CASE STUDY

eROI℠ by Ecolab

Low Silicon Antifoam Improves Efficacy and Reduces Silicon Carryover

BACKGROUND

Silicon contamination from coker antifoam is one of the major side effects in hydrotreater operation at a refinery. The silicon can shorten the life cycle of the catalyst and impede conversion efficiency. Ultimately, refiners may need to replace the catalyst while reducing its throughput. Hence, the industry has been innovating applications that lower the silicon's impact on the downstream.

A Gulf Coast Refinery changed to the low Silicon content antifoam at its 50 kBD Coker Unit. The system includes two heaters and two drums per heater (four drums in total). There is one common system of chemical injection for the four drums that include the carrier (for the best distribution of chemical on top of the drum) and the chemical itself. Prior to the change, the 50 kBD Coker Unit was using an older coker antifoam (600 kcst chemical).

SOLUTION

The improved coker antifoam is designed to have better thermal stability to sustain a higher operation temperature in the coker unit. Our technical expert group developed a new foam control tool to gain better visibility during coker operation. The refiner replaced the old coker antifoam with the new antifoam and applied the new foam control tool.

To analyze the effectiveness of the new antifoam chemical, Nalco Water ran the new foam control tool to compare performance of both chemicals (Fig. 1). Samples were pulled 8 hours after any chemical injection in one drum (blank condition) and 30, 60, 90 and 120 minutes after the chemical injection started in the second drum during operation. Plots in the graph (Fig. 2) show the amount of Silicon in naphtha and kerosene. This information was used as a blank to compare with the new chemical.

ANNUAL SAVINGS

ASSET PROTECTION

42% reduction in silicon content in naphtha

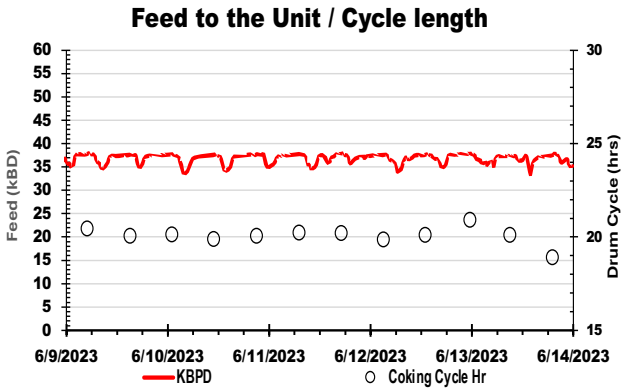
CAPACITY

30% reduction in chemical consumption

PRODUCTIVITY

15% increase in feed rate while maintaining reliable foam control

NALCO Water
An Ecolab Company



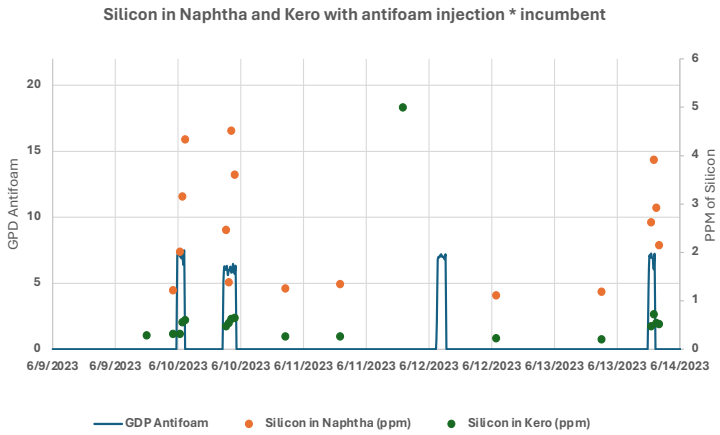
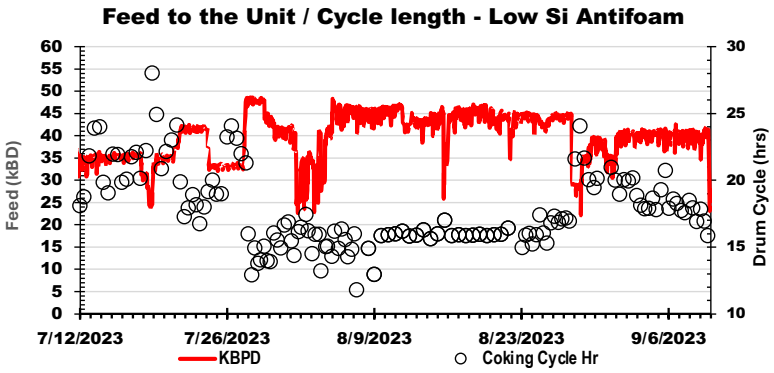


