CASE STUDY · DOWNSTREAM REFINING

Every report read "all green."

The exchangers kept failing anyway.

127 mpy of pitting hid behind a <3 mpy number. Cost cut 32%.

CASE STUDY · DOWNSTREAM REFINING · COOLING WATER PROGRAM AUDIT · INDEPENDENT · NO CHEMISTRY SOLD

Every cooling report read "all green" — and the refinery's heat exchangers kept failing every year

A refinery's cooling program looked healthy on paper. Cycles, chemistry, program residuals, product usage, and general corrosion all sat in the green, quarter after quarter. Yet the site kept replacing failed heat exchangers every year and overbuilding systems to survive the changeouts, at a cost of millions annually. Everyone had accepted it as "just the type of water here." An independent review found the real story hiding behind the green dashboard, rebuilt the metrics and baseline chemistry with the existing supplier, cut treatment cost by nearly a third, and eliminated the failures.

UNIT SERVED	KEY ISSUE	TREATMENT COST	WATER USAGE	OUTCOME
Refinery cooling system	**Hidden pitting behind green reports**	**–32%**	**–20%**	**HX failures eliminated**

Challenge — What Was Happening

Everything appeared to be operating "in the green." Cycles of concentration, water chemistry, program targets, inventory and product usage, and general corrosion rates all read on target — yet the refinery kept failing heat exchangers.

The site was replacing failed exchangers **every year** and overengineering systems just to survive the changeouts. The losses ran into the millions annually, and the problem had been written off as "just the type of water here."

The supplier reported everything as fine and routinely delivered value projects that helped the customer — while total cost kept climbing. No single number on the dashboard pointed to the real problem.

Intervention — What We Did

- Ran a **3-year water-quality and operational review**, cross-checking service reports against what the system chemistry should actually produce
- Performed an **onsite system evaluation** with operator and service-company interviews to reconstruct real operating practice
- Re-ran the corrosion data properly — including the analyses that had never been done
- Applied **advanced saturation modeling** and a full risk review, including seasonal and manganese variation in the supply water
- Rebuilt the metrics and baseline chemistry **working with both the supplier and the customer** — no plant capital required

Baseline — The Program On Paper

What The Reports Showed

- Every service report and quarterly review showed **every metric green**
- General corrosion under 3 mpy — a "good" number by any standard
- Program residuals, PTSA tracer, and product usage on target
- Account staffed by a very new service team (<2 years) with one senior advisor

Operating Conditions

- High-phosphate program — all orthophosphate, no cathodic inhibitor
- Copolymer dispersant with PTSA tracer, on target
- Tolyltriazole for yellow-metal protection
- Sodium hypochlorite, free Cl_2 held at 0.5–0.8 ppm
- Isothiazolinone non-oxidizing biocide

Root Cause

ROOT CAUSE FINDING

The pitting was never being measured. The service company had never run a pitting analysis on the corrosion coupons. General corrosion read a healthy <3 mpy — but the first proper pitting analysis showed **127 mpy of localized attack**, fast enough to drill through a heat-exchanger tube wall in under a year. That is what was failing the exchangers, and it never appeared on a single "green" report.

Copper corrosion had never been measured correctly. Done properly, the admiralty brass showed **0.9 mpy with active dezincification**. Free chlorine held at 0.5–0.8 ppm was destroying most of the tolyltriazole, leaving the yellow metal largely unprotected.

The chemistry was incomplete for the water. The phosphate program was all orthophosphate with no cathodic inhibitor, and seasonal manganese swings in the supply water drove additional risk the program never accounted for. The fix: higher cycles, orthophosphate plus a cathodic inhibitor, a reduced free-chlorine target of 0.3–0.5 ppm, a chlorine-tolerant azole, a phosphonate for manganese control, and a quad-polymer dispersant — plus operations manuals, upgraded lab methods, and training for both teams.

RESULTS DELIVERED

–32% cost

Treatment cost reduced by 32% and water use by 20% — with heat-exchanger pitting failures eliminated and the existing supplier still in place

TREATMENT COST	MILD STEEL	ADM. BRASS	WATER USAGE
–32%	**<1 mpy, 0 pit**	**<0.1 mpy**	**–20%**

RESULTS DELIVERED

- **Eliminated** heat-exchanger failures from pitting corrosion
- **Mild steel** corrected to <1 mpy general with **zero pitting**
- **Admiralty brass** protected to <0.1 mpy with no dezincification
- **32% lower treatment cost** and **20% less water**, together

ECONOMICS

- Stopped the recurring **annual heat-exchanger replacements** that ran into the millions
- Ended the overengineering built solely to survive changeouts
- Lower chemical spend and lower water use at the same time
- Corrected with **no plant capital** — metrics and chemistry rebuilt **with the existing supplier**

Even when everything reads "green," it's worth having an independent set of eyes review the whole picture. Even without a technical chemistry problem, there is almost always room to improve — and always a reason to make sure you're getting everything you can out of your plant. Green reports are only as good as the tests behind them.