

# Refinery Solves Long Term Corrosion Problem By Deploying 3D TRASAR™ Technology For Crude Overhead Systems



## INTRODUCTION

A Gulf Coast refinery has experienced corrosion failures in the crude unit overhead exchangers for over 10 years, costing the refiner in excess of \$1 million per year in equipment, labor and lost production costs. The refinery plugs tubes, retubes exchangers and replaces exchangers as frequently as every 18 months. The biggest challenge the customer faces is trying to resolve this persistent corrosion problem is clearly identifying the contributing factors and directly linking these to unit performance and the exchanger failure rate.

## PROBLEM

The customer wanted to eliminate or drastically reduce corrosion, allowing them to run turnaround-to-turnaround without suffering any downtime or lost production due to corrosion failures. In addition to the direct costs, poor overhead performance was increasing the refiner's safety and environmental exposure. Despite valiant efforts, poor corrosion performance could not be significantly reduced with the application of a traditional chemical treatment program. It was suspected that much of the corrosion damage occurring was

episodic in nature, and the direct result of operational changes. The customer needed a simple way to measure and track corrosive conditions resulting from changes in operations, linking these directly back to corrosion performance.

## SOLUTION

To meet the customer's needs, Nalco Water deployed 3D TRASAR™ Technology for Crude Overhead Systems (COS). This technology uses a stream of crude unit overhead sour water to determine the corrosive state of this water in real time. Based on an analysis, the technology directly controls the addition of caustic, neutralizing amine and filming inhibitor to the crude unit overhead. The goal was to link the chemical addition directly to the demands of the overhead system. The technology was initially deployed on monitoring mode to observe the system and establish direct linkage between changes in operations and corrosion performance.

The 3D TRASAR system discovered significant differences on corrosion rate measured by electrical resistance probes (10 mil/yr1) versus real corrosion rate measured by failure rate (40 mil/yr1). A decrease of pH and increasing chloride

## ANNUAL SAVINGS

### ASSETS

Reliability savings of  
**\$1MM**  
per year

### COSTS

OPEX savings of  
**\$169,000**  
per year



**FIGURE 1:** 3D TRASAR CRUDE OVERHEAD SYSTEM EQUIPMENT

and iron concentrations was observed during monitoring mode (Figure 2). As can be seen from Figure 2, considerable damage occurred during these periods of upset conditions.

Once a firm link was established between upset conditions and changes to unit operations, the 3D TRASAR unit was placed into control mode. At this stage the technology was fully operational, providing real-time system monitoring and chemical injection dosage based on demands. Figure 3 shows how corrosion rates improved after year two, once chemical program dosage was based on real needs, versus a predetermined value. Corrosion had previously peaked in year one at 10.57 mils/yr., and prior to the implementation of the technology, year four at 8.46 mils/yr. With the advent of manual control, corrosion was reduced by 50% during monitoring mode and further reduced by 44% during control mode. In addition to the benefit of reduced corrosion and annual savings of approximately \$1 million, the refiner consumed substantially fewer chemical additives, to the tune of \$169,000 annually from year four onwards.

### CONCLUSION

According to the data presented, automating the addition of caustic, neutralizing amine and filming inhibitor to the crude unit has dramatically improved corrosion performance. It also reduced chemical consumption, saving the customer \$1.16 million per year in total operating costs. The calculated return on investment for this application is \$5 million for an investment of \$1 million over five years.

### CORROSION EXCURSION MONITORING

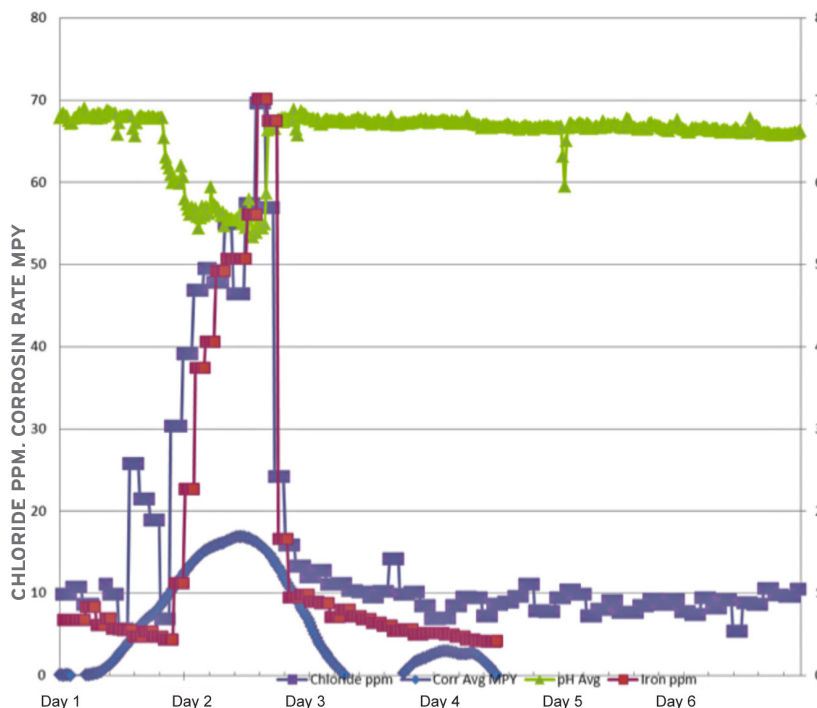


FIGURE 2: CORROSION EXCURSION DURING MONITOR MODE

### CORROSION RATES MILS PER YEAR (MPY)

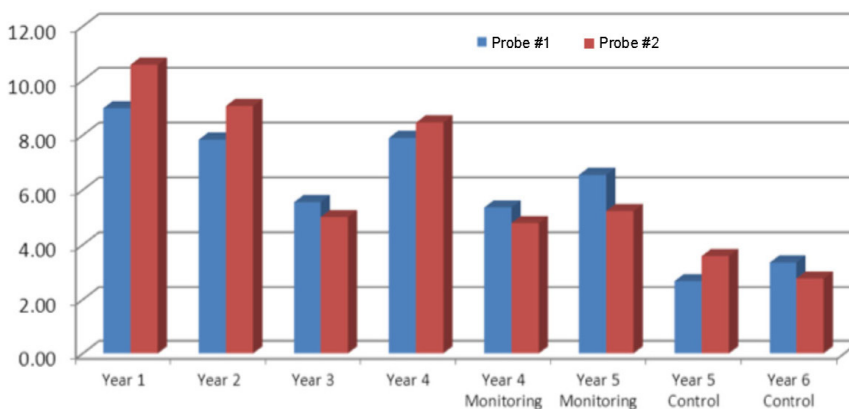


FIGURE 3: CORROSION RATES FOR BASELINE OPERATION, MONITORING MODE & CONTROL MODE

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