FIDELITY NATIONAL ENVIRONMENTAL SOLUTIONS

H_2S Case Study

BACKGROUND

DATE:
May 2014

EQUIPMENT:
EcosFrac 10 BPM ("EF10")Ozonix® Units

FORMATION:
Permian Basin (NM)

FLUID TYPE:
Produced Water

VOLUME:
~300 barrels

TREATMENT RATE:
~10 BPM batch treatment

Produced Water Treatment for H_2S in the Permian Basin

Successfully Treated H_2S in Produced Fluid

The objective of this pilot study was to treat produced water specifically for Hydrogen Sulfide ("H_2S"). Based on the findings of this pilot, FNES validated the Ozonix® treatment system's ability to eliminate H_2S and allow our customer to reuse this produced fluid. The customer had traditionally disposed of this fluid but would prefer to reuse it once treated through the Ozonix® process.

FNES processed approximately 300 barrels ("bbl") of the produced water with an EF10 Ozonix® treatment unit. The fluid was batched treated over a period of five and one quarter (5.25) hours, with samples taken at approximately every twenty (20) minutes. FNES measured H_2S concentration in each sample immediately on-site, using an instrument that had an upper limit of 80 mg/L. Using these readings FNES can calculate reaction rates and initial concentrations up to approximately 769 mg/L.

In addition to testing for H_2S, FNES also tested the Friction Reduction using a typical anionic friction reducer. The produced fluid treated through the Ozonix® treatment unit demonstrated a 19% improvement in drag reduction, proving that FNES treated fluid improves compatibility with friction reducers.

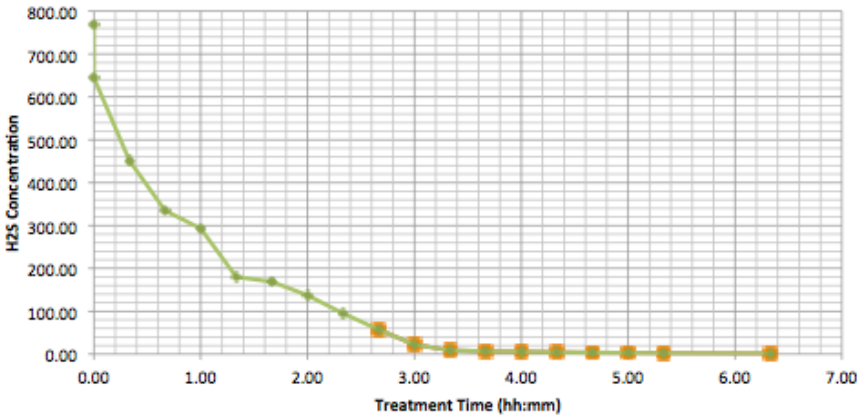

Figure 1: Hydrogen Sulfide Concentration Results

Treatment Time	S^2 as H_2S
0.00	769
0.00	645
0.33	451
1.00	293
1.33	180
2.00	137
2.33	95
3.00	22.16
3.33	9.12
4.00	5.78
4.33	4.42
5.00	3.07
6.33	1.04

Figure 2: Summary of Calculated H2S Results in mg L^{-1}

Water Type	% Drag Reduction
Treated	57
Untreated	38

Figure 3: Friction Reducer Compatibility Results Mixed with 0.5 gpt Anionic FR

TDS	pH	TOC	Alk as CaCO3	Cl	Ba	Ca	Fe	Mg	K	Na	Sr	Oil & Grease
210,000	7.0	22	550	100,000	0	3,000	0.5	660	490	77,000	62	40

Figure 4: Representative Influent Water Analytics of Produced Water