

Downstream Oil & Gas

Stream Analysis



Utilizing Rigorous Modeling & Simulation to Prevent Corrosion in Refinery Overheads

Olavo Dias, currently with Becht Engineering, has utilized OLI Systems' modeling and simulation software with rigorous chemistry expertise to resolve a number of corrosion issues. The primary objective was to pinpoint the cause of ongoing corrosion in refinery overhead systems, even after materials upgrading and complete corrosion control. He teamed up with OLI Systems' experts and utilized the thermodynamic models to simulate the refinery overheads to quickly determine a solution. This also resulted in expanding this technology to other applications that helped resolve corrosion and fouling issues based on their unique operating conditions.



Industry Trends

Enhancing reliability to achieve greater performance

The Downstream Oil & Gas industry refines crude oils into a wide range of products such as gasoline, diesel oil, liquified natural gas, propane, synthetic rubber, plastics, and lubricants. Because it is difficult to identify and remove all salts and other impurities in the feed, these contaminants can cause serious problems in different process units.

Corrosion and fouling are challenges that continue to affect downstream companies, particularly in refining overhead systems. To combat this widespread problem, today's companies are seeking better and more proactive ways to analyze corrosive contaminants and determine the most economic course of treatment in order to sustain output, reduce maintenance costs, and avoid total shutdowns. However, accurately predicting or even recognizing corrosion risks poses a major hurdle for companies.

Business Challenge

Tackling an industry-wide dilemma

In this study, Dias needed to help a refinery that was experiencing severe corrosion and fouling in their overhead systems. This was even after materials upgrading and complete corrosion control were in place. This resulted in the equipment to rapidly deteriorate, decreasing operational performance, and putting the refinery at risk of leaks and failures. Dias was tasked with finding the root causes of the problems and providing the most cost-effective solutions.

Optimizing productivity with thermodynamic models

To resolve these issues, Dias teamed up with OLI Systems to help determine the cause of these issues as well as to select optimum chemical additives and operating parameters. There was a need to understand, identify and treat the system in order to prevent failures. The plan included simulating the refining overhead systems to understand why the equipment was failing.

Dias hoped to recreate exact field conditions utilizing rigorous OLI Systems models, therefore allowing teams to monitor physical properties and process performance on an ongoing basis. The goal was to develop a prediction capability that would better equip them to identify corrosion, damage rates, adjust treatment schemes, and respond proactively. By doing so, the refinery was able to dramatically lower the costs of inspection, reduce maintenance, and optimize chemical treatment.

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Olavo Dias
*Plant Integrity & Corrosion
Management Expert,
Becht Engineering*

Optimizing refining operations with rigorous modeling

Dias utilized OLI Systems’ rigorous water chemistry tools and extensive chemical database to tackle the refinery’s corrosion issues. Leveraging state-of-the-art water chemistry modeling and analysis capabilities, he was able to simulate the exact conditions of the overhead systems.

According to Dias, “With OLI Systems’ high-level understanding of water chemistry, equilibrium, and thermodynamics, we were able to model the potential for corrosive salt formation and the specific type in the overhead systems.” This allowed engineers to recreate corrosion and fouling potentials in the real world using simulations that defined the properties of amines and hydrocarbons in process streams. With this capability, the best of amines treatment schemes for the overhead systems was possible by modeling different temperatures, pressures, pH levels, dewpoints, and other parameters.

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Olavo Dias
*Plant Integrity & Corrosion
Management Expert,
Becht Engineering*



OLI Systems delivers predictive insights and solutions

According to Olavo Dias, Plant Integrity and Corrosion Management Expert at Becht Engineering, OLI Systems solutions provided the foundation for improvements industry-wide: “OLI Systems has made significant contributions to understanding and predicting potential issues in refining overhead systems that resulted in proactive changes to minimize corrosion and fouling.”

The implementation of OLI Systems’ modeling and simulation software was key to improving overall unit performance and reliability of the overhead systems. The rigorous thermodynamic models enabled engineers to achieve three key outcomes:

- Pinpointing the proper amount of water wash and optimal amine neutralizer additions to resolve and prevent corrosion in crude distillation overheads.
- Eliminating corrosion without the use of film inhibitors in light gas overheads.
- Increased equipment life throughout all downstream operations.

As a result, Dias developed a simulation program in conjunction with an existing industry database to analyze the gaps of insight between liquid, solid, and vapor equilibrium. The entire project took roughly two years to complete; however, the implementation was immediate. The simulation program can be applied to different types of overhead systems to determine their specific corrosion issues and requirements, helping companies across the industry overcome their most daunting challenges.

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