GenGard* Reduces Acid and Water Consumption and Phosphate Discharge to Save US$135,000/year

Challenge

A European industrial producer needed to reduce effluent phosphate levels to meet new legal restrictions. Additionally, with the price of sulfuric acid rising exponentially, the customer hoped to reduce their cooling tower system's consumption of sulfuric acid, all while continuing to ensure excellent system protection.

This system has shell and tube heat exchangers, with water on the shell side, and jacketed reactors. The equipment is mostly made of mild steel, but also includes some copper and stainless steel.

Table 1: Raw Water Description

RAW WATER DESCRIPTION	
Calcium Hardness	40-100 ppm as $CaCO_3$
Chlorides	85 ppm Cl
Conductivity	390 µS

The makeup water is a blend of the raw water (Table 1) and reverse osmosis water. Blowdown control is based on chlorides, due to the stainless steel in the system. For years, this system had been well protected using a neutral pH, Dianodic* treatment program.

In an effort to meet their goals, the customer set targets of a 30% phosphate residual reduction, higher cycles at 5.0, and a pH increase of at least 0.4 units.

With these targets, the polymer's ability to inhibit deposition of calcium phosphate would be pushed to the limit.

The customer had a goal of decreasing the phosphate effluent as well as reducing the acid consumption. Targets for the recirculating water were set at a 30% phosphate residual reduction, higher cycles at 5.0, and a pH increase of at least 0.4 units. With these targets (Table 2), the polymer's ability to inhibit deposition of calcium phosphate would be pushed to the limit.

Table 2: Original Target Chemistry Program

ORIGINAL TARGET CHEMISTRY PROGRAM	
Orthophosphate	17-18 ppm
pH	7.3-7.4 (using acid)
Active Polymer	30 ppm
Chlorination	0.25 ppm free Cl_2 set point
Cycles	~4.0

Solution

GE upgraded the Dianodic treatment program to the GenGard* program (Table 3). GenGard features GE's patented Stress Tolerant Polymer (STP). STP has a superior scale inhibition ability and is a much more forgiving solution when compared to any other polymer currently available.

Table 3: GenGard Target Chemistry Program

GENGARD TARGET CHEMISTRY PROGRAM	
Orthophosphate	12-14 ppm
PH	7.7-7.8 (using acid)
Active Polymer	22.5 ppm
Chlorination	0.25 ppm free Cl_2 set point
Cycles	~5.0

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Results

After twelve months of operation, target phosphate and pH levels were consistently achieved with no decline in system protection. The average phosphate residual has been 13.9 ppm, average pH levels have been 7.8, and average tower cycles have been about 5.0; right inline with the targets (Figure 1).

There has been no adverse impact on corrosion of mild steel, with rates less than 1.0 mpy. Also, corrater readings have been consistently lower than 1.5 mpy. Excellent control has been achieved on the pitting corrosion, as well, with all mild steel coupons extracted showing a pitting density <2,5 x 10^3 pits/m^2 (according to ASTM Standard: G-46).

The change to GenGard did not require any special change in materials used, tank or container cleanings, or flushing of dosing lines or pumps thanks to the product's similar physical properties and material resistance profile.

With the use of the GenGard Technology, GE reached the client's targets of a lower impact of the phosphate in the blow down, reduced acid feed, and a lower added COD and lower TOC, plus saved 100,000 m^3/year in water consumption. Savings from acid and water total more than US$135,000/year.

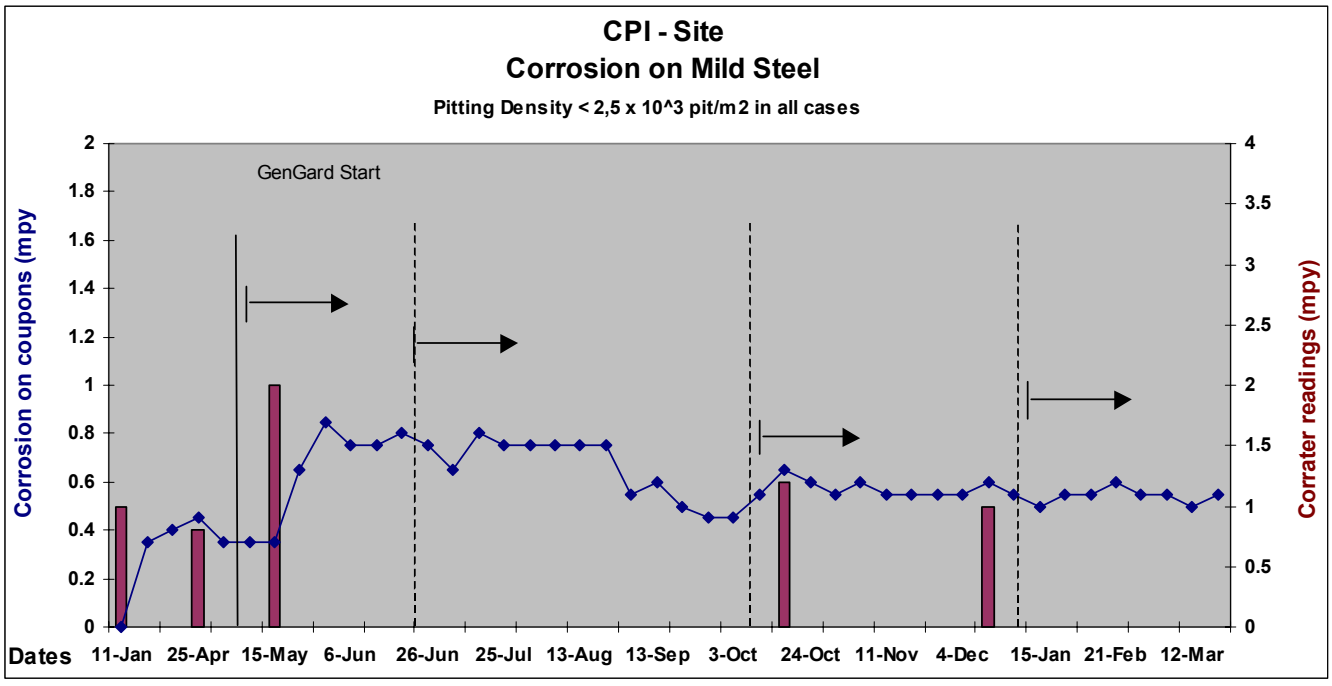

Figure 1: Corrosion on Mild Steel Using the GenGard STP Polymer