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 4.9 million gallons of water and discharged 176 pounds of metal to the sewer. All discharges were in compliance with effluent limits and the company paid about $10,000 annually in water supply costs and sewer discharge fees. In late 1994, Ace was notified that in addition to its regular water and sewer costs, they would also be required to pay an annual “metals loading” charge. For the first year, this charge exceeded $16,000. In light of this new fee and what appeared to be ever-changing environmental regulations, Ace Plating sought assistance from the Illinois Sustainable Technology Center (ISTC) to seek ways to reduce disposal costs and minimize environmental liability. In 1995, with ISTC’s assistance, the management at Ace launched an aggressive effort to use environmentally responsible processes and procedures in all of its business operations.

PROJECT EXECUTION

ISTC engineers conducted a pollution prevention (P2) assessment and discovered that Ace Plating had several P2 practices in place; such as the use of dead rinse tanks, some counter-current rinsing, nickel plating bath filtration and regular monitoring of bath chemistries. In Phase I of the project, ISTC recommended additional P2 practices and procedures for reducing water usage and metals’ discharge at the source. Meetings were held with plating line operators, focusing on operational improvements such as minimizing dragout by increasing drainage time, shaking plating bars and using proper racking techniques. The wastewater was tested on a weekly basis for metals and the results were posted so the operators understood the effect of better procedures.

The plating line was also assessed and improvements were made. Leaking water valves were replaced and existing water supply valves at each tank were adjusted to limit flow to the rinse tanks. Operators could no longer adjust the water depending on how the rinse water looked. Dead rinse tanks were used as make-up for plating tanks, rather than being dumped and batch treated. Sanitary water leaks that contributed significantly to the overall facility water discharge were tracked down and corrected.

After implementing these basic source reduction techniques, Phase II of the project began. ISTC proposed that Ace implement full counter-current rinsing. Ace’s initial rinse water flows were as follows:

![Diagram](image)

Each rinse tank used fresh water make-up. ISTC worked with Ace Plating and its operators to re-use the rinse water after plating as supply water for the rinse after etching. After an extended period of operation (with no effect on product quality), Ace was willing to use that same water again as supply water for the rinse after the cleaning step. The final rinse water flow layout was as follows:

![Diagram](image)

Rinse waters from the process were pH-adjusted to precipitate metals out of solution and then decanted prior to discharging to the sewer. ISTC assisted Ace with selection of a new pH control system to assure better precipitation of the metals.
PROJECT RESULTS

Between 1993 and 1996 Ace Plating’s water usage decreased from a peak of about 5.3 million gallons per year in 1994 to about 1.8 million gallons per year in 1996. Sanitary uses account for about one-half million gallons of water annually. The following graph illustrates the decrease in water usage.

As the water usage was decreasing, less dragout and better precipitation of metals allowed Ace to also reduce its total metals discharged to the sewer. Metals discharge is illustrated below.

It should be noted that while implementing full countercurrent rinsing in 1996, Ace also experienced a 15% increase in production that year.

BOTTOM-LINE ECONOMICS

The costs for implementing these changes totaled about $3,000, primarily for the water transfer pumps and the pH control system. Savings are as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Water &amp; Sewer Cost</th>
<th>Metals Loading Cost</th>
<th>Total Water &amp; Sewer Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>$9,739</td>
<td>*</td>
<td>$9,739</td>
</tr>
<tr>
<td>1994</td>
<td>$10,239</td>
<td>*</td>
<td>$10,239</td>
</tr>
<tr>
<td>1995</td>
<td>$6,727</td>
<td>$16,763</td>
<td>$23,490</td>
</tr>
<tr>
<td>1996</td>
<td>$3,414</td>
<td>$13,709</td>
<td>$17,123</td>
</tr>
</tbody>
</table>

Total Savings (1995 vs. 1996) = $6,367

*The metals loading cost was implemented in 1995 by the local sanitary sewer district.

The effect of implementing P2 was clearly seen on the company’s bottom line. The cost of implementing full countercurrent rinsing was recouped in about six months. Having implemented relatively easy and inexpensive process modifications, Ace was still faced with an annual expense of $17,000 for water and sewer costs. Ace had to decide if it would take the next step and seek to achieve zero process water discharge. Ace Plating’s management knew that zero discharge would be a much costlier proposition and would also involve more risk. Product quality had to be maintained and good rinsing was second only to having good plating solutions when dealing with product quality. With a firm commitment that P2 was the way to future success in environmental matters, Ace chose to seek zero discharge. Details of that part of the project will be highlighted in “Ace Plating Project – Phase III.”

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