SAMPLING AND ANALYSES OF SMALL METAL FINISHING INDUSTRIES
March 1973
CONNECTICUT AND MASSACHUSETTS

On March 1 and 6, personnel from the Environmental Protection Agency, Region I sampled a total of five small metal finishing industries in Connecticut and Massachusetts.

At the request of Permits Branch, Surveillance and Analysis Division's Technical Studies Section established a sampling program at three metal finishing industries in Connecticut and two in Massachusetts. The criteria for choosing the sampling locations were: 1) the industry must discharge less than 76 cubic meters (20,000 gallons) per day effluent, and 2) the industry must have an operating waste treatment system employing current technology. Approximately 20 industries were canvassed before finding five which met the established constraints. Four of the industries selected incorporated integrated systems developed by Lancy Laboratories, and one was a batch treatment system. Table 1 is a listing of the industries sampled, their location, waste flow, and type of treatment, and Table 2 is a listing of abbreviations. Field reports and analyses are appended.

TABLE 1

SMALL METAL FINISHING INDUSTRIES
SAMPLED MARCH 1 & 6, 1973

NAME	LOCATION	OPERATING DAY (HOURS)	FLOW m^3/day (gpd)	TREATMENT
Beaton & Corbin Mfg. Co.	Southington, Conn.	0730 - 1630	32 - 40 (8500 - 10,500)	Lancy
Empire State Novelty	Shelton, Conn.	0730 - 1730	59 (15,600)	Lancy
Star Pin Company	Shelton, Conn.	0700 - 1600	<76 (<20,000)	Lancy
V. H. Blackington Company	Attleboro, Mass.	0800 - 1700	103 (27,000)	Lancy
H. F. Barrows Co.	North Attleboro, Mass.	0700 - 1700	9.1 (2400) max. batch/day	Batch Treatment by William Domey

TABLE 2

LIST OF ABBREVIATIONS

ABBREVIATION	DESCRIPTION	UNITS OF MEASURE
Ag	silver	micrograms per liter (ug/l)
Au	gold	ug/l
^{o}C	degrees centigrade	
CN	cyanide	milligrams per liter (mg/l)
Cr	chromium	ug/l
Cr^{+6}	hexavalent chromium	ug/l
Cu	copper	ug/l
Fe	iron	ug/l
gpd	gallons per day	
gpm	gallons per minute	
J	value reported is approximate	
K	actual value known to be less than reported value	
L	actual value known to be more than reported value	
lpd	liters per day	
lpm	liters per minute	
M^3/day	cubic meters per day	
nflt	non-filterable	
Ni	nickel	ug/l
pH	hydrogen ion concentration	standard units
Rh	rhodium	ug/l
Sn	tin	ug/l
tnflt	total non-filterable residue	mg/l
Zn	zinc	ug/l

BEATON & CORBIN MFG. CO.
SOUTHINGTON, CONNECTICUT

MARCH 1, 1973

Beaton & Corbin Manufacturing Co., Southington, Connecticut, is a machining and plating operation which produces, primarily, plumbing fixutres. The company plates nickel and chromium on such plumbing fixutres as sink traps, drain pipes, and pipe collars. At one time, Beaton & Corbin also plated copper, but they have eliminated this process and the use of cyanide at the company. The plating room operated from 0730-1630 hours Monday through Friday, and the total process waste flow averages 60 - 75 liters (16 - 20 gallons) per minute during the operating day.

The process for piping begins with brass tubes which are machined to the desired configurations before being sent to the plating shop. Pipe collars are stamped from sheets of an unknown base metal and assembled in the machine shop before being sent to the plating room.

In the plating room the fixtures are degreased and then sent to the plating process. The plating operation is on a continuous conveyor. Parts placed on the conveyor go to an alkali bath, acid dips, nickel plating and chromium plating, interspersed with rinses. Upon completion of the cycle, the plated parts are taken to parts bins for examination and storage until shipment.

