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Project Summary

Technical Assistance for Huntington Park Group Treatment Facility

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Group treatment is one alternative for firms faced with the problem of compliance with pretreatment regulations whereby they may achieve the benefits from economics of scale. A preliminary study of the concept as applied to the plating firms within Huntington Industrial Park, Providence, RI, was conducted under an earlier (1980) effort. It was found at that time that, with the assumed ten participating firms, substantial savings could be realized.

The phase of the work described here investigated the current (1982) status of pollution control in Huntington Industrial Park through three case studies. The studies reveal that thee plants are either meeting or show promise of meeting pretreatment regulations on levels of cyanides and heavy metals at the present time. This was achieved through in-plant changes to reduce water consumption, installation of recovery equipment, and elimination of cyanide process solutions. In some cases, the installation of electrolytic recovery systems has eliminated the need for expensive treatment equipment, the generation of metallic hydroxide sludge, and associated disposal problems.

This Project Summary was developed by EPA's Hazardous Waste Engineering Research Laboratory, Cincinnati, OH, to announce key finding of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

The Huntington Industrial Park in Providence, RI, presents a unique situation for studying pretreatment of wastes from electroplating operations. No other area of comparable size has such a high concentration of electroplating firms. The jewelry industry is heavily represented in the park. The Narragansett Bay Water Quality Management District Commission Treatment Plant which serves the Providence area receives large concentrations of the industrial park's influent. In 1980 it was determined that as much as $30,000 per week worth of silver was discharged into Narragansett Bay.

Nationally, compliance with pretreatment regulations may be difficult for the smaller job shops, who lack the expertise and/or economic capability to install and operate treatment systems. Regionally, projected impacts in the Providence area are significant. Huntington Industrial Park is located within Providence at the Cranston, RI, boundary. With easy access to highways, the park is ideally located in respect to the many electroplating and jewelry firms in the area. Although not planned as an electroplating park when constructed about 10 years ago, 11 plants in the park now fall into that category. With the exception of one plating job shop and one electronics concern, all are in the business of jewelry manufacturing. In the 11 firms, employment ranges from 25 to 350. The avrage number of working days per year is 242. All except two oprate on one 8-hour shift.

These plants are faced with the problems of compliance with environmental regulations. Because of their proximity, thee possbility for reducing waste treatment costs through group treatment was investigated. Group treatment refers to the joint establishment of a waste treatment facility by a group of shops in close proximity, discharging wastes. Ownership, management, and operation would generally involve the participating companies themselves, although a number of variants are possible. The Group Treatment Facility (GTF), while primarily intended for the benefit of its members, could offer to treat the wastes of other small shops having similar waste constituents.

In early 1980, CENTEC Corporation performed a preliminary analysis of group treatment at Huntington Industrial Park. Wastewater from each of the 10 potential participants was sampled and analyzed, and flows were measured. The CENTEC joint treatment mathematical model was used to size and cost the GTF and to indicate the economic decision for each of the participants. Transportation of wastes by both truck and by private sewer system was evaluated. Preliminary contacts were made with SBA, State of Rhode Island Department of Environmental Management, Providence Department of Public Works, Rhode Island Department of Economic Development, and the Bank of Wisconsin (a potential underwriter). As a result of that earlier feasibility study's conclusion that the proposed GTF was feasible and might result in savings, the potential participants decided to move ahead with the project.

The Group Treatment Facility design completed under the earlier study called on each plant to install counter-current rinsing and initiate other innovative techniques to minimize the volume of rinsewater requiring shipment to the GTF. Each plant was to achieve flow reductions of 60 to 90 percent. The tretment of cyanides would be the most costly GTF process. In fact, the earlier study found that if cyanides could be eliminated from the plants' production process, the need for a joint treatment facility would have to be reevaluated.

Since the 1980 study, most of the plants in the park have instituted the recommended in-plant changes to significantly reduce the volumes of wastewater being treated. In addition, and perhaps of most significance, most plants have replaced some cyanide baths and cleaners with non-cyanide types while retaining product quality.

The three-case study project described in this report had a its objective the evaluation of the changes made by the platers at Huntington Park since the original study, and the reevaluation of the course of action needed to achieve compliance in light of those changes.

Discussion

In the full report, the three plants surveyed are referred to by plant number and by case number. In this Project Summary they will be referred to as case numbers 1, 2, and 3. In each of the three plants surveyed, data from this study and from the 1980 study were compared. In cases 1 and 2 improvements made since 1980 consisted of installation of counter-current rinsing, aerating rinsewater flow restrictors, and electrolytic recovery units and utilization of non-cyanide baths. In case study 3, the improvements included installation of an automatic plating machine and rinsewater flow restrictions. The new plating machine now accounts for 80 percent of the plant's production.

