



Verza360® Unlocks \$2.6M in Savings Across Texas Saltwater Disposal Network

Challenge

High Solids and Oil Carry Under Increase Operating and Chemical Treatment Costs

A Midstream saltwater disposal (SWD) operator in Texas was experiencing high solids and oil carry under across its network of >20 SWDs, resulting in:

- high injection pressures
- increased filter changes
- loss in oil recovery
- injection well plugging
- interface pads, and tank bottoms.

This poor water quality contributed to an increase in operating costs and injection well acidizations to enable the disposal of over 300,000 barrels of varying water chemistries per day (BWPD) across the network.

The typical chemical program consisted of acid surfactants and oxidation products, dosed at ~250 ppm and cost ~\$0.03 per barrel of water per day injected, yet provided marginal improvement in terms of water quality and operational performance.

Solution

Verza360® for Iron Control

In collaboration with a local chemical provider and the SWD operator, Solugen formulated an iron chelant, Verza360® (Verza), to address the key challenges.

Verza is a proprietary, carbon-negative, and biodegradable organic acid-based chelant that is primarily effective at controlling iron-based solids. It is a proven solution for iron in oil removal and improving oil/water interface and quality affected by iron stabilized emulsions.



Trial

Applying Verza Treatment to SWD Network

An 18-month trial was conducted across the SWD network to observe the effect of Verza treatment (dosed at ~30 ppm) in terms of the following key performance indicators (KPIs):

- oil recovery
- solids reduction
- tank bottom cleaning
- oil pads interface and quality
- time savings, and
- reduced environmental impact.

For the first 5 months, a baseline was established using the incumbent chemical program before switching over to Verza in months 6 through 18. Each month, the following performance data was gathered and averaged across the network for comparison against the incumbent program and effect on KPIs:

- total suspended solids (TSS)
- total oil and grease (TOG)
- barrels of oil per day (BOPD) and barrels of water per day (BWPD) injected.

Results

Verza Treatment Improves Water Quality and Injectivity

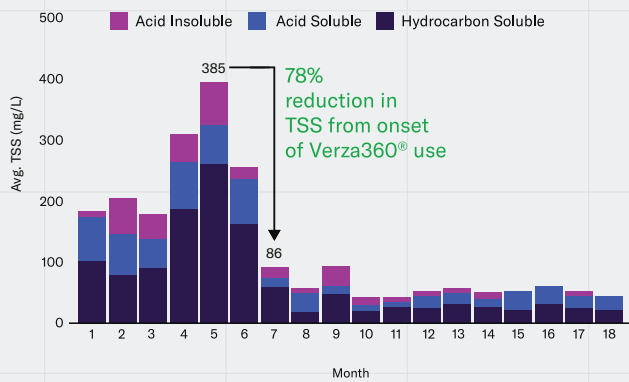
Total Suspended Solids (TSS)

Suspended solids can settle in any part of an SWD system and cause problems. A TSS measurement is one basis for estimating the plugging tendency of water as it measures the amount of solids in the water that are not in solution. TSS is typically measured by filtering a given volume of water through a 0.45 µm pore-size membrane filter and reported in terms of hydrocarbon soluble, acid soluble, and acid insoluble concentrations. For injection wells, guidelines typically specify that the maximum amount of TSS be no more than 25 mg/L when the water is passed through the filter at a pressure of 20 psi.

In this case, after 2 months of introducing Verza into the network, the TSS content dropped by 78% and sustained this performance for the duration of the trial (Figure 1).

Figure 1

Average TSS content over 18 months across SWD network



Overall, the average percent reduction in TSS was 78.4%, considering the average TSS data gathered before and after Verza360® treatment (Table 1).

Table 1

Summary of Average TSS Content Before and After Verza360® Treatment*

	Before Verza360®	After Verza360®	Avg. % Reduction
Hydrocarbon soluble (mg/L)	136.3	26.3	80.7%
Acid soluble (mg/L)	64.0	17.8	72.2%
Acid insoluble (mg/L)	35.7	6.8	81.1%
Total suspended solids (mg/L)	236.0	50.9	78.4%

*Before Verza360® data is an average of months 1-5. After Verza360® data is an average of months 6-18.