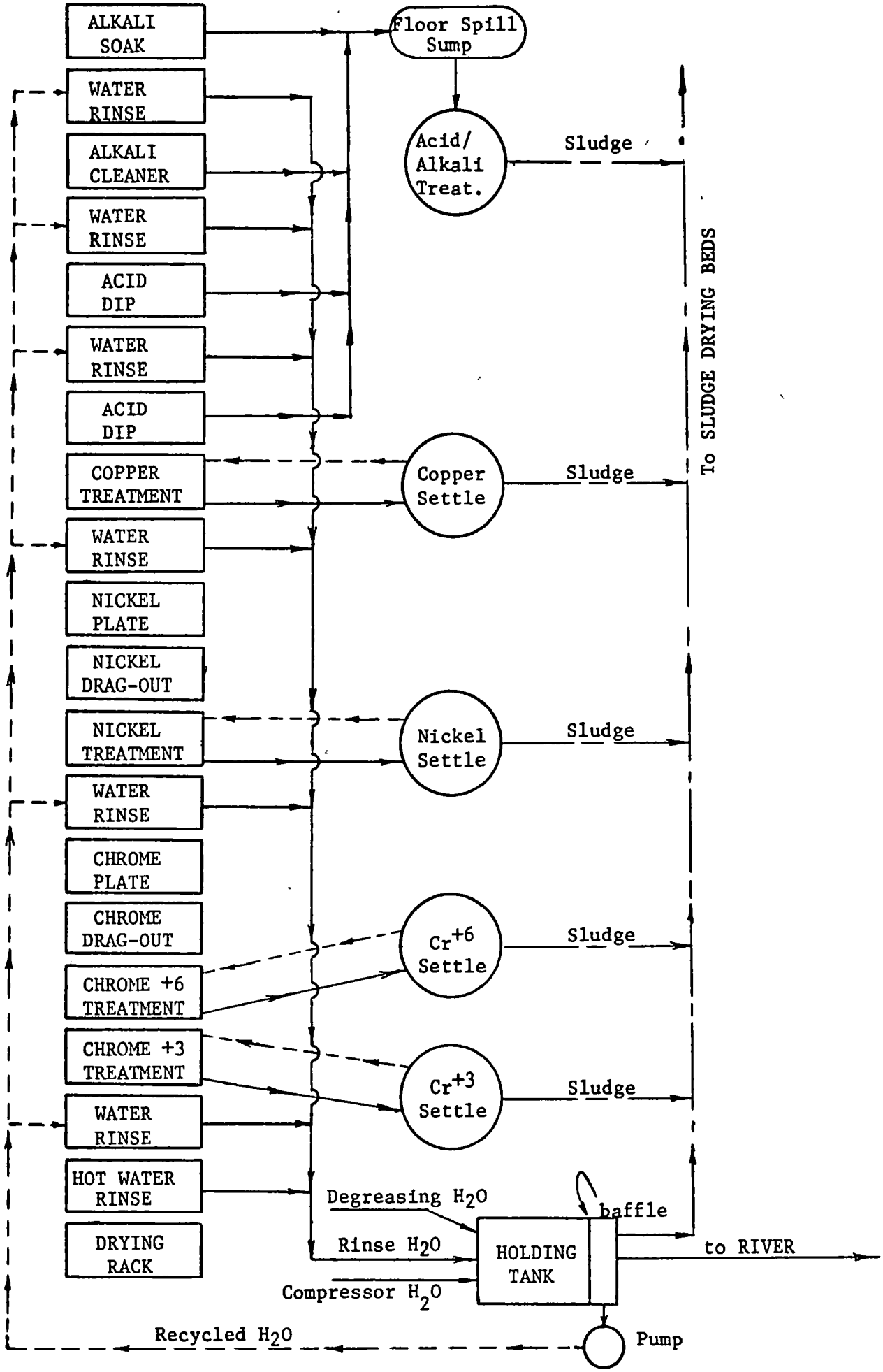
Beaton & Corbin Mfg. Co. uses five integrated systems developed by Lancy Laboratories for eliminating waste sources. The five systems treat nickel, copper, hexavalent chromium, trivalent chromium, and alkali plus floor spillage wastes. Copper treatment is required because of copper being dragged out of the brass tubing during the cleansing

operations. Effluents from the plating process are separated so that each concentrated waste goes to the appropriate treatment tank for metal precipitation. With the exception of the alkali and floor drainage treatment, the treated effluents are recycled back to the processes from whence they came. Dilute rinse waters are discharged to a general waste collection sump in the plating room and are discharged to a sedimentation tank.

Sedimentation is the only treatment given the sewered industrial waste waters. These industrial wastes come from the dilute rinse tanks, degreasing operations, and welder compressors. The wastes are combined in a 32 cubic meter (8500 gallons) rectangular settling tank which has a baffle at the downstream end. Some of the water passing over the baffle is recycled to the process rinse tanks and the excess discharges to an open ditch which drains to the Quinnipiac River about one-half mile away. Figure A-1 is a schematic of the process operations.

Sludges from the treatment systems are discharged to one of two on-site sludge drying beds. Dewatering is by evaporation and percolation to groundwater. The sludge and one quarter of the contents of each tank is withdrawn and discharged to a sludge bed periodically. For the alkali tank this occurs weekly and for the copper about once per month. Thenickel and chromium tanks are drawn down every two weeks.

The system has been in operation approximately two years and to date only one drying bed has been used. Plant personnel typify the soil as fine gravel having excellent permeability. The drying bed



FLOW DIAGRAM
BEATON & CORBIN MFG.,CO.

FIGURE A-1

has never been cleaned and total sludge accumulation is estimated to be 15-23 centimeters (5.9 - 9.1 inches) deep.

The sampling program consisted of obtaining eight grab samples collected one hour apart, two 4-hour composite samples, and one operating day composite sample (0730-1630 hours) of the final effluent. Samples were collected at the discharge to the open ditch (Station BC01). All samples collected were analyzed for dissolved hexavalent chromium, total chromium, total and dissolved copper, nickel and zinc, and total non-filterable residue. In addition, the operating day composite was analyzed for cyanide, and the pH and temperature of the hourly grabs were recorded. The analytical results are shown in Table A-1.

The files of the Connecticut Division of Water Pollution Control contained analytical data about a sample collected on August 15, 1972. The data on file are shown below.

total chromium	0.14 mg/l	nickel	0.60 mg/l
copper	0.08 mg/l	cyanide	K0.01 mg/l
zinc	0.26 mg/l	total nflt. residue	3.40 mg/l

TABLE A-1

INDUSTRY NAME: BEATON & CORBIN MFG. CO.
CITY, STATE: SOUTHINGTON, CONNECTICUT
DATE: MARCH 1973

ANALYTICAL RESULTS

STATION	DATE 1973	TIME HOURS	SAMPLE TYPE	TEMP. °C	pH S.U.	TNFLT mg/l	CYANIDE mg/l
BC01	03/01	0900	GRAB	17.5	6.3	-	
BC01	03/01	1000	GRAB	17.0	6.4	9	
BC01	03/01	1100	GRAB	19.5	7.0	5	
BC01	03/01	1200	GRAB	20.0	5.7	10	
BC01	03/01	1300	GRAB	20.0	5.9	6	
BC01	03/01	1400	GRAB	21.0	6.3	5	
BC01	03/01	1500	GRAB	21.5	6.8	5	
BC01	03/01	0800-1600	COMP	-	-	2	K0.005
BC01	03/01	1300-1600	COMP	-	-	5	-

