

Non-P Program reduced corrosion rates by 30% while ensuring environmental compliance in a Specialty Chemical Plant



BACKGROUND

Phosphorus has been widely used in the industry as part of the chemical treatment to control mild steel corrosion with excellent results.

Phosphorus is also considered an essential nutrient for algae; its excess in effluents causes the proliferation of these species in surface water bodies with negative environmental impact. It has become a worldwide concern leading to stricter regulations in different countries regarding the permissible limit of this compound in discharges, including blowdowns of cooling systems.

A specialty chemical plant in Mexico with open recirculating systems with high thermal efficiency demand was using a phosphate-based program with excellent results. Mild steel corrosion rates results

were < 1mpy (0.65 mpy), without any limitations due to scaling or fouling. The system was operating at 6 cycles of concentration. The customer was satisfied with current program results.

However, a new local regulation, the Particular Discharge Conditions (CPD) specifies a maximum of 1.0 ppm of phosphorous in the outfall. To comply with the new phosphorus regulation in its outfall, the plant decided to implement a non-phosphorus program in their cooling water system.

Nalco Water and the customer agreed to run a field trial using the ultimate Non-P Treatment Technology from Nalco Water. This case summarizes the findings and results from that field trial.

ANNUAL SAVINGS

WATER

Reduced makeup water use by
35,040 m³
equivalent to the annual drinking
water needs of more than
32,000 PEOPLE

ENVIRONMENTAL RESPONSIBILITY

Cost savings from environmental
regulatory penalties –
Equivalent to more than
\$36,000 USD
per year

COSTS

Cost savings from reduced water
and chemicals use –
Equivalent to more than
\$18,000 USD
per year

ASSETS

Extending the life of heat
exchangers by reducing corrosion
\$9,000
USD/YR

TOTAL VALUE DELIVERED

Total cost savings with this program
\$63,000
USD/YR

RESULTS

After the implementation of the program, the following results were obtained:

- 96% reduction of phosphate in the tower blowdown discharge
Before: 8 ppm After: 0.35 ppm
(Make up water has traces of Phosphate). As shown in Figure 1.

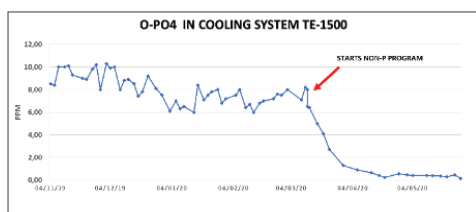


Figure 1. Orthophosphate content in the tower

- 30% reduction on mild steel corrosion results
Before: 0.65 mpy After: 0.45 mpy
30% reduction



Figure 2. Corrosion rates in mild steel

- Increased cycles of concentration
Before: 6 After: 7

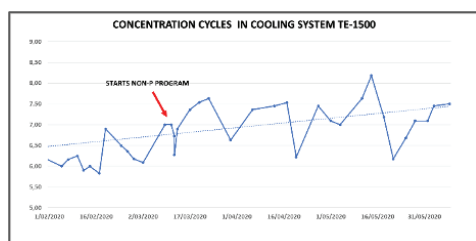


Figure 3. Cycles of concentration in the tower

- Acid consumption was used for pH control and it was reduced by 31.4% (10.5 ton/year)

Additionally the process out temperature in the heat exchangers was maintained in the optimum range, keeping the equipment clean of build-up and reinforcing the suitability of the non-phosphorus program.

CONCLUSION

Nalco Water's Non-P Chemistry allowed this specialty chemical plant to become compliant with new environmental regulations for phosphorus discharge in CPD, supporting local sustainability initiatives aimed to mitigate the impact of industrial discharge on water bodies.

The innovative program combined with Nalco Water's digital platforms and the support of a team of experts allowed considerable improvements in the cooling system. Benefits started with the better mild steel corrosion performance, reduced stress due to the phosphate handling and an increased operating window, providing higher process reliability, productivity (by maintaining adequate temperature control) and assurance of the integrity of assets in these facilities.

The total returns obtained are estimated to be \$63,000/yr which includes water, chemicals and energy savings. This project had substantial positive impact on the customer's Total Operational Costs (TCO), both preventive and restorative.

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