

# H<sub>2</sub>S Case Study

## Produced Water Treatment for H<sub>2</sub>S in the Permian Basin

### Successfully Treated ~ 450,000 Barrels of H<sub>2</sub>S laden Produced Fluid

#### BACKGROUND

**DATE:**  
October 27 - November 03, 2014

**EQUIPMENT:**  
EcosFrac 80 BPM  
("EF80") Ozonix® Units

**FORMATION:**  
Permian Basin (NM)

**FLUID TYPE:**  
Produced Water

**VOLUME:**  
~450,000 barrels

**TREATMENT RATE:**  
~80 BPM batch treatment

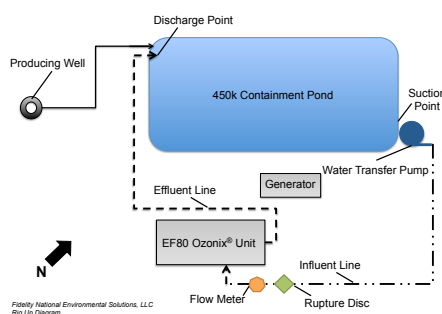
**LABORATORY:**  
Martin Water Laboratory

#### TESTS & METHOD:

- S<sup>2</sup> as H<sub>2</sub>S (SM 4500)
- S<sup>2</sup> as H<sub>2</sub>S (USEPA Methylene Blue Method)

The objective of this case study was to treat produced water specifically for Hydrogen Sulfide ("H<sub>2</sub>S"). Based on the findings of this study, FNES displayed the Ozonix® treatment system's ability to eliminate H<sub>2</sub>S 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 450,000 barrels ("bbl") of the produced water with an EF80 Ozonix® treatment unit; rig-up is shown below.



The fluid was batch treated and reached non-detectable limits after four (4) days of treatment; samples were taken at different locations and times throughout the treatment process. FNES measured H<sub>2</sub>S concentration in each sample immediately on-site, using an DR890 colorimeter, which utilizes the USEPA Methylene Blue Method. All field readings were third party verified by Martin Water Laboratory located in Midland, Texas.

Using these readings FNES can calculate reaction rates and create predictive modeling tools to estimate treatment times for other fluids.

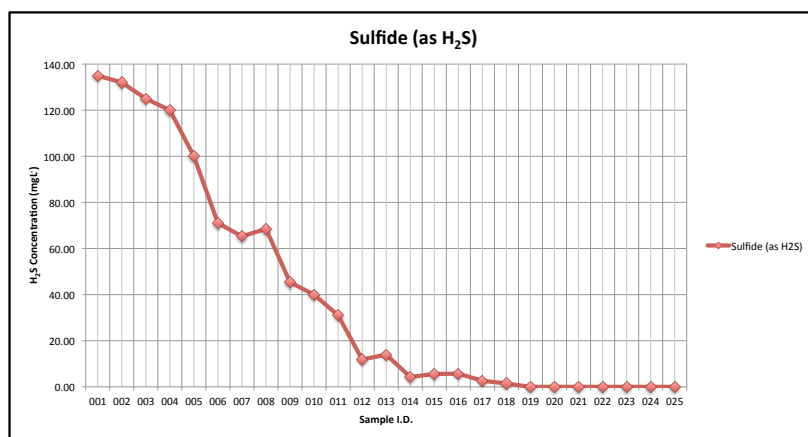


Figure 1: Hydrogen Sulfide Concentration Graphical Results

Field Analytics Log			
Date and Time	Sample I.D.	Sulfide	Sulfide (as H <sub>2</sub> S)
10/27/14 0:00	001	127.04	135.00
10/27/14 15:30	002	124.21	132.00
10/28/14 15:45	003	117.63	125.00
10/28/14 15:45	004	112.92	120.00
10/28/14 18:00	005	94.10	100.00
10/29/14 9:00	006	66.81	71.00
10/29/14 9:45	007	61.45	65.30
10/29/14 10:15	008	64.44	68.48
10/29/14 11:30	009	42.65	45.32
10/29/14 12:30	010	37.64	40.00
10/29/14 12:30	011	29.17	31.00
10/29/14 18:00	012	11.16	11.86
10/30/14 8:30	013	13.12	13.94
10/30/14 8:30	014	4.02	4.27
10/30/14 14:23	015	5.27	5.60
10/30/14 18:15	016	5.37	5.71
10/31/14 8:30	017	2.50	2.66
10/31/14 15:00	018	1.35	1.43
10/31/14 19:30	019	0.00	0.00
10/31/14 20:30	020	0.00	0.00
10/31/14 9:30	021	0.00	0.00
10/31/14 10:30	022	0.00	0.00
11/1/14 8:30	023	0.00	0.00
11/2/14 8:30	024	0.00	0.00
11/3/14 9:00	025	0.00	0.00

Figure 2: Hydrogen Sulfide Concentration Numerical Results