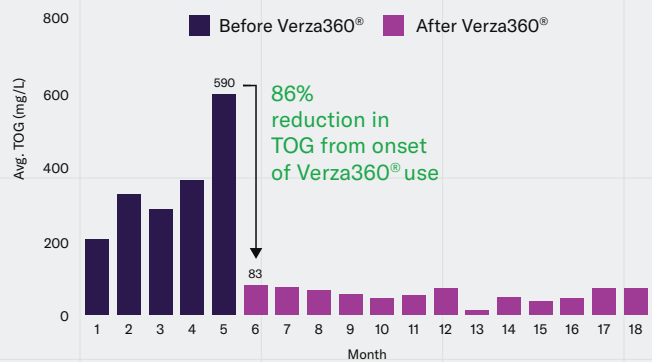
Total Oil and Grease (TOG)

The presence of dispersed or emulsified oil in water often presents problems when injecting produced waters. Oil in water can cause decreased injectivity in several ways. It can cause “emulsion blocks” in the formation, serving as an excellent glue for certain solids, such as iron sulfide, thereby increasing plugging efficiency. Oil in water can also be trapped in the pores of the formation rock around the wellbore, further reducing injectivity. When produced water is disposed into surface waters, the concentration of oil in the water is usually limited by government regulation. Thus, an analysis for oil content should be conducted on any water regardless of origin given the many ways in which water can become contaminated with oil and impact injection.

In this case, when Verza was introduced into the network during month 6 of this trial, the average TOG content decreased by 86% compared to the incumbent program implemented in prior months (Figure 2). This improved performance was maintained for the duration of the trial.

Figure 2

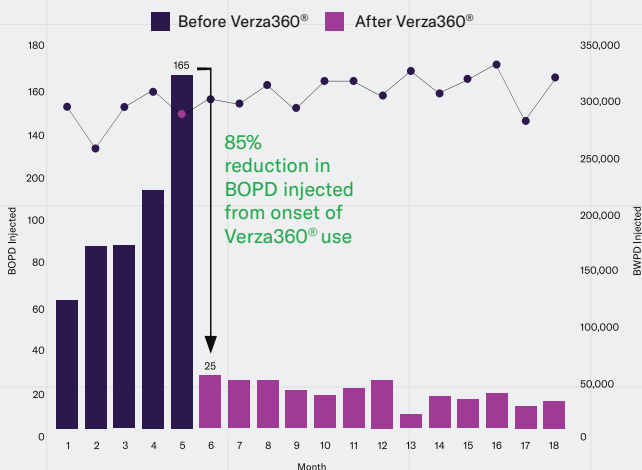
Average TOG content over 18 months across SWD network



Consequently, Verza enabled a reduction of 85% barrels of oil per day (BOPD) injected compared to the incumbent, thus improving the amount and quality of water injected for the duration of the trial (Figure 3).

Figure 3

Average BOPD and BWPD injected over 18 months across SWD network



- **Reduced Tank Bottom Cleanings:** Due to the decrease in solids accumulation, tank bottom cleanings were reduced from 3X/year to 1X/year, if needed.
- **Time Savings:** >90% reduction in facility upsets minimized operator time spent managing the network.
- **Reduced Environmental Impact:** Greener chemistry and lower injection rates (30 ppm vs. 250 ppm) reduced the use of chemical tanks, pumps, and deliveries with less trucks on the road.

In total, the operator realized annual total cost of operation (TCO) savings of \$0.024/bbl. As such, the Midstream operator continues to utilize Verza to this day across its network.

To learn more, visit solugen.com/oilandgas or email us at energysolutions@solugen.com.

Conclusions

Verza Treatment Improves Operational Performance and Total Cost of Operation

Since the introduction of Verza into the network, the Midstream operator has incurred major improvements to operational performance while adding substantial savings to its Total Cost of Operation (TCO).

In relation to the previous KPIs, Verza enabled the following improvements:

- **Improved Oil Recovery/Oil Pad Interface:** Verza chemistry improved oil/water interface and quality across all systems, enabling 80% reduction in BOPD injected into disposal well.
- **Solids Reduction:** 72% reduction in acid solubles and 81% reduction in acid insolubles eliminated the need for annual acidization injections while increasing water injection.



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