

AcroClear® Treatment Resolves Issues Caused by FeS Formation in Tank Battery

CHALLENGE

- » Tank battery upsets were occurring daily due to formation of FeS solids.
- » Commingling of incompatible fluids from wells high in H₂S and other wells high in iron led to the formation of FeS solids and hydrocarbons in water tanks.
- » Large interface pads present in the separation equipment frequently put oil out of sales specification with BS&W levels >4%.
- » Batch treatments of acid-based chelators weren't working well enough and introduced corrosion risks to the equipment.
- » Regular cleanouts and equipment reconfigurations meant to keep the problem under control were lowering production volumes.

SOLUTION

- » Continuous application of AcroClear, an acrolein-based product that scavenges H₂S and dissolves FeS solids.
- » AcroClear is water- and oil-soluble and can penetrate oily coatings on FeS particles, clarify black water and eliminate discharge of FeS solids.
- » Continuous monitoring during the trial allowed the team to adjust treatment rates and ensure KPIs were met.

RESULTS

The approach essentially eliminated the problem with iron sulfide solids. Since the treatment began:

- » No cleanouts of the tank battery have been required.
- » Water quality dramatically improved.
- » Interface pads for all the tanks have been significantly reduced, and oil has consistently met sales specifications with BS&W levels now averaging 0.3%.
- » The need for batch treatments with acid-based chelators before the SWD has been eliminated.
- » Operator was able to normalize operations and comingle produced fluids at the gun barrel as designed.

CONTINUOUS APPLICATION IMPROVES OIL AND WATER QUALITY, ELIMINATES TANK CLEANOUTS FOR OPERATOR IN THE PERMIAN

NORTH AMERICA LAND

OVERVIEW

Iron sulfide (FeS) developing from the commingling of incompatible produced fluids in a West Texas operator's tank battery caused a host of problems with the process stream: large interface pads in the gun barrel and water tanks, water in the oil tanks, oil carryover and black sludge in the system, and high H₂S levels throughout. Multi-Chem, a Halliburton Service, was engaged to resolve the issue and recommended a continuous application of AcroClear®, an acrolein treatment designed to eliminate toxic H₂S gases and FeS solids. The approach effectively removed the FeS and alleviated the need for other time-consuming and expensive operational workarounds.

CHALLENGE

Produced fluids from two high-producing wells with high H₂S rates were combining with production from 16 other wells from different formations with elevated iron. This commingling led to the problems with FeS solids in the tank battery.

The interface pads and contamination of the water and oil streams that resulted forced the operator to shut in wells every month to allow for manual clean outs of the tanks. Sales oil regularly failed to meet pipeline specifications with BS&W levels in excess of 4%, which required reprocessing of the oil. Traditional batch treatments with a competitor's acidic chelator were having a limited effect and caused new challenges by upsetting the system's pH balance and raising corrosion risks.

The operator resorted to re-piping the tank battery to delay the comingling of the two production streams to avoid the formation of FeS solids. This configuration bypassed an oil separation process that contributed to elevated hydrocarbons being transported to the saltwater disposal well.



Iron sulfide solids were forming in the customer's tank battery (similar to the one shown above), causing a host of challenges: large interface pads in the gun barrel and water tanks, water in the oil tanks, oil carryover and black sludge in the system, and high H₂S levels throughout.



These photos show the improvement in water quality during treatment. 1. Water from the outlet transfer pump following mechanical cleanout and before continuous treatment. 2. Same location following 10 days of treatment. 3. One month of treatment. 4. Two months of continuous treatment.

SOLUTION

Multi-Chem technical professionals visited the site to assess operations, sample produced fluids and conduct water analysis to determine the best treatment approach. They recommended treating the system continuously with AcroClear, an acrolein-based H_2S scavenger and iron sulfide dissolver that consistently outperforms conventional chemical solutions.

The team established two injection points. The first was at the commingled stream from the 16 high-iron wells. The other treated the water stream for the two high H_2S wells. The combined initial dose rate was 21 gallons/day. It was optimized down to 18.5 gallons/day.

The water- and oil-soluble sulfide controller is able to penetrate the oily coatings on iron sulfide particles, clarify black water and rid discharge of iron sulfide solids. AcroClear is a simple organic molecule that is non-corrosive and does not affect the pH of an aqueous system.

The reaction between H_2S , iron sulfide and acrolein produces a low molecular weight, highly water soluble by-product that is stable and prevents the regeneration of H_2S and FeS.

The rapid reaction with dissolved H_2S can be an advantage when retention time is an issue.

RESULT

At the start of the field trial, dissolved H_2S levels at the outlet pump were 6 ppm and the levels of total suspended solids (TSS) were 300 mg/L. By the end of the trial, H_2S levels were less than 1.0 ppm and the TSS was maintained at or below the 100 mg/L threshold.