K - value known to be less than value reported

TABLE A-2

INDUSTRY NAME: BEATON & CORBIN MFG. CO.
CITY, STATE: SOUTHINGTON, CONNECTICUT
DATE: MARCH 1973

ANALYTICAL RESULTS

STATION	DATE	TIME HOURS	SAMPLE TYPE	METALS ug/l							
				NICKEL		ZINC		COPPER		CHROMIUM	
				TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISS. Cr^{+6}
BC01	03/01	0900	grab	380	290	220	60	400	120	960	204
BC01	03/01	1000	grab	510	440	300	150	500	220	1085	138
BC01	03/01	1100	grab	620	540	400	350	660	300	1110	50
BC01	03/01	1200	grab	650	580	460	340	770	0	1310	10
BC01	03/01	1300	grab	580	500	420	290	650	260	1045	30
BC01	03/01	1400	grab	660	610	360	240	550	260	1010	103
BC01	03/01	1500	grab	780	700	370	240	510	250	1275	275
BC01	03/01	1600	grab	820	740	500	330	660	370	1305	109
BC01	03/01	0800-1600	comp.	600	480	360	220	800	240	990	93
BC01	03/01	0900-1200	comp.	560	450	420	190	580	240	1080	68
BC01	03/01	1300-1600	comp.	710	630	400	280	600	290	1215	115

INDUSTRIAL WASTE SURVEY

EMPIRE STATE NOVELTY
SHELTON, CONNECTICUT

Empire State Novelty Company in Shelton, Connecticut manufactures clasps for ladies' pocketbooks. The clasps are formed at the plant from pieces cut from a steel ribbon, then plated. Plating consists of a series of washes and rinses followed by a nickel dip, nickel recovery, nickel treatment, rinse, brass flash, cyanide rinse treatment, two more rinses and a drying step. The wastewater from this process is treated by Lancy integrated systems for nickel and cyanide. Figure B-1 is a flow diagram of the plant's process.

Constant overflow from the nickel treatment and the cyanide rinse treatment tanks in the plating line is fed by gravity to two approximately 7.5 cubic meter (2000 gallon) treatment tanks. In the nickel tank the pH is adjusted to between 10.5 and 11.0 with caustic soda (NaOH) and the nickel ions bond with hydroxide to form a precipitate which settles to the bottom of the tank. The clear liquid from the top of the tank is then piped back to the plating system for re-use . The tank and the pipes to and from the tank are periodically cleared of this sludge build-up with an acid solution which is pumped through them. Sludge is deposited into two lagoons outside the plant.

The cyanide is treated by alkaline chlorination using sodium hypochlorite. The reaction when carried to completion converts the cyanide to carbon dioxide (CO_2) and nitrogen (N_2) gases. Clear liquid from the top of the tank is then piped back to the plating operation.

Spillage from the other tanks in the operation enters floor drains and is gravity fed to one of two 1.9 cubic meter (500 gallon) tanks

