Case study: Northeastern United States

Cooling water treatment program using DemandTrac 900 reduces iron fouling in a Northeast refinery

A Northeast refinery habitually uses well water as cooling tower makeup during the summer months when surface water usage is curtailed. Well water is clearly not the preferred choice of makeup, as it usually contains excessive iron, calcium and alkalinity. Iron is typically 6 to 8 ppm in the well water, and when cycled up, is often over 20 ppm as Fe in the cooling towers.

Frequent exchanger cleanings are scheduled in the spring, when cooler temperatures allow the plant to adjust process flows. Maintenance always struggled with the heavily fouled bundles due to rock solid iron deposits. A combination of chemical cleaning and high pressure mechanical washers was typically used to remove as much of the iron deposits as possible. This method usually takes longer than planned and the process never really gets down to the base metal. Consequently, loss of heat transfer follows along with the associated problems of underdeposit corrosion and tube leaks.

Shortly after Baker Hughes was awarded the business, the refinery asked for assistance in mitigating the effects of iron fouling, which has plagued the plant for the past 25 to 30 years. The Baker Hughes representatives worked with the Baker Hughes Technology Department and undertook a lengthy investigation into the problem and work on a chemical solution. Capital dollars were not available to the refinery in the foreseeable future to install the needed iron removal pretreatment system.

Most chemical solutions were explored, including chelating the iron, sequestering the iron in the wells, treating with higher levels of chlorine, and even permanganate addition for oxidation of iron to Fe_2O_3. Some treatment options proved to be possible in pilot plants, where reaction times and settling rates could be controlled. However, the application of any treatment program would have little chance of success in the field due to no practical method of removing the iron. Also, trying to manage a half dozen scattered well sites with little to no daily attention by operations personnel would be difficult.

The normal cooling water treatment program consisted of BPC68095 corrosion inhibitor (a phosphate/zinc corrosion inhibitor) and DemandTrac™ 485 deposit control agent, a scale inhibitor/dispersant and yellow metal corrosion inhibitor. This program is typically capable of handling up to 5 ppm of iron, but was no match for the 22 to 25 ppm of Fe in the recirculating water.

A supplemental ter-polymer, DemandTrac 900 internal treatment agent, was identified as having the best chances of modifying the iron deposit from a rock hard deposit to something more manageable, and more readily removed by normal pressure washers. The free residual DemandTrac polymer control target was moved from 5 to 10 ppm with the addition of the ter-polymer. Small adjustments were made to optimize the new treatment program. All other

Challenges

- Well water used as cooling tower makeup during the summer months, which usually contains excessive iron, calcium and alkalinity
- Struggle with heavily fouled bundles during maintenance due to rock solid iron deposits

Results

- Applied a cooling water treatment program consisted of BPC68095 corrosion inhibitor (a phosphate/zinc corrosion inhibitor) and DemandTrac 485 deposit control agent
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This case history is presented for illustration purposes only as the results may vary between applications. However, for this customer, the results were quite dramatic with the first exchanger opening. Operations personnel were pleasantly surprised when the main exchanger opened up cleaner than ever; but more importantly, the deposits found on the tubes were much softer and easily removed by normal pressure washings. The Unit Superintendent commented in a Systems Review meeting in front of all other supervisors, *"This is the best opening and quickest we've turned around this exchanger in 30 years!"* Shortly after this meeting, DemandTrac 900 internal treatment agent was in all of the remaining cooling towers in the refinery.

Before using DemandTrac 900 ter-polymer. (coupon was hand washed).

After using DemandTrac 900 ter-polymer. (coupon was hand washed).

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