

Ethylene plant in North America leverages Arsenal Plus™ to help improve performance and reduce spent caustic by 45%

CASE STUDY

► BACKGROUND

An ethylene customer in North America switched to a less costly, unsweetened feedstock which was high in CO₂ content. Caustic towers are critical assets in ethylene plants that help remove acid gases such as carbon dioxide and hydrogen sulfide from the process stream. The feedstock change increased the waste output, also known as spent caustic, to the Wet-Air-Oxidation (WAO) unit which had a maximum capacity of 9 gallons per minute (gpm).

Nalco Water, an Ecolab Company proposed Arsenal Plus an innovative dual chemical treatment program to meet their desired goals. The Nalco Water team approached the customer to discuss benefits such as significantly reducing cost and minimizing waste by leveraging the synergistic effects of both chemicals. The proposal also highlighted potential improvements, such as enhanced fouling control and the ability for the unit to handle higher CO₂ content, aligning with the customer's goals of efficiency and sustainability.

► SOLUTION

The original program used a dispersant and antifoam, which were successful in controlling fouling and foaming in the caustic tower. However, the necessity to reduce spent caustic drove Nalco Water and the customer to explore alternative options. The improvement was developed through a strategic injection and adjustment of two Nalco Water inhibitor chemicals, into different sections of the customer's Caustic Tower system.

Arsenal Inhibitor #1 was fed to the upper section while Arsenal Inhibitor #2 was injected to the lower section.

The unique synergistic reactions between the two Arsenal inhibitors allowed the chemicals to economically and efficiently react with CO₂ and acetaldehyde, reducing caustic consumption and mitigating fouling. Validation was performed through observing caustic flows and taking samples of the spent caustic and caustic tower sections. Implementation occurred over the course of several days with the impact being observed almost immediately.

eROISM
by Ecolab

ANNUAL SAVINGS



WASTE

\$100,000 Annually

45% Reduction in Spent Caustic



ASSET PROTECTION

Improvement

in aldol polymer fouling control



CAPACITY

Increase

throughput of a cheaper feedstock



LOCATION PRODUCTIVITY

\$268,000 Annually

42% reduction in fresh caustic.
Reduced chemical treatment costs
for aldol polymer.



TOTAL VALUE DELIVERED

**\$368,000
Annually**



► RESULTS

At this site, the program successfully reduced both spent caustic generated and makeup caustic by more than 40%, saving the customer \$368,000 a year in operational costs alone. The spent caustic stream was reduced from 9 gpm to 4.5 gpm while the makeup caustic rate dropped by 42%.

Additional benefits included a drastic improvement in spent caustic quality, improved handling of rapid CO₂ loading, and reduction of required caustic concentrations in the caustic tower. The photos highlight improvement in caustic samples with the previous program versus the new program with Arsenal Plus.

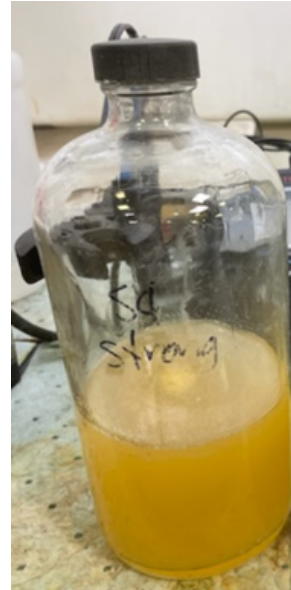


FIGURE 1: Strong Section sample with previous treatment program

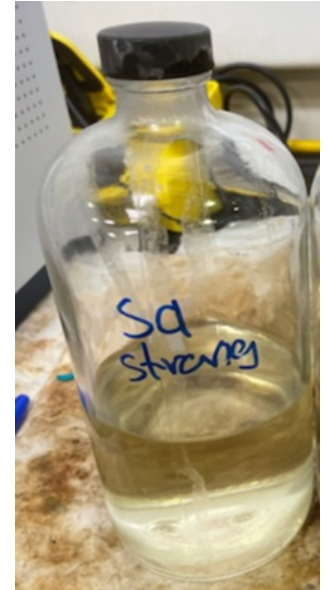


FIGURE 2: Strong Section sample with Arsenal Plus

► CONCLUSION

At this site, Arsenal Plus helped improve the efficiency of CO₂ removal and significantly decrease caustic consumption while continuing to mitigate aldol polymer formation. The customer views the treatment as a major success. The customer specifically stated that “the tower samples look great” and there is also no concern of aldol polymer fouling under the new program.