CASE STUDY

Liquid-phase H_2S sensor cuts end-of-pipe dosing by 50%

The SulfiLogger™ H_2S sensor has demonstrated its ability to optimize H_2S management activities and reduce operational costs. A Danish water utility used the continuous signal from a SulfiLogger™ sensor as a direct control input for the dosing of iron salts. By dynamically adjusting the chemical dosing rate to match real-time H_2S sensor data, the effectiveness of the dosing system improved while chemical consumption dropped by 50%.

Background

Hydrogen sulfide (H_2S) causes severe problems in collection systems when wastewater is pumped over long distances. To limit rotten-egg odors and to mitigate premature asset deterioration, utilities often add neutralization agents to the wastewater. However, without a dynamic overview of the H_2S concentrations in the wastewater, the optimal chemical dosing rate remains unknown. This lack of information implies that there will be either under- or overdosing - and time-consuming dosing optimizations.

Challenge

A Danish water utility wanted to optimize the dosing of ferrous sulfates ($FeSO_4$) in a force main discharge well to reduce the consumption of chemicals and to improve the mitigation of potential H_2S related odor and corrosion issues in the collection system.

Solution

A small, self-contained dosing system was installed at the force main discharge well consisting of a SulfiLogger™ H_2S sensor, a dosing pump, and a chemical tank. In this setup, the SulfiLogger™ sensor's real-time H_2S signal was used as a dynamic control input for the dosing pump. By measuring directly in the raw wastewater at the end-of-pipe transition inside the well, the SulfiLogger™ sensor was able to quickly detect changes in the composition of the wastewater and thereby allow the fast reacting chemicals to be added in just the right quantity. The dosing rate was simply proportional to the H_2S signal.

To measure the effect of the dosing setup, an additional SulfiLogger™ sensor was installed in the sewage in a manhole 1.2 km downstream in the gravity system, and using these two measurement points, different dosing strategies were implemented and compared.

The SulfiLogger™ sensor placed directly in the raw sewage in the inlet of the well.

Industry

Wastewater

Business needs

- Reduce chemical consumption
- Mitigate H_2S induced corrosion in the collection system
- No odor complaints

Solution

Sensor-controlled dosing of $FeSO_4$ end-of-pipe using continuous, liquid-phase H_2S measurements

Benefits

- 50% reduction in chemical use
- Zero H_2S downstream from the dosing point
- Increased lifespan of assets (Corrosion potential eliminated)
- No odor complaints

For more information, visit:
sulfilogger.com/cases

Results

With dynamic H_2S sensor-controlled dosing, the consumption of chemicals was optimized, and all downstream H_2S problems were fully mitigated.

With a constant dosing strategy, even using twice the daily amount of chemicals used for the sensor-controlled dosing strategy, the dosing was unable to fully neutralize the H_2S spikes above 1mg/L.

Without any dosing, the majority of the dissolved H_2S detected end-of-pipe was transported to the downstream verification site 20 mins later, where odor and corrosion issues would persevere.

