

Case Study: CH-1970

NEW ONLINE SALT ANALYZER CAPTURES PROCESS UPSET ALLOWING QUICK MITIGATION OF THREATS



INTRODUCTION

There are many potentially corrosive contaminants in feeds to crude units that can end up in the overhead systems. The major concern remains salt-in-crude and consequently, good desalting and good caustic injection practices are critical. However, residual salts, especially magnesium chloride, left in the crude oil after desalting can hydrolyze to form HCl, which is typically the most prevalent corrosive contaminant found in crude unit overhead systems.

Maintaining and protecting the operational integrity of crude unit overhead systems is key. Failure to do so can impact unit reliability and availability, which ultimately compromises the profitability of the refinery as well as increasing the risk to personnel and public safety.

BACKGROUND

Effectively managing desalters and overhead corrosion control programs can be a challenge, especially when processing discounted feedstocks. The combination of frequent crude changes, coupled with significant batch-to-batch variation, results in highly variable contaminant levels in the feed to many crude units, making good control difficult.

Complicating things further, the operation of the desalters is also subject to a lot of variability, with even small upsets resulting in rapid increases in levels of residual salt leaving the desalter. These problems are exacerbated by the traditional service frequency of the desalting process (ie. typically two or three times per week) as a health check on key process variables, like salt-in-crude, and trying to control the process with such infrequent measurements is impossible.

Instead, the technology now exists to provide the salt data hundreds of times per day, which in turn allows for

process optimization to the desalter during the same crude run and through crude switches. This will vastly improve contaminant removal and reduce corrosion potential downstream of the desalter, and should also lead to economical use of caustic, which again has downstream benefits in terms of lowering Na residuals. Overall, system reliability will increase and more cost advantaged crudes can be considered in the refinery crude diet.

SOLUTION

A Gulf Coast Refiner installed the Nalco Champion 3D CrudeFlex Online Salt Analyzer (OSA) at the desalted crude outlet of one of the crude units, complimenting the 3D TRASAR™ Technology for Crude Overhead Systems (3DTCOS) that was already installed. With the addition of the online analyzer, both inorganic and organic chlorine were detected, providing real time chlorine measurements. This ensured upsets could be detected quickly and mitigating actions taken, whilst ensuring ongoing desalter performance met critical KPI's.

By having online analyzers on both the desalted crude outlet and the overhead sour water, the increased volume of data provided a much clearer picture of how operational variability impacted desalting and overhead corrosion control. The ability to analyze in near real time provided little time-lag in the results, allowing the refiner the potential to catch unit variations that would otherwise go unseen. This permitted the refiner to act upon them ensuring that good desalter performance was maintained and that that overhead corrosion was kept under control.

RESULTS

As discussed previously, existing procedures to monitor the performance of the desalter and the overhead corrosion control program rely on spot samples, snapshots at one particular moment in time. The reality is that the refiner operates in total ignorance between

measurements and is often unaware of the impact that even the smallest upset can cause.

A short time after commissioning the OSA, the refiner experienced an operational issue and, as a consequence, had to reduce feed rates. Upon reducing feed rate, the OSA began to show a sharp increase in salt exiting the desalter, with the 3DTCOS showing an increase in overhead chlorides that quickly exceeded the control value of 25ppm (see figure 1).

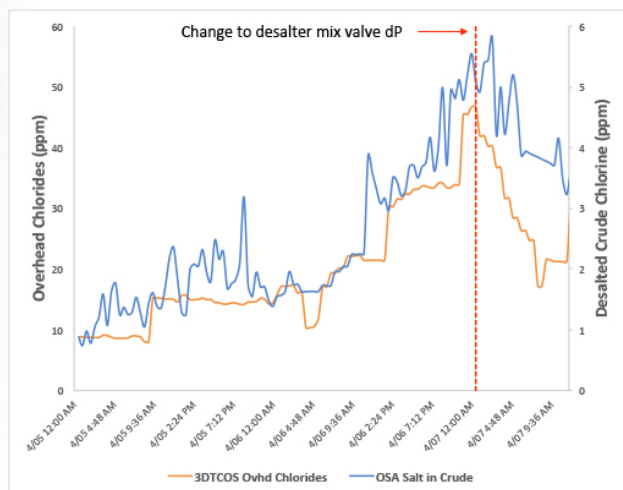


Figure 1: Data from the Online Salt Analyzer & 3DTCOS

The online analyzers, linked to the refinery control system, alerted Operations to the increases and quickly determined that the reduction in feed rate resulted in a lower mix valve dP. Reduced mixing efficiency and poor contact between the wash water and the crude oil resulted in desalting efficiency being compromised.

The increase in chlorides required increased neutralizer dose rates to ensure that the overhead sour water pH remained within the desired control band. Furthermore, the higher chlorides increased the risk of salt formation, potentially pushing salting into the top sections of the crude tower.

Once recognized, the mix valve dP was increased back to typical operating levels and the salt in crude and overhead chlorides began to reduce almost immediately, returning to typical levels.

CONCLUSION

The installation of the online salt analyzer, in addition to the 3DTCOS already installed, fills the monitoring gaps of the desalter and the crude unit overheads. By providing continuous near real-time analysis, out of compliance situations are communicated immediately when they may have otherwise remained unseen.

Since 90% of overhead corrosion can happen in as little as 10% of the time, identifying these events allows the refiner to take corrective actions immediately. This can help the refiner maintain the operational integrity of the crude unit overhead system, improving unit reliability and availability.

The next step is to close the loop in a semi-automatic function such that adjustments can be made to mix valves, desalter levels, in an even more timely manner, further reducing risk and improving reliability.

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