

Spectrus* NX1100 Controls Cooling System Microbes and Dramatically Reduces Costs at a Texas Chemical Plant

Challenge

In an effort to maintain biological control at a west Texas chemical plant, a competitor was using various single-active, commodity-type, non-oxidizing biocides (isothiazolin, glutaraldehyde, and dodecylguanidine hydrochloride), along with chlorine dioxide. Secondary treated municipal wastewater with bacteria counts as high as 106 per mL (cm^3) was used as makeup to the cooling system. In addition, the cooling system was continuously contaminated with a process water stream containing 2,000 to 7,000 ppm (mg/L) of organics.

Despite daily biocide additions of 100-ppm (mg/L) product, the treatment program was not able to maintain microbiological control. Visual inspections of heat exchangers revealed 2 to 4 inches (51 to 102 mm) of biological deposits in channel heads, and heat exchanger tube surfaces were completely covered with slime. Carbon steel corrosion rates were greater than 25 mpy (0.63 mmpy) because of microbially influenced corrosion caused by sulfate reducing bacteria. In addition, whenever the commodity-type isothiazolin biocide was fed, recirculating copper levels increased dramatically because of the copper stabilizer present in this product.

System Details

System Volume: 106 gallons (3,785 m^3)
Recirculation Rate: 60,000 gpm (13,200 m^3/h)
DT: 26°F (14°C)
Makeup source: Municipal effluent
Cycles: 5 to 6

Solution

GE Water & Process Technologies was given the opportunity to survey this system. The GE representative used ATP-based biomonitoring to document microbial levels in excess of 108 per mL (cm^3). ATP-based biomonitoring was also used to show that the single active biocides were not achieving significant

or lasting reductions in microbial levels. The customer valued the fact that adenosine triphosphate (ATP) - based biomonitoring provided realtime results instead of the two-day-old numbers provided by the competitor's dipslide monitoring method.

A toxicant evaluation was performed to select an effective biocide. This procedure identified Spectrus NX1100 as the product of choice.

Spectrus NX1100 was initially fed at 100-ppm (mg/L) to clean up the system. Thereafter, a 45-ppm (mg/L) level was targeted. The initial application of 100-ppm (mg/L) Spectrus NX1100 reduced bulk water counts down to 102 per mL (cm^3) four hours after product feed. After 24 hours, bulk water counts dropped to less than 101 per mL (cm^3). The bulk water remained virtually sterile for another 24 hours. During the application, ATP biomonitoring showed very high "free" ATP levels, indicating destruction of microbial cells and release of internal ATP.

Results

Spectrus NX1100, used in conjunction with a chlorine gas/sodium bromide program, proved highly effective in controlling microbes in the cooling system. Overall cooling costs were greatly reduced. What the customer previously spent in two months for biocides alone now covers their total annual expenditures for all cooling treatment.

In contrast to the competitor's program, Spectrus NX1100 is fed only when needed, as determined by ATP-based biomonitoring and visual inspection of NiCr mesh coupons. Bulk water counts are now consistently maintained at less than 104 per mL (cm^3). Coupons and coupon holders that previously were always covered in slime are now slime-free. Further, use of Spectrus NX1100 eliminated the copper contributed by the commodity-type isothiazolin product. The combination of good microbiological control and copper elimination reduced carbon steel corrosion rates to less than 0.5 mpy (0.013 mmpy).



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