



Solenis Treatment Program Improves Performance and Environmental Profile of Manufacturing Plant's Cooling Tower

Enviroplus™ 3508 Advanced Cooling Water Treatment

Background

This Midwestern U.S. engine manufacturing plant was satisfied with the performance of their traditional stabilized phosphate cooling water treatment program. However, as a result of increasingly stringent discharge restrictions, this facility was unable to meet its phosphate effluent limits and was forced to adapt an alternative, environmentally friendlier cooling water treatment program. Implementing a reduced phosphate program was a concern to plant management because they did not want to sacrifice the good performance results they had been achieving. After starting an Enviroplus 3508 advanced cooling water treatment program, this engine manufacturing facility not only reduced effluent phosphate levels, but also benefited from significant improvements in deposit and corrosion control and improved water conservation.

Situation

The cooling tower system at this facility had good results using a traditional stabilized phosphate cooling water treatment program, which required sulfuric acid feed to control the pH at 7.2. This treatment program was controlled between 12 to 18 ppm total inorganic phosphate with 3 to 3.5 cycles of concentration. Cycles of concentration for this cooling water system were limited by the plant's high calcium hardness levels in the makeup water and a maximum hardness tolerance level of 1000 ppm calcium for the treatment program.

An anticipated change in the plant's permitted phosphate effluent levels and a new corporate focus to embrace environmentally friendlier technologies created the need for change. During the plant's annual water treatment review, plant management agreed to convert to the use of environmentally responsible products in their open evaporative cooling water systems. Plant personnel were apprehensive since they feared that both the cost and performance of an environmentally friendlier alternative with reduced total phosphorus might not compare favorably with that of

their traditional, proven, stabilized phosphate technology.

Ashland Solution

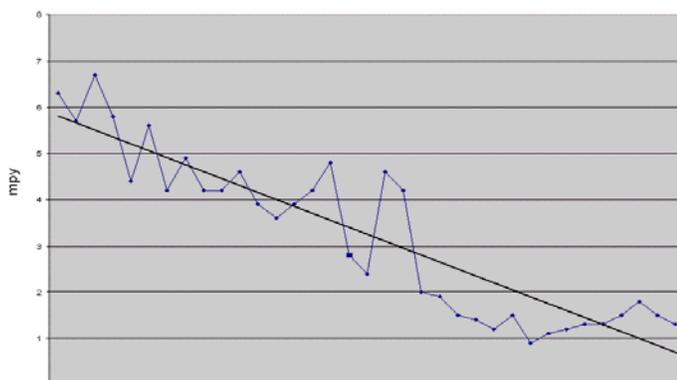
A complete assessment of cooling system operations and treatment options was performed. This assessment concluded that the plant's goal to switch to a more environmentally responsible technology, while maintaining cooling water treatment program costs and performance, could be achieved with an Enviroplus advanced cooling water treatment. Enviroplus products include environmentally responsible components to assist plants in complying with increasingly stringent discharge regulations. In addition, the primary components of Enviroplus products are inherently biodegradable and eventually break down in the environment. Enviroplus is a family of treatment products that provide outstanding corrosion control and optimum protection from scale and fouling, while improving the environmental impact on treated water being discharged.

Corrosion protection with Enviroplus products comes from a patented¹ blend of both anodic- and cathodic-based inhibitors. Fouling and scale control is delivered through a novel combination of high performance polymeric dispersants. Given the water chemistry and system conditions, the product chosen for this engine manufacturing facility was Enviroplus 3508 advanced cooling water treatment. Enviroplus 3508 is a low phosphorus-containing product, and at the recommended use rate, the product contains less than 1 ppm total phosphorus (as P) from organic and inorganic sources.

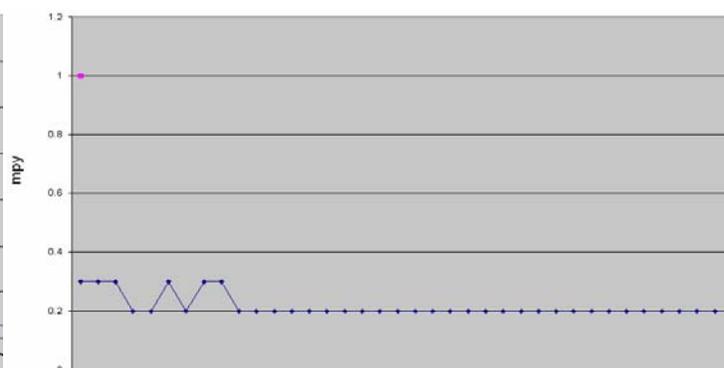
¹U.S. Patent # 6,464,900

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During start-up of this new cooling water treatment program, a Drew™ CFM 2000 fouling monitor and Corratex* corrosion monitor were used to monitor deposit and corrosion control performance. In order to mimic system heat exchanger conditions, the Drew CFM 2000 fouling monitor was set to 2.3 fps linear velocity with a 130 °F skin temperature. The pH set point for controlling the tower was increased from 7.2 to 8.6. This increase in system pH significantly reduced sulfuric acid usage and minimized safety concerns associated with acid handling. Because of Enviroplus™ 3508's higher calcium tolerance and superior deposit control technology, cycles of concentration were increased from 3 to 4. This increase in cycles of concentration resulted in an 18% decrease in chemical treatment consumption and a \$24,000/year savings in water usage. The total cost of the Enviroplus program was less than the plant's previous program, thereby eliminating original concerns of treatment cost increases. During this transition from stabilized phosphate to Enviroplus technology, no fouling was observed and mild steel corrosion rates dropped significantly, from 4.0 mpy to 0.6 mpy. The corrosion rate further decreased to 0.2 mpy after almost a year using the Enviroplus program (see graphs below).



Graph 1: Corrosion rate decreasing with time at start of transition to Enviroplus program.



Graph 2: Corrosion rate after one year on Enviroplus program.

Cooling System Water Chemistry	Stabilized Phosphate Program	Enviroplus Program	Benefits
pH	7.2	8.6	Reduced Acid by 85%
Cycles of Concentration	3	4	33% Increase
Calcium Hardness	1000 ppm	1200 ppm	~20% Increase
Total Hardness	1240 ppm	1500 ppm	~20% Increase
Total Alkalinity	55 ppm	430 ppm	
Conductivity	2100 µmhos	2400 µmhos	
Langelier Saturation Index	+0.1	+2.5	
Larson-Skold Index	22	2.8	Drastically Reduced
Steel Corrosion Control	4 mpy	0.6 mpy	85% Improvement
Phosphorus Level (asP)	7.1 ppm	0.8 ppm	89% Reduction

Table 1

Also shown below is a performance summary and comparison table of the cycled tower water from both treatment programs (Table 1).

Customer Benefits

Minimization of the cooling water treatment program's environmental impact was of key importance to this Mid-western U.S. engine manufacturing plant. Switching from a traditional stabilized phosphate program to Enviroplus 3508 advanced cooling water treatment provided the plant an 89% reduction in phosphate discharge from the recirculating cooling water system. The lower phosphate level and inherent biodegradability of the new Enviroplus program significantly improved the environmental profile of this plant's cooling tower operation.

Although the need to seek an alternative cooling water treatment program was environmentally motivated, additional performance and cost benefits were achieved. The Enviroplus program exceeded expectations, by not only reducing phosphate discharge levels, but also by significantly reducing the need for acid feed, reducing corrosion rates by 82%, increasing cycles of concentration by 33%, and by reducing the overall cost of system operation.