospheric release of hydrogen sulfide (H_2S) gas, resulting in complaints from the community about the foul odor near downstream release points.

COMPLICATION

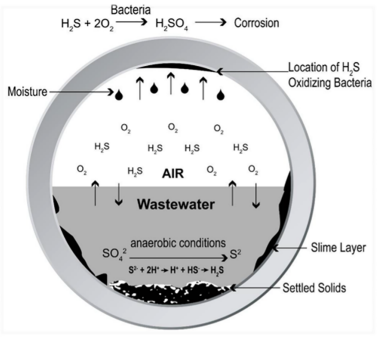
Liquid-phase chemical treatments of sodium hypochlorite, nitrate-containing chemicals, ferrous chemicals, and magnesium hydroxide proved to be expensive and only moderately effective in controlling the formation and buildup of hydrogen sulfides, resulting in spikes in the atmospheric release of H_2S gas and an ongoing source of community complaints.

While the foul odor is one of the top sources of community complaints, high concentrations of the gas are extremely dangerous to those maintaining the collection system, with no proven antidote for hydrogen sulfide poisoning.

In addition to being a safety issue, the odor is indicative of the conditions in which anaerobic bacteria produce sulfuric acid (H_2SO_4) when H_2S combines with moisture – eating away at concrete and metal infrastructure, resulting in potentially significant corrosion of pipes, concrete, rebar, and manhole covers and the associated long-term infrastructure costs – greatly reducing the lifespan of the collection system. As such, the City's longer-term objective was to mitigate the related issue of pipe and manhole corrosion from sulfuric acid forming in the collection system.

Replace Chemicals and Catalysts with Oxygen to Prevent the formation of H_2S and the production of Sulphuric Acid (H_2SO_4)

Liquid Phase Treatment	Mechanism
Sodium hypochlorite	Oxidize sulfide
Nitrate-containing chemicals	Provide a preferred electron acceptor for bacteria
Ferrous chemicals	Precipitant - Sequester sulphides by forming $FeS_{(s)}$
Magnesium hydroxide	pH adjustment
SDOX-CS® Oxygenation | Side-stream injection of supersaturated solution	Provide a preferred electron acceptor for bacteria



Corrosion | Bacteria oxidize H_2S to produce Sulphuric Acid (H_2SO_4)

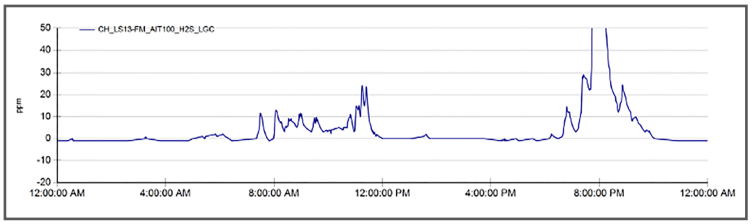
CHART WATER | BlueInGreen A Chart Industries Company

RESOLUTION

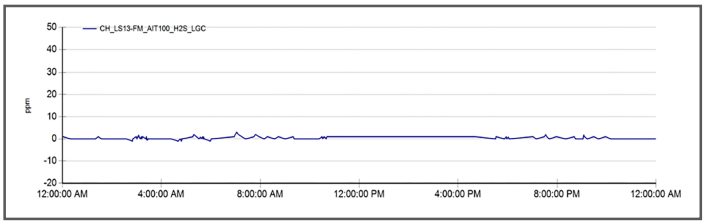
To prevent the formation of H_2S, City engineers deployed BlueInGreen's Supersaturated Dissolved Oxygen (SDOX®) side-stream dissolution system under a two-year Treatment-as-a-Service (TaaS) equipment and services contract to pilot the technology at a key lift station. Engineers evaluated the efficacy of SDOX® technology to maintain an aerobic environment in the forcemain, collecting data on the operation of the SDOX® technology and the presence of H_2S in the collection system 24/7, 365 days/year.

By injecting a supersaturated oxygen stream at the lift station, City engineers were able to maintain an aerobic environment in a more precise and cost-effective manner as sewage traveled to Calgary's collection system and wastewater treatment facility. The presentation of data collected from the SDOX® system coupled with the City of Calgary's online H_2S monitoring system demonstrated the efficacy of the SDOX® treatment tactic to control the formation of H_2S in forcemains at 8% of the operating cost of chemical treatment. Furthermore, during 15,000 hours of operation, the SDOX® system required minimal maintenance.

H_2S Levels with Chemical Treatment (Nitrates, No Oxygen)



H_2S Levels with SDOX® (Oxygenation)



Having proven the SDOX® system's ability to deliver superior odor and corrosion control at a fraction of the cost, the City purchased the system used in the operational trial, retaining it as the preferred method for reducing community odor complaints while improving worker safety and enhancing the lifespan of existing infrastructure.

ECONOMIC/OPERATIONAL

- Superior and more precise odor and corrosion control at a fraction of the cost while enhancing the lifespan of existing infrastructure.
  - More consistent and more precise dosing achieving better treatment compared to chemical applications
  - A 92% reduction in operating costs compared to chemical treatments
  - Minimal maintenance – periodic lubrication, pump-belt adjustment and replacement
  - Enhanced corrosion control, increased life expectancy of infrastructure and a reduction in the associated long-term maintenance and operating costs
  - A two-year payback period on capital investment
- Enhanced worker safety

SOCIAL/COMMUNITY

- Reducing community odor complaints | Enhanced social license

ENVIRONMENTAL

- Improved air quality