Fig. 1: Performance with the old coker antifoam



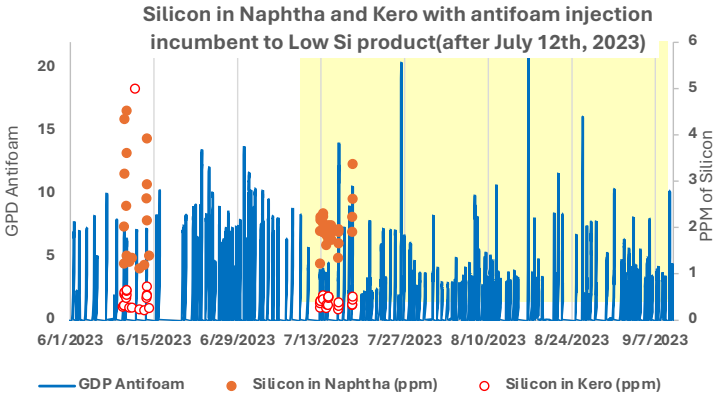


Fig. 2: Comparison of performance with the two chemicals and usage after switching to the next-generation coker antifoam

RESULTS

After the chemical trial, the reduction of silicon and naphtha was reduced around 42% during the chemical injection time.

Below (Fig. 3) is an evaluation of the impact of silicon to hydro processing:

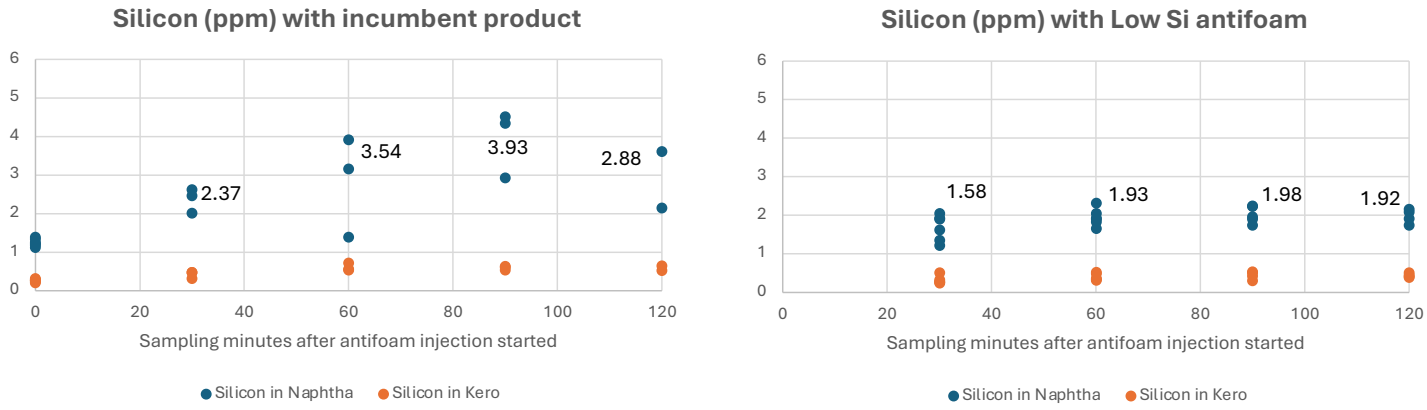


Fig. 3: Impact of silicon to hydro processing in comparison to the old and the improved coker antifoam

The switch to the improved coker antifoam allowed the site to reduce ~11% of silicon to the naphtha hydro finer. The lowered silicon content helped improved the overall performance.