EMPIRE STATE NOVELTY
SHELTON, CT.
PLATING PROCESS

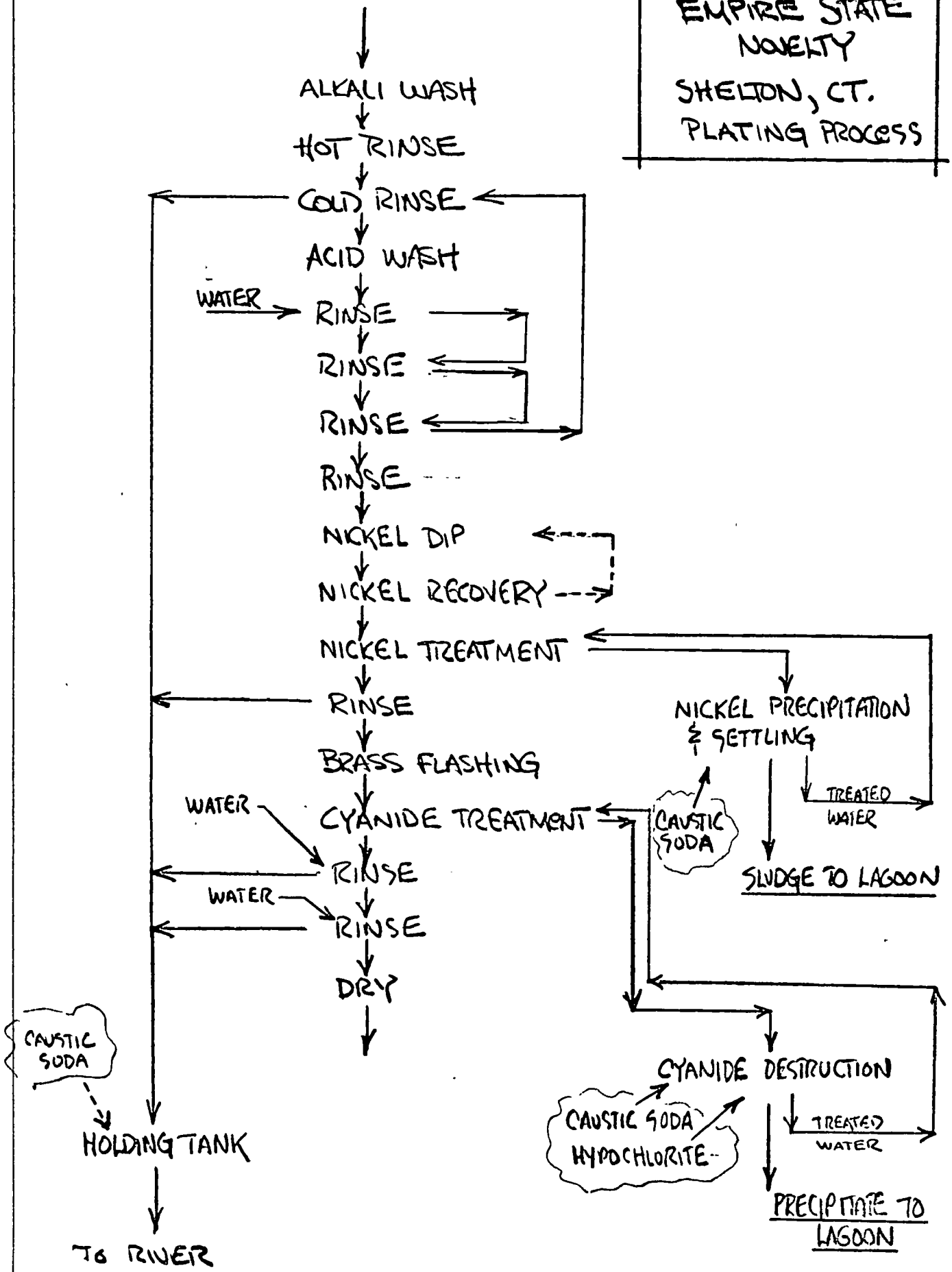


Figure B-1

where it is periodically treated on a batch basis. The rinse tank after the nickel treatment tank and the two rinse tanks following the cyanide rinse treatment tank are gravity fed to a 6.3 cubic meter (2400 gallon) tank. Here the pH is monitored and adjusted before the wastes are discharged into the Housatonic River (See Figure B-1). This water is crystal clear but could contain residual quantities of cyanide, nickel and possibly iron. Sludge from the nickel treatment is sent to a sludge dying bed. Water is removed by evaporation or percolation to groundwater.

SAMPLING INFORMATION

On March 1, 1973, five sets of grab samples and three composite samples were collected from this holding tank which was being filled at approximately 98 liters (26 gallons) per minute. The grab samples were analyzed for oil and grease, cyanide, total suspended solids, dissolved metals and total metals (copper, nickel, iron, zinc). One operating day composite sample and two four-hour composite samples were prepared and analyzed for cyanide, total nonfilterable residue, dissolved metals and total metals, giving a total of 12 individual composite samples. The results of the analyses are shown in Tables B-1 and B-2.

The State of Connecticut's files contained analytical data on a one-hour composite sample collected from Empire State Novelty on March 25, 1971. The data are shown below:

total chromium	0.0 mg/l	zinc	0.2 mg/l
copper	0.2 mg/l	iron	1.8 mg/l
nickel	0.8 mg/l	cyanide	0.1 mg/l

TABLE b-1

EMPIRE STATE NOVELTY
SHELTON, CONNECTICUT
MARCH 1973

ANALYTICAL RESULTS

STATION	DATE	TIME	SAMPLE TYPE	TEMP °C	pH(1) S.U.	TNFLT mg/1	CYANIDE mg/1	OIL & GREASE mg/1
ENO1	3/1/73	0800	grab	7	J8	----	----	------
ENO1	3/1/73	0930	grab	7	J7	11	----	2.4
ENO1	3/1/73	1000	grab	7	J8	14	----	------
ENO1	3/1/73	1100	grab	6	J8	11	----	2.4
ENO1	3/1/73	1204	grab	7	J7	14	----	------
ENO1	3/1/73	1320	grab	6	J7	10	----	------
ENO1	3/1/73	1406	grab	6	J7	15	----	------
ENO1	3/1/73	1500	grab	6	J8	25	----	------
ENO1	3/1/73	1600	grab	7	J8	15	----	------
ENO1	3/1/73	1700	grab	7	J8	9	----	------
ENO1	3/1/73	0800-1700	composite	----	----	8	0.095	------
ENO1	3/1/73	0800-1100	composite	----	----	13	0.048	------
ENO1	3/1/73	1200-1700	composite	----	----	21	0.100	3

1 - Color comparator pH ribbon paper used.
J - Approximate value.

TABLE B-

EMPIRE STATE NOVELTY CO.
MARCH 1, 1973

ANALYTICAL RESULTS

STATION	TIME	SAMPLE TYPE	METALS ug/l							
			COPPER ug/l		NICKEL ug/l		IRON ug/l		ZINC ug/l	
			TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
EN01	0800	grab	----	----	----	----	----	----	----	----
EN01	0930	grab	240	100	430	280	3065	1210	550	160
EN01	1000	grab	280	40	420	180	2875	10	460	0
EN01	1100	grab	250	40	430	190	2725	25	380	—
EN01	1204	grab	290	30	50	140	2965	10	380	0
EN01	1320	grab	280	40	560	180	3060	15	410	10
EN01	1406	grab	240	20	500	80	3150	10	380	0
EN01	1500	grab	260	20	560	60	3100	5	360	0
EN01	1600	grab	260	20	580	70	3150	15	380	0
EN01	1700	grab	240	20	490	70	3125	5	340	0
EN01	0800-1700	composite	240	80	460	160	3045	2180	460	—
EN01	0800-1100	composite	200	90	380	190	3045	445	650	—
EN01	1200-1700	composite	260	30	480	140	2900	10	390	0

STAR PIN COMPANY
SHELTON, CONNECTICUT
MARCH 1, 1973

Star Pin Company, Shelton, Connecticut, manufactures common pins, pins with plastic heads and assorted other small wire formed garment hooks. Base materials are rolls of steel or brass wire of various diameters depending on the product. These are plated with nickel or tin or are "black treated" with steel or brass oxides. Prior to the plating operation, the products are tumbled together with sawdust to remove surface oil and grease. After separation from the sawdust, they pass through a number of cleaning solutions, rinses and an acid rinse. The pins are then rinsed with clear water and placed in the appropriate plating tank. From the plating tank the pins are transferred to either a nickel or cyanide treatment tank (depending on plating being done). The treatment tank removes and treats the dragout from the plating tank. The pins are then placed in a clear water rinse.

Following the plating operation the plated material is passed through a bright dip process. "Bright dipping" consists of immersing the product in a hot cleaner, clean water rinse, CN solution, CN treatment rinse and then another clean water rinse. These stages may differ from metal to metal and finish desired, but the process is similar. The products are then tumbled dry and polished with powdered corn husks and sent to packaging.