In all three plants, surveyed water consumption in cases 1, 2, and 3 was reduced by 62.5 percent, 64.5 percent, and 88.2 percent, respectively. Total regulated metals discharged were reduced 12.7 percent, 82.3 percent, and 83.6 percent.

In cases 1 and 2, cyanide concentrations were reduced 98.2 percent and 97.0 percent. In case 3, a higher concentration of cyanide was noted. The full report recommends elimination of an excess rinse to reduce cyanide concentrations.

Analytical results of the composite effluent sample indicate that case 1 and 2 plants are meeting EPA pretreatment regulations without need for further in-plant changes or the installation of additional treatment equipment.

Many calculations involving rinsing of plated parts and recovery of metals require a determination of the quantity of process solution clinging to the parts and rack, the so-called "dragout." To determine a reasonable dragout for case 2 the following experiment was conducted.

The first rinse tank following the nickel plating tank was emptied, thoroughly cleaned, and refilled with fresh water. An initial sample from the rinse tank was analyzed for nickel concentration. Additional samples of the "dead" rinse tank were analyzed after 10, 27, and 40 racks had passed through the tank. A sample of the nickel plating tank was also analyzed for nickel concentration. From these analyses, the dragout was calculated to be 0.20 liters per rack for the plants in all three cases.

Tables 1, 2, and 3 compare plant performance in 1982 against perform-

Table 1. Huntington Industrial Park Plant Performance Comparison—Case 1

	February 1980—February 1982		
Parameter	*2/80*	*2/82*	*Percent Reduction*
Effluent Flow, gpd	*64,000*	*24,000*	*62.5*
Analyses, mg/l			
All Metals	*1.74*	*4.05*	*12.7*
CN_t	*2 9*	*0.14*	*98.2*
Au	*	*<0.5*	-
Rh	*	*<0.5*	-
Ag	*<0.01*	*0.05*	-
Cd	*<0.01*	*<0.01*	-
Cr_t	*0.05*	*0.22*	-
Cu	*0.68*	*1.04*	-
Ni	*0.95*	*2.56*	-
Pb	*<0.001*	*0.007*	-
Zn	*0.06*	*0.17*	-
Sn	*	*<1.0*	-

**not analyzed.*

Dragout Experiment Results: DRAGOUT = 0.020 l/rack

Table 2. *Huntington Industrial Park Plant Performance Comparison—Case 2*

Parameter	Effluent Analysis February 1980—February 1982 2/80	2/82	Percent Reduction
Effluent Flow, gpd	32,000	11,371	64.5
Analyses, mg/l			
All Metals	1.85	1.69	82.3
CN_t	3.9	0.60	97.0
Au	*	<0.5	-
Rh	*	<0.5	-
Ag	0.13	<0.01	-
Cd	<0.01	<0.01	-
Cr_t	<0.05	<0.05	-
Cu	0.45	0.33	-
Ni	1.10	0.70	-
Pb	0.004	0.006	-
Zn	0.17	0.06	-
Sn	*	<1.0	-

*not analyzed.

Dragout Experiment Results: DRAGOUT = 0.020 l/rack

Table 3. *Huntington Industrial Park Plant Performance Comparison—Case 3*

Parameter	Effluent Analysis February 1980—February 1982 2/80	2/82	Applicable Regulations <10,000 gpd Daily Max.	4-D Average	Percent Reduction
Effluent Flow, gpd	48,600	5,720			88.2
Analyses, mg/l					
All Metals	14.0	19.44	-	-	83.6
CN_t	10.7	10.6	5.0	2.7	88.3
Au	*	<0.5	-	-	-
Rh	*	<0.5	-	-	-
Ag	<0.01	<0.01	-	-	-
Cd	<0.01	<0.01	1.2	0.7	-
Cr_t	0.69	<0.05	-	-	-
Cu	4.92	3.87	-	-	-
Ni	6.90	14.0	-	-	-
Pb	0.008	<0.001	1.2	0.7	-
Zn	1.50	1.57	-	-	-
Sn	*	<1.0	-	-	-

*not analyzed.

Dragout Experiment Results: DRAGOUT = 0.021 l/rack

ance in 1982 against performance in 1980.

Conclusions

The three case studies in the full report dramatically demonstrate the ability of plating shops in the Huntington Park area to meet pretreatment regulations with minimal capital investment. In most cases, the purchase of wastewater treatment an be limited to a relatively simple pH adjustment system for treating batch dumps prior to discharge.

Application of the techniques employed by the three plants studied to other plants in Huntington Park should eliminate the need for a Group Treatment Facility. In particular, the utilization of electrolytic recovery units can often eliminate the need for treatment equipment and avoid the generation of hydroxide sludges and their disposal problems.

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The complete report, entitled "Technical Assistance for Huntington Park Group Treatment Facility," (Order No. PB 85-222 768/AS; Cost: $10.00, subject to change) will be available only from:
National Technical Information Service
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