

Upstream Oil & Gas

Corrosion Analysis



Resolving Upstream Corrosion with Rigorous Water Chemistry Simulation

Creedence Energy Services is an oil and gas chemical company who plans to become the leader of production chemical programs in the Bakken oil fields. To achieve this, Creedence Energy enlisted the extensive water chemistry analysis capabilities of OLI Systems, to help them mitigate corrosion and optimize drilling performance for their customers. OLI Systems' thermodynamic modeling and simulation software provided vital chemistry insights to discover, predict, and treat corrosion in downhole equipment. This enabled Creedence Energy to rapidly resolve corrosion issues and extend asset life.





Industry Trends

Optimizing extraction for increased yield

Corrosion is a major cause of equipment failure and lost production in the Upstream Oil and Gas sector. According to NACE International, corrosion costs upstream companies a collective \$1.4 billion dollars each year. These costs are broken down into \$589 million in surface pipeline and facility expenses, \$463 million in downhole tubing expenses, and \$320 million in capital expenditures.

To combat this industry-wide issue, oil and gas producers are seeking new technologies to improve their production methods and operating materials to stand up against corrosion. Corrosion control is essential to sustain and enhance oil and gas operations, enabling producers to extend asset life and increase well productivity, integrity, and yield.

Business Challenge

Enhancing the reliability of downhole equipment

Creedence Energy is an oil and gas chemical company servicing Bakken Basin and surrounding basins. Their mission is to deliver superior integrity and performance in acid pumping and delivery services. They aim to provide oil and gas operators with safe, affordable, and effective downhole chemical treatments in order to improve well production, decrease failure rates, and significantly extend runtime. Creedence Energy offers customers a Total Safety Approach to dramatically reduce and ultimately eliminate incidents, injuries, and spills.

In this study, Creedence Energy needed to extend the life of oil pumps in the Bakken oil fields. A combination of heat, abrasive particles, corrosive fluids, and the velocity of produced fluids created an extremely corrosive environment. Within just six months, downhole equipment was at risk of catastrophic failure. In a particularly difficult case, teams were forced to replace over 100 segments of tubing in less than three months—twice. The company formed a conventional hypothesis that carbon dioxide was causing the corrosion; however, after a visual inspection of the failed tubing, they also found signs of an unknown type of corrosion that perplexed their engineers.

Driving productivity with chemistry analysis

Creedence Energy employed the extensive water chemistry analysis capabilities of OLI Systems to determine the cause of the corrosion and to diagnose the quickest, most economic method to treat problem areas. They planned to utilize OLI Systems' modeling and simulation technology to visualize operating environments across the Bakken oil fields. The goal was to model the physical conditions of these drill sites to learn the outcomes of various chemical reactions.

Creedence Energy hoped to measure the extent of the carbon dioxide corrosion damage as well as the possibility of oxygen-induced or freshwater-induced corrosion. While these reactions are uncommon in downhole equipment, the company planned to utilize thermodynamic models to pinpoint the exact causes and locations of the corrosion, and to aid the selection of ideal operating materials to prevent future corrosion issues.

Solution



“OLI Studio: Corrosion Analyzer was a vital tool in diagnosing the root cause of metal loss and identifying the best course of treatment.”

Eric Nelson
*Lead Technology Advisor
Creedence Energy Services*

Modeling production fluids for rigorous insight

Creedence Energy adopted the OLI Studio: Corrosion Analyzer to “turn the lights on” in the affected tubing. Utilizing this industry-leading software in conjunction with the extensive chemistry knowledge of OLI Systems experts, the company was able to analyze the root of the issue by testing for additional types of corrosion.

Engineers began by modelling the introduction and mixing of oxygen-rich freshwater with produced fluids in the downhole equipment. Results from the Corrosion Analyzer found that general corrosion rates increased by 5–15 mpy in each of the scenarios. They also found that maximum pit current density increased by 25–40% on models when oxygen-rich freshwater was mixed. Finally, the polarization curve generated by the Corrosion Analyzer determined a strong influence of oxygen-accelerated corrosion. Creedence Energy operationalized these vital insights to establish a trial to chemically control the oxygen concentration of introduced freshwater and dramatically increase the reliability of the downhole equipment.

“ An investment in OLI Systems provides significant rates of return to our staff productivity and confidence, and to our clients by optimizing their operations. ”

Eric Nelson
Lead Technical Advisor
Creedence Energy Services



OLI Systems extends asset life

The implementation of the OLI Studio: Corrosion Analyzer allowed Creedence Energy to optimize drilling and production processes across a number of drill sites. The modeling and simulation software has proven to be a vital tool in diagnosing the root cause of metal loss in addition to identifying the best course of treatment—implementing an Electronic Submersible Pump to efficiently and reliably deliver the desired flow rate of fluids. The results have been remarkable.

Since the trial, tubing inspections have repeatedly shown that less than 10 segments of tubing need to be replaced due to corrosion. Additionally, corrosion reduction now occurs with a 100% greater exposure time than was previously possible. These improvements were applied to 59 wells with 60 more applications planned, enabling the customer to save hundreds of thousands of dollars.

Because of this success, Creedence Energy and OLI Systems are working together to develop guidelines, present configuration files, and case templates for an initiative called “OLI for Non-Chemists.” The program will enable Creedence Energy to bring the power of OLI Systems’ simulation technology to their technicians, empowering engineers and scientists to cut costs and optimize operations for all of their customers. According to Eric Nelson “An investment in OLI Systems provide significant rates of return to our staff in productivity and confidence, and to our clients by optimizing their operations.”

for more information: www.olisystems.com

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