Star Pin currently uses Lancy Laboratory's integrated nickel and cyanide treatment systems and batch treatment for floor spills. The nickel is treated in closed system by raising the pH to 11 with caustic soda to precipitate metal hydroxides. The process treatment tank's

continuous overflow drains to a settling tank and the treated water is recycled to the process tanks. This is also done for cyanide and other metals. Cyanide treatment employs a solution of hypochlorite. Both integrated tanks are monitored for pH with an alarm system being activated below pH 9. The floor spills are split into acid and alkaline spills. Both are batch treated by raising the pH and addition of hypochlorite to the alkaline tank for CN treatment. The tanks are settled overnight and then have the clear liquid pumped off to the final neutralization tank. All of the clear water rinses and detergent cleaning overflows prior to acid cleaning or plating, are discharged through the final neutralization tank which is monitored for pH. If the neutralization tank drops below pH 6, caustic is fed in automatically to bring the pH up again. The neutralization tank then discharges to the tail race of a water wheel and then to the Naugatuck River.

The sludge deposit in the floor spill tanks and integrated treatment tanks are pumped periodically to 55 gallon drums and the contents removed by a scavenger named Mayhew.

SAMPLING INFORMATION

On March 1, 1973, two four-hour composite samples, an operating day composite sample and eight grab samples were taken from the final neutralization tank (Station SP-1). Temperature and pH were recorded at the time of sampling. Samples were collected and analyzed for total metals (Ni, Sn, Fe, Zn, Cu), dissolved metals (same), oil and grease, cyanide, and total suspended solids. A grab sample was taken of the influent rinse water (canal water designated Station SPC) and a grab sample was taken of the treated clear liquid from the floor spill tanks (Station SP-2). Analytical data are in Table C1.

Accurate flow measuring equipment was not available at the plant. State of Connecticut records indicate that the discharge from the plant is less than 75 cubic meters (20,000 gallons) per day.

STAR PI.. .OMPANY
SHELTON, CONNECTIC UT
FLOW DIAGRAM

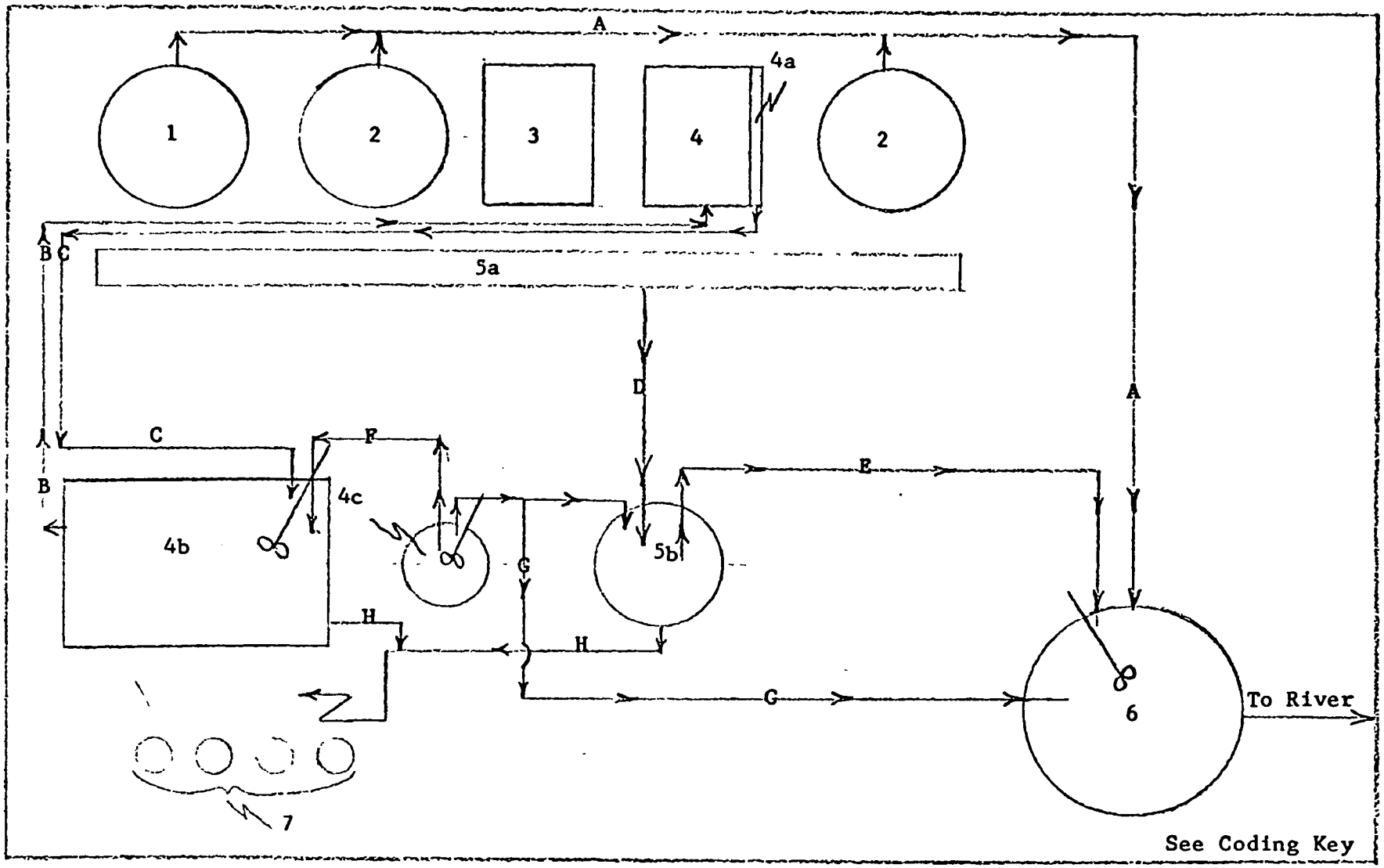


FIGURE C-1

KEY TO FLOW DIAGRAM

STAR PIN COMPANY

1. Preliminary cleaning, degreasing (no discharge) and associated clear water rinses.

2. Clear water rinses.

3. Plating tank for either nickel or tin.*

4. Integrated treatment process tank for nickel, cyanide and tin.
   a. Integrated treatment tank overflow.
   b. Integrated treatment reservoir and settling tank.
   c. Chemical mix tank, caustic for nickel, hypochlorite for cyanide.