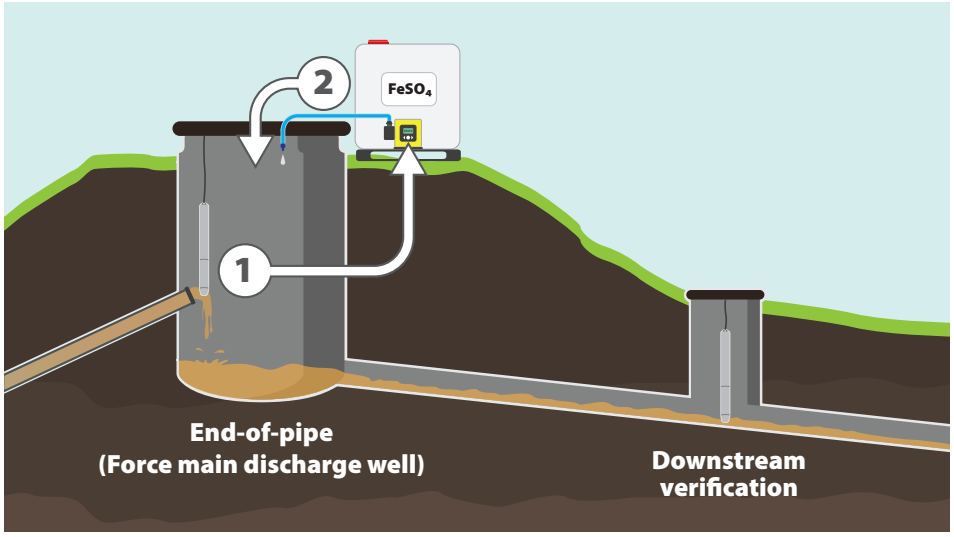
The pitfalls of constant dosing

Constant chemical dosing - the dominant strategy used for the dosing of iron salts - is a simple but inefficient approach to H_2S mitigation. The fundamental shortcoming of this strategy is that H_2S is a dynamic variable - not a constant - and as the composition of the wastewater changes, a constant dosage is excessive throughout long periods of the day, yet also incapable of fully neutralizing the effect of H_2S spikes. The constant dosing strategy also fails to account for shifts in the magnitude of H_2S variations caused by factors including pump operation settings, changing seasons, varying temperatures, and heavy precipitation.

Savings potential

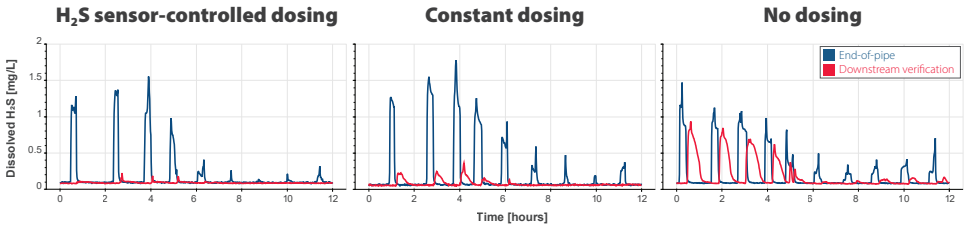
The H_2S sensor-controlled dosing strategy improved the effectiveness of the dosing system, thereby minimizing the impact of corrosion and odor issues, while using 50% less chemicals compared to a constant dosing strategy. This case has proven that a dynamic, sensor-controlled dosing strategy - using the SulfiLogger™ sensor - can enable utilities to optimize the effectiveness of H_2S management activities and reduce operational costs.

Dosing setup

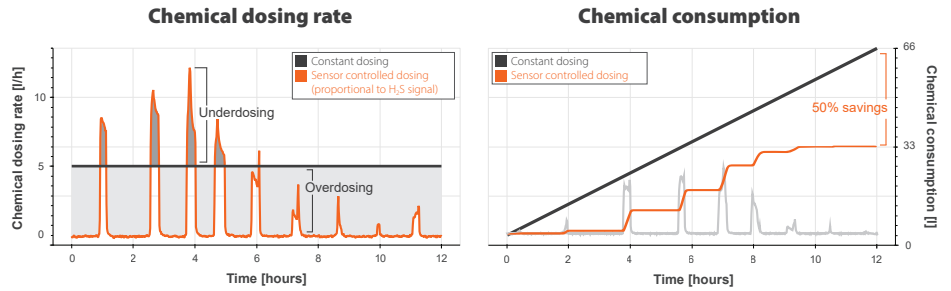


The SulfiLogger™ sensor delivered continuous H_2S data to a chemical dosing pump (1), which dynamically adjusted the dosing rate proportionally to the sensor signal (2). The effectiveness of the system was measured and compared to other approaches using a second SulfiLogger™ sensor measuring in the sewage 1.2 km further downstream.

Effectiveness



Chemical consumption



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