

Achieving Zero Process Water Discharge at Ace Plating Company

Ace Plating, Part III

Introduction

Ace Plating Company is a small Chicago job shop offering a variety of decorative electroplating finishes including various types of brass, nickel, bronze and copper. In 1993, Ace Plating used about five million gallons of water annually and discharged 176 pounds of metal to the sewer. In light of new discharge fees and what appeared to be ever-changing environmental regulations, Ace Plating sought assistance from the Illinois Waste Management and Research Center (WMRC) to seek ways to reduce disposal costs and minimize environmental liability. Beginning in 1995, the management at Ace used WMRC's assistance to launch an aggressive effort to use environmentally responsible processes and procedures in all of its business operations.

Previous Project Work

The initial work to reduce water and metal discharges at Ace Plating is detailed in WMRC Publication # TN99-066. Over a two-year period, Ace reduced its water usage by three million gallons annually (60% reduction). Ace also reduced the amount of metals it discharged to the sewer by about 20% while simultaneously increasing production by 15%.

The next phase of work at Ace Plating involved using new technology in an attempt to achieve zero process water discharge. The technology "electrocoagulation" was new to the metal finishing industry, but had been in existence for almost 100 years. Electrocoagulation refers to using current to destabilize the electrical charges around ions and colloids in order to allow

those water contaminants to coagulate out of solution and aggregate (combine together). The coagulated particles are then removed from solution by filtration.

After reviewing several systems, WMRC worked directly with two vendors and conducted pilot studies at Ace Plating. Eventually Ace purchased and installed one of the vendor's electrocoagulation units. The electrocoagulation system allowed Ace to recycle and reuse its water several times over, but a small amount of water had to be bled off to prevent build-up of dissolved solid contaminants. Details of the electrocoagulation work and conclusions about the technology can be found in WMRC publication number TN-00-071.

With the start-up of the electrocoagulation system in September 1997, Ace began recycling and reusing its rinse water. Ace reduced its process water discharge approximately 99% from its 1993 usage. The build-up of sodium, sulfates and chlorides in the process water forced Ace to batch discharge 1,000 gallons of this "clean" water weekly. Therefore, Ace was still subject to the local sanitary sewer district regulations. Ace requested and received a change in its discharge authorization status in June 1998 from significant industrial user (SIU) to batch discharger.

In February 1999, Ace finalized implementation of a spray rinse system for its cleaner tank. The project reduced sodium contaminants in the process rinse water, but batch discharge was still required.

Zero Discharge

Ace was required to provide notification to the local

Publicly Owned Treatment Works (POTW) at least one week prior to each batch discharge. Ace always discharged at the same day and time each week. The company was able to provide the local POTW with a discharge schedule at the start of each quarter.

In September 1999, data was taken at various places throughout the electrocoagulation system. With some parts of the system not performing as designed, Ace still managed to continue recycling its process water.

Ace also regularly checked its batch discharges using an outside lab to assure itself that no metals of concern entered the sewer system. This expense, coupled with required semi-annual sampling, prompted Ace to re-examine the issue of zero process water discharge.

When Ace Plating requested that WMRC review its previous recommendation to become a zero process water discharger, Ace was continuing to discharge at a rate of 1,000 gallons of process water each week. This equated to 200 gallons per day or 12.5 gallons per hour (gph) for a 16-hour day. Reverse osmosis and evaporation were technologies considered to help achieve zero discharge. Of the two, reverse osmosis was more expensive and required more maintenance. Reverse osmosis would allow additional water to be recycled, but it also generated a small retentate stream that required disposal.

The least expensive method for handling the process water stream contaminated with essentially dissolved salts was evaporation. WMRC provided Ace with several evaporator options and calculated the operating expenses. In June 2000, Ace ordered the evaporator and had it operational by October 2000. Ace discharges "clean" recycled water to the evaporator, which helps keep the evaporator free of metal contaminant build-up. The evaporator is rated for 17-gph and is therefore more than adequate to evaporate the 1,000 gallons per week required to keep the level of contaminants in the recycled water within manageable limits.

Results

The sewer inlet was capped with concrete. Ace spent \$7,000 for the evaporator and about \$1,000 to do the

roof work and to install the stack and natural gas piping. Annual operating costs for natural gas are about \$2,400 (based on paying \$0.30 per therm for natural gas).

Ace uses its former holding tank as a surge tank in case of evaporator problems. The holding tank allows Ace about one week of production time to correct any problems with the evaporator. To date, evaporator maintenance has been minimal. Without the more expensive auto-fill system, an employee has to manually fill the 120-gallon evaporator tank about three times per day. The evaporator tank level shuts off the evaporator when the tank level drops to about half full.

By implementing zero discharge, Ace Plating is no longer subject to the local sanitary sewer authority. Five years after deciding to reduce its wastes and to be in compliance more often, Ace Plating is achieving 100% compliance. While other electroplating companies cringe each time new clean water regulations are discussed, Ace Plating's management is confident that with its closed loop system, the company will be able to meet any new regulations.

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