5. a. Floor spill catch basin (acid or alkali).
   b. Batch treatment for floor spills (acid or alkali).

6. Final neutralization tank.

7. Barrels sludge is pumped to for holding until removal by scavenger.

A. Clear water overflow line.

B. Integrated treatment return line.

C. Integrated treatment overflow line.

D. Floor spill line.

E. Clear liquid removal line. (After batch treatment, one for each acid and alkali tanks.)

F. Chemical feed line for integrated treatment.

G. Chemical feed line for floor spill tanks and final neutralization tank (hypochlorite for alkali spills, caustic for acid floor spill tank and final neutralization tank).

H. Sludge removal line from integrated treatment and floor spill tanks (hand held).

* Black treating has similar system but uses an activation tank, then oxidizing tank and then to cyanide. Bright dip process also follows similar system after plating operation.

TABLE C

STAR PIN COMPANY
SHELTON, CONNECTICUT
MARCH 1, 1973

ANALYTICAL RESULTS

STATION	DATE	TIME	SAMPLE TYPE	TEMP °C	pH S.U.	TNFLT mg/1	CYANIDE mg/1	OIL & GREASE mg/1
SP-1	3/1/73	0740-1040	comp.	----	---	1.5	K0.005	-----
SP-1	3/1/73	1140-1440	comp.	----	---	1	0.005	-----
SP-1	3/1/73	0740-1540	comp.	----	---	1	0.003	-----
SP-1	3/1/73	0840	grab	4	7.9	5	-----	-----
SP-1	3/1/73	0940	grab	3	7.9	---	-----	-----
SP-1	3/1/73	1040	grab	4	7.6	3	-----	-----
SP-1	3/1/73	1140	grab	3	6.9	1	-----	-----
SP-1	3/1/73	1240	grab	3	6.9	2	-----	-----
SP-1	3/1/73	1340	grab	4	7.9	8	-----	-----
SP-1	3/1/73	1440	grab	3	6.9	2	-----	------
SP-1	3/1/73	1540	grab	3	6.8	5	-----	-----
SP-2	3/1/73	0700	grab	----	---	12	-----	J 15.3
SPC	3/1/73	1050	grab	4	5.5	3	-----	-----

J - Approximate value
K - Actual value known to be less than reported value.

TABLE C1 CONT.

STAR PIN COMPANY
SHELTON, CONNECTICUT
MARCH 1, 1973

ANALYTICAL RESULTS

STATION	DATE	TIME	SAMPLE TYPE	METALS ug/l					
				NICKEL		ZINC		COPPER	
				TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
SP-1	3/1/73	0740-1040	comp.	1190	1180	280	180	120	60
SP-1	3/1/73	1140-1440	comp.	--	940	40	40	20	5
SP-1	3/1/73	0740-1540	comp.	--	1170	--	90	--	30
SP-1	3/1/73	0840	grab	1100	1040	260	150	50	10
SP-1	3/1/73	0940	grab	1230	760	140	30	220	160
SP-1	3/1/73	1040	grab	2760	2310	320	180	160	40
SP-1	3/1/73	1140	grab	--	990	--	30	20	10
SP-1	3/1/73	1240	grab	--	530	20	0	20	5
SP-1	3/1/73	1340	grab	--	1790	120	100	60	5
SP-1	3/1/73	1440	grab	340	320	100	10	100	0
SP-1	3/1/73	1540	grab	1860	1840	--	40	20	20
SP-2	3/1/73	0700	grab	820	120	300	80	310	190
SPC	3/1/73	1050	grab	0	0	10	0	--	5

V.H. BLACKINGTON COMPANY
ATTLEBORO, MASSACHUSETTS
March 6, 1973

V.H. Blackington Company manufactures emblems, badges and trophies. These are die stamped or cast at the plant or purchased from an outside source. The die struck items are made from steel, tin or brass and the castings are white metal. Some of the badges and emblems are partially enameled prior to plating. Plating is done following degreasing and cleaning in a series of detergent tanks and clear water rinses. The type of plating done is dependent upon customer requirements with gold, nickel, copper, silver or rhodium.

The plating operation includes preliminary rinsing, bright dipping, treatment rinse and final clear water rinsing. The plated product is then dried, polished and assembled. Trophies are either free standing or suspended in clear plastic.

Treatment consists of Lancy integrated systems for nickel, cyanide and copper. This involves a continuously overflowing process treatment rinse that cycles through a large settling tank. Caustic soda is added to maintain the entire system at pH 11. The pH adjustment causes the metal ions to precipitate out as hydroxides. Hypochlorite is added to treat the cyanide. Settled sludge in the treatment tanks is pumped to a sludge drying lagoon at the rate of approximately 380 liters (100 gallons) per week. Dewatering occurs by evaporation and percolation to groundwater. Floor spills are batch treated in a large tank by addition of caustic soda and hypochlorite if necessary. The solids and liquids from the floor spill tank are both pumped to the lagoon.

Clear water rinses overflow and are discharged to a small stream which flows to the Ten Mile River. The rinse water passes through a

chemical mix tank prior to discharge and is monitored for pH. If the pH falls below 6, caustic soda is added to raise the pH to between 6 and 9. This tank also serves as a settling tank but had not been pumped in approximately 18 months. This creates a problem when the caustic is added as a mixer resuspends a great many solids. The discharge from the neutralization tank is about 0.19 cubic meters (50 gallons) per minute.

