CASE STUDY
CH-2001

Nalco Water CrudeFlex Consulting Service Helps A Gulf Coast Refinery Generate Significant Crude Flexibility Profits

eROI℠ by Ecolab

VALUE DELIVERED

PROFITABILITY

IMPROVED PROFITABILITY BY

$41MM ANNUALLY

INTRODUCTION

A Gulf Coast refiner desired to improve profitability by blending from a selection of various opportunity crudes. The variability in the characteristics of these crudes introduced a variety of processing challenges, significant risk of unstable blending, and consequently threatened processing reliability. Opportunity crude oils include, but are not limited to, light tight oils, crudes with very high viscosities, high H2S concentrations, high solids containing crude oils, and high acid/TAN (Total Acid Number) crudes. Variability in the quality of opportunity crudes can threaten processing reliability within a refinery.

SOLUTION

Opportunity crudes have challenged the refiner to redefine the way they purchase and refine crude blends. To improve profitability and achieve operational goals, the refiner relied heavily on Nalco Water's CrudeFlex crude processing consulting service. As part of the consulting service, a crude processing and property database provided hydrocarbon feedstock information that is not included in the typical crude assay and could be translated into process and control parameters. The database currently leverages the knowledge of over 1,200 crudes properties and global processing experiences to provide insight into crude quality's impacts on refinery operations.

The CrudeFlex crude blending service was used to predict overall blend stability of proposed blends. The highly accurate predictive model is built into the CrudeFlex crude blending service to evaluate blend stability immediately. The predictive model can account for non-linear crude stability behavior, indicating the predictive reliability.

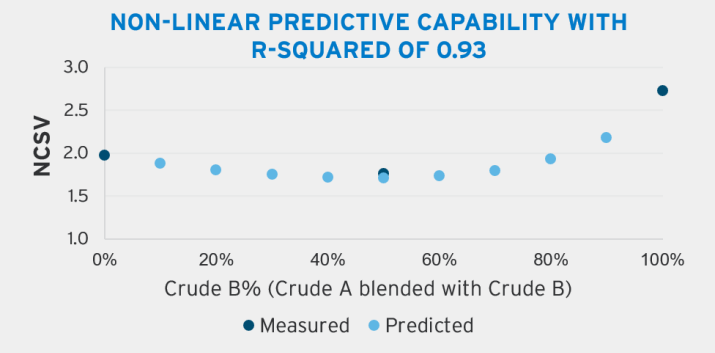

FIGURE 1: HIGHLY ACCURATE PREDICTIVE MODEL

The R-squared (R^2) of 0.93 between predicted and measured stability values further validates the predictive accuracy (Figure 1).

The predictive model is based on the data from Nalco Water's Residue Stability Analyzer (RSA). RSA is a field deployable analyzer to measure the crude blend stability on site. The predictive model enables the immediate generation of the Nalco crude stability value (NCSV), asphaltene solubility (Af) and oil solvency power (Sf) (see example in Figure 2).

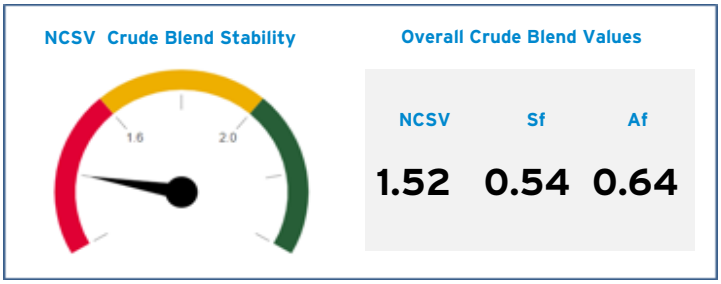

FIGURE 2: IMMEDIATE CRUDE BLEND STABILITY GUIDE

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The NCSV quantifies crude blend stability into three severity regions. The actionable predictive values provide a guideline on how to optimize crude blending and introduce new or cost-advantage crudes into the normal diet. Additionally it guides the mitigation of processing risks (such as fouling and emulsification) while processing challenging feedstocks and recommends the appropriate asphaltene stabilizer dosage for chemical treatment optimization.

Additionally, CrudeFlex crude blending service is able to determine the compatibility for light tight oil (LTO). This key feature overcomes the inadequacy of current industry methods based on ASTM methodology to determine low asphaltene content (<0.5%) crudes. This capability enabled the immediate generation of an accurate crude blend stability value when LTO is part of the crude slate (Figure 3).

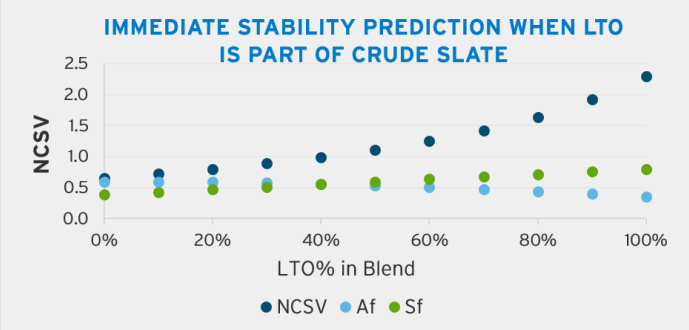

FIGURE 3: IMMEDIATE STABILITY PREDICTION WHEN LTO IS PART OF CRUDE SLATE

RESULTS

During the field trial, Nalco Water used the CrudeFlex crude blending service to preemptively evaluate crude compatibility and provide guidance to the crude buyers and tank farm operations on what to insource and how to safely blend new crudes. The information guided successful and effective crude selection process for blending of various LTO/opportunity crudes and maximized the refinery's profitability.

In addition, Nalco Water measured overall crude feed stability on-site using a Residual Stability Analyzer (RSA). The predicted stability values from CrudeFlex crude blending service were trended with the measured values determined on site, demonstrating the efficacy of the predictive model as the result shows both values are highly correlated (Figure 4).

As a result, Nalco Water CrudeFlex crude processing consulting service enabled the Gulf Coast refiner to safely process 20 new opportunity crudes in one year. Consequently, the refinery achieved significant profitability improvement from crude flexibility attributing $41 million of their annual increase to the contributions from CrudeFlex consulting service.

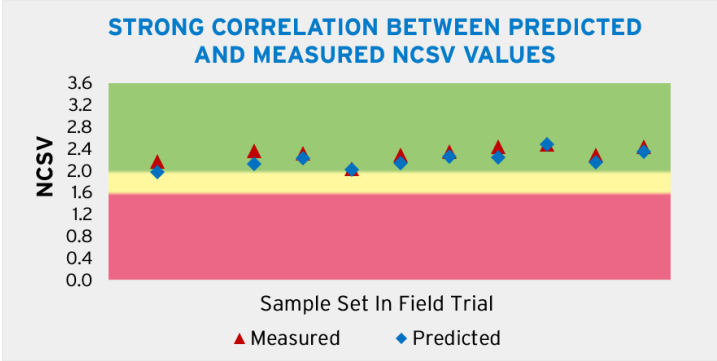

FIGURE 4: BLEND PREDICTION VALIDATION IN FIELD TRIAL

CONCLUSION

Nalco Water CrudeFlex crude processing consulting service is rigorous to enable the refiner to optimize the use of opportunity crudes and light tight oils (LTO) in the crude units to maximize the profitability. It helps the refiner to preemptively mitigate expected processing challenges and avoid the undesirable, costly impacts of unstable crude blends by injecting asphaltene stabilizer chemistry only when necessary.

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