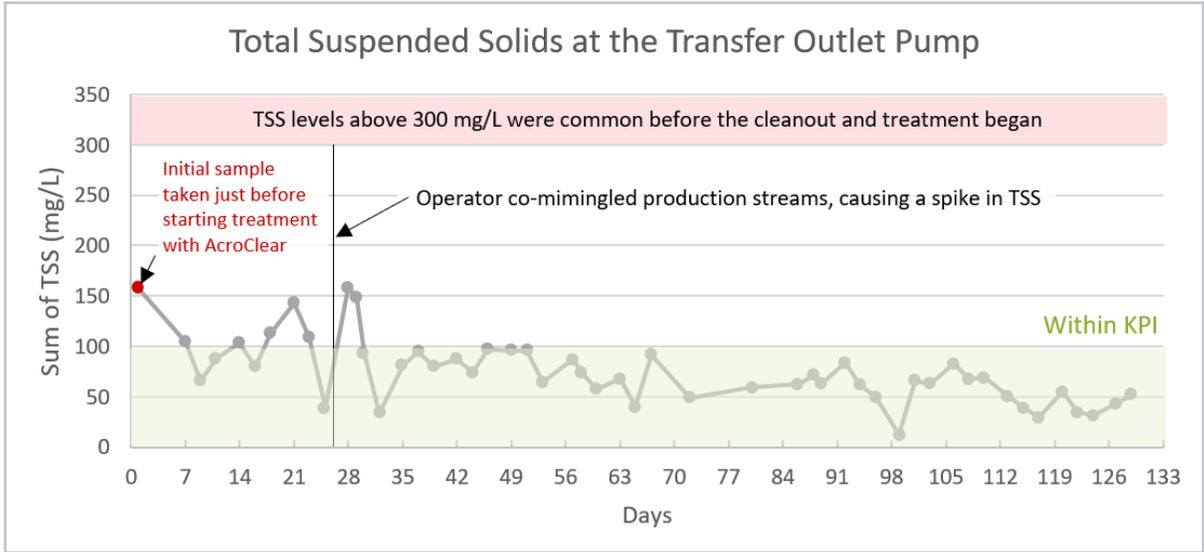
The approach worked quickly with an almost 50% reduction in TSS within the first 10 days.

The reduction in solids throughout the tank battery and improved water quality delivered major benefits to the operator, including:

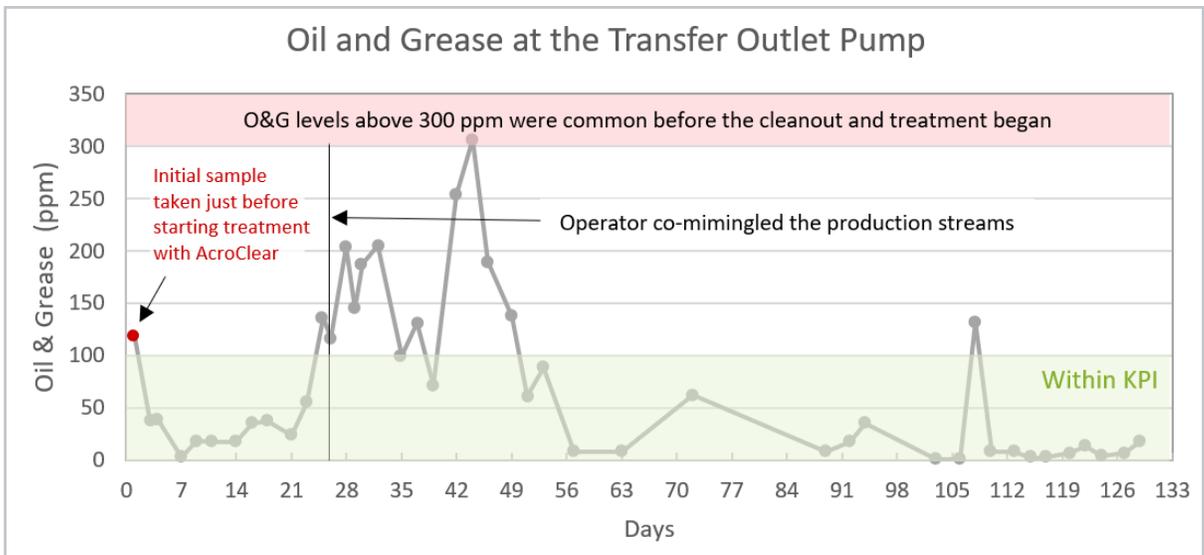
- Cleanouts of the tank battery were no longer required;
- Interface pads in all the tanks had shrunk considerably;
- Batch treatments with corrosive-inducing chelators were no longer required;
- Oil has consistently met sales specifications; and
- Piping was re-configured to allow for co-mingling of produced fluids at the gun barrel as originally designed.

These improvements mean higher production volumes and money saved by eliminating less-effective treatments.

Following the success of the field trial, the operator made the treatment program at the site permanent and requested a continuous AcroClear treatment approach at another facility.



Following the decline in Total Suspended Solids after the mechanical cleanout of the tanks, the AcroClear treatment succeeded in lowering and maintaining levels at a manageable rate. After the success evident by the third week of continuous treatment, the operator re-adjusted the piping to allow the comingling of the incompatible wells ahead of the gun barrels. This led to an uptick in TSS levels, but the AcroClear treatment succeeded in bringing the levels back down to below 100 mg/L. Before treatment, the operator regularly had TSS levels above 300 mg/L. Four months after continuous treatment began, TSS levels are maintained below 60 mg/L.



Oil and grease levels tell a similar story. The AcroClear treatment accelerated the decline in oil and grease levels following the mechanical cleanout. When the operator re-piped the equipment to commingle the incompatible wells ahead of the gun barrels to maximize production flows, oil and grease levels spiked, which took a few weeks to bring under control. After four months of continuous treatment, oil and grease levels were maintained below 20 mg/L.

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