City of Wichita, Kansas' Odor Control Program – Continuing Optimization with a Cost-Conscious Approach

By

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Odors and Air Pollutants

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The Problem

- High degree of sulfide generation occurs throughout the City
  - 4 WWTF, 59 lift stations, & 3,254 km (2,022 mi) of sanitary lines with many areas of flat grade and low flow velocities
  - Many lift stations are oversized designed for future growth
    - Commercial discharges high in FOG and BOD
  - Several long forcemains and inverted siphons present extreme sulfide generation
  - Several industries discharge large volumes of higher strength flows in the upper reaches of the collection system

The Problem

- Before 2008 Wichita had relied on heavy ferrous chloride dosing at lift stations to control odors within the collection system onward to the largest WWTP, Plant 2
  - $H_2S + FeCl_2 \rightarrow FeS + 2HCl$
- This had localized success within the collection system but once these flows combined lowered pH (< 6.5) limited the success
  - Manual lime dosing somewhat compensated

Identifying The Best Solution

- US Peroxide implemented a Peroxide Regenerate Iron – Sulfide Control (PRI-SC®) program in 2008 to improve the odor control results and reduce costs, focusing on Plant 1 to Plant 2
- Due to a decrease in revenue, the odor control budget was cut in 2010, leading to many odor complaints
- The City re-evaluated the odor control program and issued a Request for Proposals focusing on the Plant 2 collection system in 2013

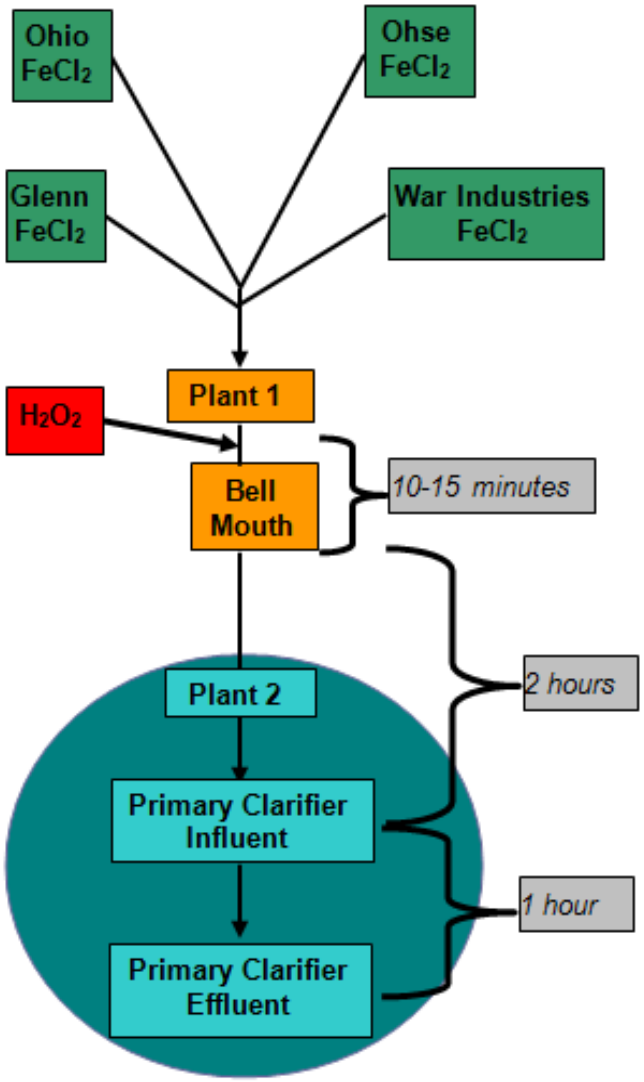
Identifying The Best Solution

- Through the City's mandatory purchasing procurement process a "biostimulant" product was tested
  - This did not meet contractual obligations for minimum H2S levels, multiple feed sites, and monthly reporting
- In 2014 USP was awarded a contract for odor control of the Plant 2 collection system

The Solution

- USP implemented PRI-SC® to address the limitations of using heavy iron dosing while offering a cost-savings
  - Step 1: $H_2S + FeCl_2 \rightarrow FeS + 2HCl$
  - Step 2: $FeS + H_2O_2 \rightarrow S^0 + Fe(OH)_2$
  - Step 3: $Fe(OH)_2 + H_2S \rightarrow FeS + 2H_2O$
  - Net: $2H_2S + FeCl_2 + H_2O_2 \rightarrow S^0 + FeS + 2HCl + 2H_2O$

