Inhibition Reduction and Nitrification Improvement in a Coke Manufacturing Treatment System

Inhibition Control Using Microcat® XR Hydrocarbon Degrader and Nitrification Improvement using Microcat® XNC Nitrifier Concentrate – QM Case study 114

Problem

A coke refinery wastewater treatment plant that discharges about 1091 m^3/day has trouble at times maintaining ammonia removal (nitrification). An initial equalization tank has a volumen of about 945 m^3. The treatment system has 2 rectangular dissolved air floatation (DAF) units manufactured by Nijhuis Water Technology. One DAF is on the front end of the treatment process to capture oil, grease, and mercury. The wastewater then goes into a 3409 m^3 aeration basin followed by the final DAF acting as a final effluent clarifier.

Objective

The primary objective of this program is to reduce the inhibition to the nitrification that occurs due to the presence of difficult-to-biodegrade organics and perhaps some mercury salts from the coking process getting through to the initial DAF and into the biological part of the treatment plant.

Procedure

Microcat-XR Hydrocarbon Degrading Bioformula is added daily to the aeration tank to aid in the biodegradation and to reduce the concentration of the inhibitory organic compounds and therefore to reduce their toxic effect on the nitrifying microbial population in the biomass. Microcat-XNC Nitrifying Bioformula is added to boost the nitrifying microbial population when process or mechanical issues in the coking process allow above-normal inhibitory or toxic compounds to enter the biological process and inhibit the nitrifier population from reducing ammonia by oxidizing it to nitrate.

Results and Conclusions

The regular application of Microcat XR to the biological process has greatly reduced the inhibition of the nitrification process during continuous biological process operations throughout the year. Many fewer "episodes" of toxicity/inhibition occur which generates a more stable operation and better overall effluent quality.

However, when upstream coke manufacturing processes and mechanical failures generate higher influent concentrations of inhibitory organic compounds in the biological process, adding Microcat-XNC quickly restores nitrification. Use of Microcat-XR and Microcat-XNC help the coke plant to more consistently achieve the coke plant effluent discharge limits as listed below:

Mercury (Hg)	<0.2 µg/L
Total Cyanide (CN)	<13.24 mg/L
Available Cyanide (CN)	<1 mg/L
Ammonia 30 Day Average	<52.33 mg/L
Ammonia Daily Maximum	<87.13 mg/L