Water Care Success Story

Treating Chelated Wastewater from an Integrated Zinc Electroplating and Phosphating Operation

Background

A large electroplating and phosphating facility was under consent to meet discharge regulations for zinc metal into a nearby river. The plant had a zinc phosphate process and a zinc electroplating process, which were the primary sources of zinc metal.

In addition, waste oil collection and separation from wastewater process required attention, as residual zinc was detected in this waste source.

A specific cleaning process dictated that no substitute for a chelated cleaner was possible. The oil contamination was addressed with a dissolved air floatation unit (DAF), however, during peak production periods, oil contamination into the wastewater system was a problem.

Existing treatment equipment was at full capacity. An improved chemical treatment method was required to meet wastewater discharge criteria with the existing process and equipment.

Existing technology

The existing wastewater treatment program included the application of an aluminum based coagulant for solids neutralization, agglomeration, and settling.

Final pH was maintained at 8.0 SU.

Flocculation was poor to non-existent.

Residual oil was commonly found upon the clarifier and treatment tanks.

Zinc concentrations in the discharge out-fall were 1,000% over the discharge permit limit.

COVENTYA Water Care Action Plan

Upon review, multiple wastewater deficiencies were identified and addressed. The following steps were taken:

- All sources of zinc wastewater were identified and characterized for oil and chelant content.
- The oil removal system (DAF) was evaluated. Testing included zinc, oil, and grease in the supernatant, and chelant content of the process water to this source.
- Treat-ability studies of the DAF process waste were performed to evaluate zinc removal with COVENTYA Water Care products.
- Treat-ability studies of the wastewater treatment system were performed with COVENTYA Water Care products to determine the best treatment scheme for zinc removal.
The COVENTYA Water Care Program

The treatment program was a multiple stage treatment. The following steps outline the process:

**Primary Wastewater Treatment System**

- In the initial collection tank, stage one, combined zinc phosphate and electroplating wastewater is reduced to a pH of 3 to 4 SU with hydrochloric acid. To this tank, OMEGA BP-4123, an iron based cationic polymer / coagulant blend is added. This step isolates the chelants from the zinc metal ions and conditions the waste solution, forming a micro floc of de-stabilized colloids.

- To stage one, OMEGA CP-1169, a specialty cationic polymer, is added. This addition further enhances the neutralization of wastewater charge differentials, creating a uniformly neutral solution with a net cationic charge.

- In stage two, the pH is adjusted to pH of 8.5 to 9.0 SU with sodium hydroxide. To this tank, OMEGA MP-5165, an inorganic sulfide based metal precipitant, is added. OMEGA MP-5165 functions as a polishing aid to assist in zinc metal capture. Any residual zinc not precipitated as a metal hydroxide is reacted with OMEGA MP-5165 and precipitated as a metal sulfide.

- To the floc tank clarifier, OMEGA AP-2040, an anionic polymer, is added to enhance final flocculation. Based upon the colloidal conditioning in stage one, OMEGA AP-2040 rapidly forms a dense, dewatered macro floc, or flocculation of waste solids.

**Oil Removal: Dissolved Air Floatation Treatment**

- An aluminum coagulant, OMEGA C-3115 is added to the oily wastewater. With pH adjustment to 8.5 SU, the oil is separated from the water phase.

- To the water phase, OMEGA MP-5165 is added to capture soluble zinc and complex this metal as a metal sulfide. This preconditioning of the DAF supernatant eliminates the high zinc loading to the primary wastewater system.

**COVENTYA Water Care program evaluation**

The COVENTYA Water Care treatment program has enabled this faculty to meet compliance on a consistent basis. Zinc metal levels at the outfall are now below 1.0 ppm.

Based upon the quality of the effluent discharge, the plant is now in the process of engineering a reuse water tank assembly for water use in non-critical rinse applications within the plant.