The Solution



The Solution

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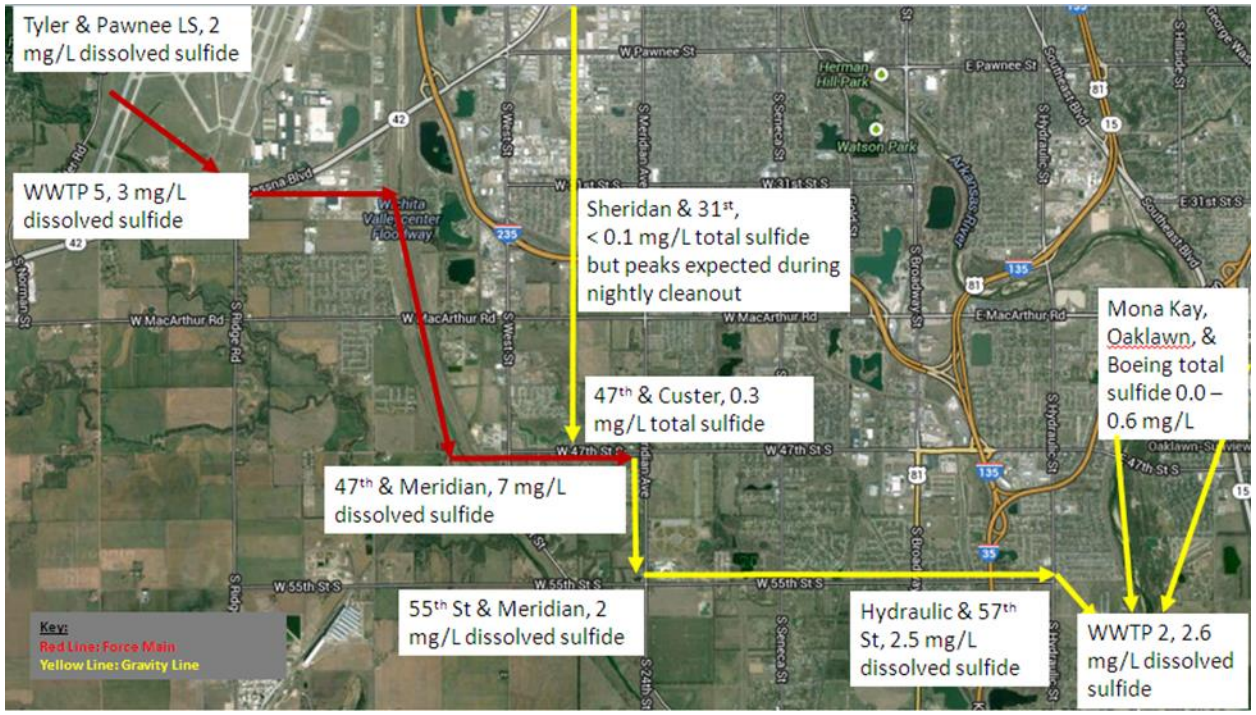
Condition	Date Range	Clarifier H_2S, Avg.	Costs
$FeCl_2$ Only	4/7 – 4/9/13	28 ppm	$560/day
PRI-SC®	3/20 – 3/22/13	8 ppm	$400/day

Condition	Date Range	Bell-Mouth H_2S, Avg.	Costs
$FeCl_2$ Only	1/10 &1/13/13	38 ppm	$480/day
PRI-SC®	1/11/13 - 1/12/13	4 ppm	$480/day

The Solution

- Conducted a survey of Plant 2 collection system to identify sulfide loadings and control points



The Solution

- Upstream H2O2 dosing point for sulfide oxidation
  - Plant 5, a scalping plant with membranes, precluded upstream Fe dosing

The Solution

- FeCl2 injection point for durational control upstream of Plant 2

The Solution

- Conducted bench scale testing to ensure that with FeCl2 dosing pH would remain above 6.5

Condition	pH Reading
Control	6.89
16 mg/L Fe^{2+} Dosage	6.68
32 mg/L Fe^{2+} Dosage	6.51
48 mg/L Fe^{2+} Dosage	6.32
96 mg/L Fe^{2+} Dosage	5.98

The Solution

- H2O2 injection point for iron regeneration at headworks

Results

Baseline

Site	Average H_2S (PPM)	Dissolved Sulfide (mg/L)
Tyler Lift Station	11.0	2.1
Plant 2 Bar Screens	2.2	0.6
Plant 2 Clarifier Flume	36.8	0.9

PRI-SC Results

Site	Average H_2S (PPM)	Dissolved Sulfide (mg/L)
Tyler Lift Station	5.8	0.2
Plant 2 Bar Screens	0.0	1.0
Plant 2 Clarifier Flume	19.7	0.7
Plant 2 Clarifier Weirs	2.4	0.7

H2S % Reductions

Site	% Reduction of Average H_2S
Tyler Lift Station	47%
Plant 2 Bar Screens	~ 100%
Plant 2 Clarifier Flume	46%

Path Forward

- Continue to provide greatest value to residents and rate payers
  - Explore seasonal lime dosing at Plant 1
  - Automate H_2O_2 dosing for iron regeneration and sulfide oxidation at Plants 1 & 2
  - Periodic re-evaluation of odor control targets, dosing rates, budgets, and overall strategy

Questions?