Sampling consisted of collecting two four-hour composite samples, one operating day composite sample and eight grab samples from the final neutralization tank (VHB-1). The samples were analyzed for total metals (Cu, Au, Rh, Sn), dissolved metals (same, cyanide* and total suspended solids. All samples were preserved according to EPA Standard Methods. Analytical data appear in Table D-1.

*Cyanide was run on composites only

TABLE D-1

V. H. BLACKINGTON COMPANY
ATTLEBORO, MASSACHUSETTS
MARCH 1973

ANALYTICAL RESULTS

STATION	DATE	TIME HRS.	SAMPLE TYPE	TEMP °C	pH S.U.	TNFLT mg/1	CYANIDE mg/1
VHB-1	03/06	0830-1130	comp.	----	----	7	2.25
VHB-1	03/06	1330-1630	comp.	----	----	2	0.006
VHB-1	03/06	0830-1630	comp.	----	----	20	0.212
VHB-1	03/06	0830	grab	12	----	26	-----
VHB-1	03/06	0930	grab	12	6.4	12	-----
VHB-1	03/06	1030	grab	12	6.1	4	2.0
VHB-1	03/06	1130	grab	12	7.0	6	-----
VHB-1	03/06	1330	grab	12	9.7	12	-----
VHB-1	03/06	1430	grab	12	9.2	4	-----
VHB-1	03/06	1530	grab	12	6.5	14	-----
VHB-1	03/06	1630	grab	12	6.4	2	-----

TABLE D-1 Cont.

V. H. BLACKINGTON COMPANY
ATTLEBORO, MASSACHUSETTS
MARCH 6, 1973

ANALYTICAL RESULTS

STATION	DATE	TIME	SAMPLE TYPE	METALS ug/l							
				NICKEL		ZINC		COPPER		RHODIUM	
				TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
VHB-1	03/06	0830-1130	comp.	285	65	260	250	6100	2900	0	0
VHB-1	03/06	1330-1630	comp.	---	110	---	150	1020	380	0	0
VHB-1	03/06	0830-1630	comp.	135	100	---	200	2640	1500	0	0
VHB-1	03/06	0830	grab	295	110	580	550	12500	8250	0	0
VHB-1	03/06	0930	grab	---	110	---	150	---	1880	0	0
VHB-1	03/06	1030	grab	145	120	---	250	1520	1340	0	0
VHB-1	03/06	1130	grab	120	55	110	0	1550	320	0	0
VHB-1	03/06	1330	grab	105	65	90	0	1160	280	0	0
VHB-1	03/06	1430	grab	145	120	45	0	860	330	0	0
VHB-1	03/06	1530	grab	120	110	280	250	1240	700	0	0
VHB-1	03/06	1630	grab	170	130	---	50	420	380	0	0

PROCESS FLOW CHART
V.H. Blackington Co.
Attleboro, Ma.