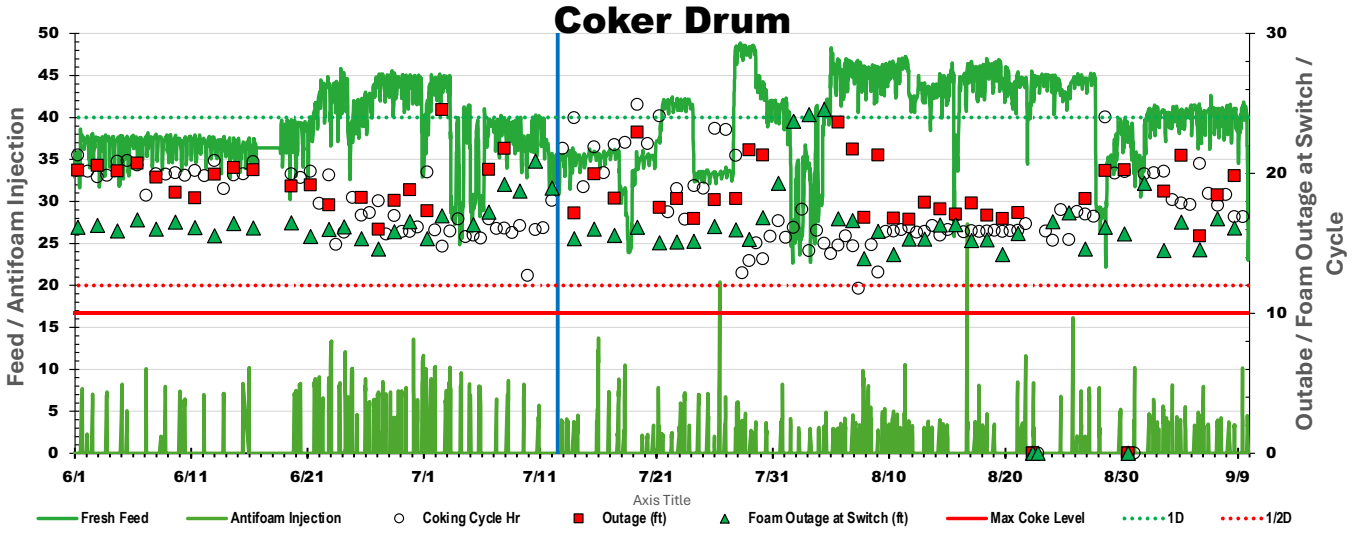


Fig. 4: Coker Drum perfomance

In the graph above it is shown that the foam front at switch was maintained in what Nalco Water considers a safe and stable level for the operation (below ½ a diameter from top tangent line) while outage/drum cycle is optimized. Antifoam flow was managed, as required by feed changes, to maintain a reliable foam height at switch.

Specific usage of the chemical was also reduced:

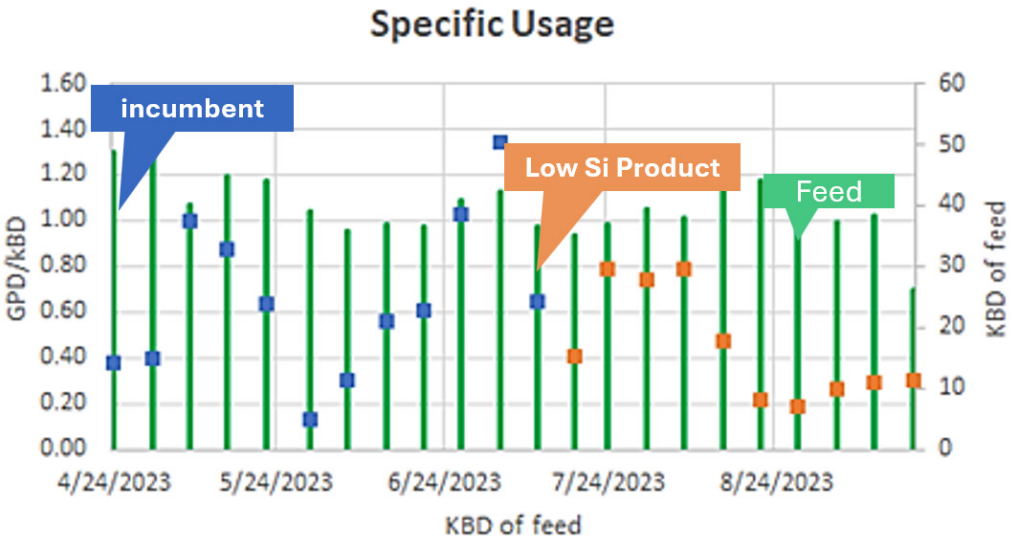


Fig. 5: Coker Antifoam Usage

CONCLUSION

The Gulf Coast refiner was able to reduce the silicon content in the naphtha of the Hydrofiners. After an economic analysis, chemical was switched to the improved coker antifoam – which lowers silicon content and is more stable at Coker operating temperatures – allowing the usage to be optimized.

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