

CHALLENGE

Gulf Coast refinery eliminates **zinc silicate** deposition in critical heat exchangers

A >250,000 BPD Gulf Coast refinery was losing production capacity to deposition in critical heat exchangers — including the crude unit overhead trim cooler — despite a well-controlled zinc-phosphate program. The root cause was a salt the standard prediction tools were not built to see.

UNIT SERVED

Refinery · >250k BPD

KEY ISSUE

**Zinc silicate
deposition**

RISK

**Production loss ·
Throughput**

ROI

< 6 hours

CHALLENGE

What was happening

An open recirculating utility system on an alkaline zinc-phosphate program was fouling critical exchangers. Calcium phosphate was in control. Zinc phosphate was in control. Polymer dosages were correct — yet deposit analysis kept confirming significant zinc deposition, with a strong but unexplained silica component.

INTERVENTION

What we did

Aligned refinery and service-company data, online and offline. Heat-exchanger modeling with time-series U-coefficient analysis and competing-ion saturation modeling. Reviewed and re-interpreted lab deposit analysis. Onsite data collection, system evaluation and team interviews, with a full engineering report and root-cause presentation.

ROOT CAUSE

The tools and training in use tracked zinc and silica separately — so the team assumed silica was a different problem. No standard model accounted for **zinc silicate**. At alkaline pH with 3 ppm zinc, a swing of just **0.5 cycles of concentration** was enough to drive zinc silicate deposition. Adjusting design control limits for zinc, CoC, polymer and pH — and adding zinc silicate to the prediction tools — eliminated the problem.

ANNUAL VALUE DELIVERED

\$38.45M

per year · ROI < 6 hours

Water saved

202.3M gal / yr

Energy reduction

1.5% · ~\$2.18M / yr

Production increase

2.5% · ~\$36.27M / yr

Plus

Prevented downtime not counted

Refinery water-treatment spend is <1% of operating expenses — and procurement is usually focused on reducing chemical cost. An independent, first-principles review can unlock millions in cost savings and production increases, with ROI measured in hours. Your system deserves a second look.