

CASE STUDY · DOWNSTREAM REFINING · COOLING TOWER CORROSION · RELATIONSHIP · INDEPENDENT · NO CHEMISTRY SOLD

The program looked excellent, and the coupons were shiny. Mild steel was pitting at 52 mpy.

A refinery cooling tower ran a traditional alkaline phosphate program. The account manager who designed it had moved to the customer side and now managed the water treatment contract, and he believed the program was excellent. In reality, mild steel was pitting at 52 mpy. IWA fixed the technical problem without making the contract owner look like he had done something wrong.

ASSET	PROGRAM	PITTING	ROOT CAUSE	OUTCOME
Refinery cooling tower	**Alkaline phosphate**	**52 mpy → none**	**Polymer at 334% of need**	**~$2.1M/yr protected**

Challenge — Two Problems at Once

Technical: correct the program to deliver the contracted performance. **Relationship:** the program's designer now owned the contract on the customer side, and the fix could not make him look wrong.

The customer wasn't unhappy, but the contract was up for review. Without a fix, **the service company's business was in jeopardy**.

Intervention — What We Did

- Focused on the **3 months before and 3 months after** the dispersant change
- Reviewed **feed rates** and **coupon results**; had the **pit interiors analyzed**
- Modeled deposition and corrosion with **proprietary saturation and kinetic modeling software**
- Worked with **both the service company and the customer**

Baseline — What We Found

The Program

- **Alkaline pH** program: **orthophosphate**, **chloro-tolyltriazole**, a **polymeric $CaCO_3$ inhibitor**
- A **terpolymer dispersant**, recently switched from a copolymer

The Symptoms

- Coupons **shiny and like new**, other than small pits; pitting at **52 mpy**
- Contract owner **believed the program was excellent**; contract **up for review**

ROOT CAUSE FINDING

Not galvanic. No copper was found in the pits.

A 1:1 product swap. The terpolymer replaced the copolymer at the same ppm product in blowdown. But the site needed only **50% as much active terpolymer**, and the new product was **1.67× more concentrated**: 1.67 ÷ 0.5 = **334% of the dispersant needed**.

Cleaned, then too clean. The terpolymer lifted settled solids and calcium phosphate out of the system, then kept the metal so clean, with calcium phosphate and carbonate so fully inhibited, that it effectively stopped **cathodic corrosion inhibition**. Pits formed and grew.

The Fix — Technical and Relationship

- Modeling used as the **justification for the change**
- **Simplified product feeds**, changed the product mix, dosed on an **actives basis**, and **reset operating conditions and controls**
- Kept the finding on **the conversion math**, not the program design
- Presented **the model, not opinions**, to both sides, giving the contract owner a **data-backed optimization** to stand behind

RESULTS DELIVERED

~$2.1M a year protected

Exchanger life and leak risk protected, plus polymer no longer overfed, with no capital

MILD STEEL PITTING	MILD STEEL GENERAL	COPPER	DISPERSANT FED VS. NEED
52 mpy → none	**<1 mpy**	**<0.1 mpy held**	**334% → matched**

REFINERY

- **~$0.83M/yr** exchanger life protected (83-mil wall perforates in ~1.6 yr at 52 mpy)
- **~$1.25M/yr** leak-driven rate cuts avoided
- **Contracted performance** delivered

SERVICE COMPANY

- **Revenue kept** on a fixed-fee account, with **higher profitability** (~$41K/yr polymer)
- **Positioned well** for the contract review or any bid
- **Relationship intact** with the contract owner

Many times we think that overfeed of polymeric materials, even accidental, won't cause harm in a system; it just adds cost. The truth is, the chemistry has to be in balance for the system to operate correctly and achieve the contractual targets. Let us help you optimize.

Value basis: 150,000 bpd refinery; 60,000 gpm tower, 15°F range, 5 cycles (~986M lb/yr blowdown). Exchanger life: 12 carbon steel bundles at ~$120K installed retube, ~1.6-yr life at 52 mpy vs. 20-yr design (~$0.83M/yr). Leaks: 2 a year avoided, each a 10% rate cut for 3 days at a $13.85/bbl Gulf Coast cracking margin (Oct 2025, Worley Consulting via Oil & Gas Journal), ~$0.62M each. Polymer: 14 ppm product overfeed at ~$3/lb (~$41K/yr). Range ~$1.5M (1 leak/yr) to ~$3.3M (Oct 2026 margin, $26.72/bbl). Excludes leak cleanup, environmental exposure, and contract value retained. Details generalized to protect client confidentiality. © Industrial Water Advisory — Independent, vendor-neutral cooling, boiler & process water consulting.