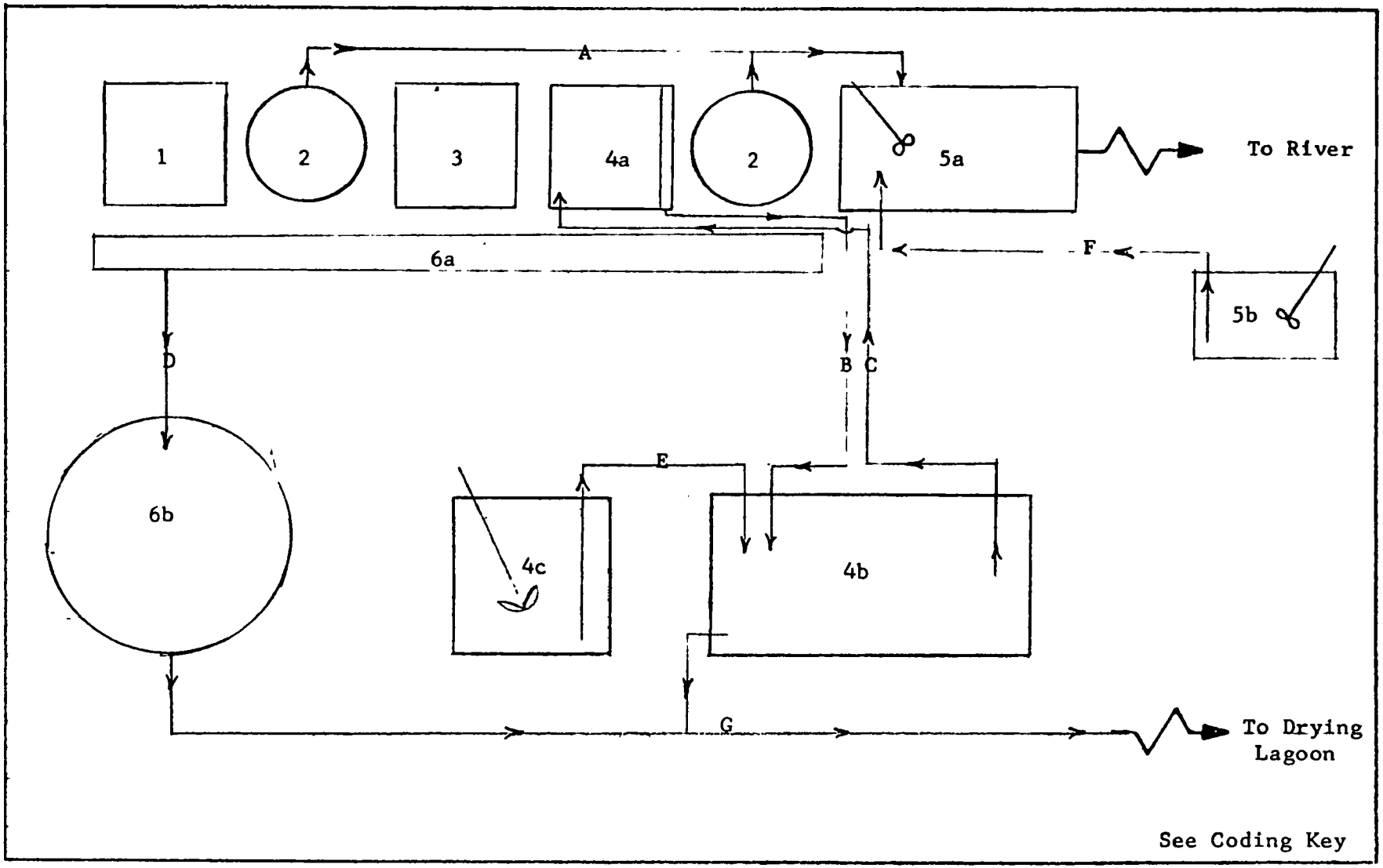


Figure 1

KEY TO FLOW CHART

V. H. BLACKINGTON COMPANY

1. Preliminary cleaning and degreasing (no discharge).

2. Clear water rinses.

3. Plating tank for one of the following: Ni, Cu, Au, Ag, Rh.

4. a. Process line integrated treatment tank, for one of the following: Ni, Cu, Cn.

   b. Integrated treatment reservoir and settling tanks.

   c. Treatment chemical stock tank. Soda ash for nickel, hydrosulfite for copper and hypochlorite for cyanide treatment.

5. a. Final neutralization tank for clear water rinses.

   b. Stock tank for caustic soda, if pH of 5a. falls below 6, this is added.

6. a. Floor spill catch for basin.

   b. Batch treatment for floor spills.

A. Clear water rinse continuous overflow line.

B. Integrated treatment tank continuous overflow line to reservoir.

C. Integrated treatment continuous return line.

D. Floor spill drain line.

E. Integrated treatment chemical feed line.

F. Neutralization tank chemical feed line.

G. Treatment sludge removal line.

INDUSTRIAL WASTE SURVEY

H. F. BARROWS COMPANY
NORTH ATTLEBORO, MASSACHUSETTS

H. F. Barrows Company of North Attleboro, Massachusetts produces various types of fine jewelry. The process operations which contribute to the contamination of the wastewater include barrel finishing, electro-plating, pickling and bright dipping operations. The heaviest contamination comes from the elctro-plating, pickling and bright dipping operations.

During the elctro-plating operation, nickel, gold and rhodium are electrolytically bonded to brace and sterling silver. From this operation, large quantities of acids, cyanide and heavy metals contaminate the wastewater flow. The pickling and bright dipping operations create various metal oxide and acid wastes.

The wastewaters from the above operations have been completely segregated. The acid wastes are piped to one of the two 5.7 cubic meters (1500 gallon) acid waste treatment tanks. Caustic soda (NaOH) is used to maintain a pH range of 8.7 to 9.3. Forced air then gently mixes the wastes in the tank for about 15 minutes to facilitate flocculation, the contents of the tank are allowed to settle for approximately 12 hours. Every two to two and one-half days a tank of treated acid waste is discharged to the Ten Mile River.

The cyanide containing wastes are piped to one of two 3.4 cubic meter (900 gallon) cyanide destruction tanks. Caustic soda is used to raise the pH higher than 9.0 and calcium hypochlorite is added to convert the cyanide to cyanate.

As the hypochlorite is added, the tank is gently mixed by forced air for a short time. If a chlorine residual between 2.0 and 3.0 mg/l persists after two hours, the pH is adjusted to between 8.7 and 9.3. The tank is again gently mixed and allowed to settle for approximately 12 hours. After the required settling time, the treated waste having a chlorine residual of 0.5-3.0 mg/l and a pH of 8.7 - 9.3's discharged to the Ten Mile River. A tank of treated cyanide waste is discharged every three to five days.

SAMPLING INFORMATION

On March 6, 1973, three sets of grab samples were collected at the influent to the acid waste treatment tank (ACOI), the effluent from the acid waste treatment tank (ACOE), the influent to the cyanide destruction tank (CNOI) and the effluent from the cyanide destruction tank (CNOE). These samples were collected as the tank was discharging. the first set at the start of discharge , the second when the tanks were half emptied, and the third just prior to the end of the drainage. All samples collected from the acid tank were analyzed for nonfilterable residue, pH and total and dissolved copper, zinc, rhodium and nickel.

The samples collected from the cyanide destruction tank were analyzed for nonfilterable residue, pH, cyanide and total and dissolved copper, zinc, rhodium and nickel.

One set of grab samples was collected from the town water supply (HFBCWI) and analyzed for total and dissolved copper, zinc, rhodium and nickel.

H. F. BARROW COMPANY
ATTLEBORO, MASSACHUSETTS
MARCH 6, 1973

ANALYTICAL RESULTS

STATION	TIME	SAMPLE TYPE	TEMP °C	pH S.U.	TNFLT mg/l	CYANIDE mg/l
CNOI	1030	grab	15	9.6	3	72.25
CNOI	1230	grab	14	9.0	2	-----
CNOI	1430	grab	15	9.6	1	69.00
CNOE	1030	grab	18	10.7	5	15.00
CNOE	1230	grab	18	10.5	1	14.2
CNOE	1430	grab	20	10.5	4	12.25
ACOI	0925	grab	25	7.2	3	-----
ACOI	1130	grab	23	2.5	5	-----
ACOI	1330	grab	25	6.0	0	-----
ACOE	0925	grab	20	10.4	2	-----
ACOE	1130	grab	20	10.2	1	-----
ACOE	1330	grab	20	10.4	1	-----
HFBCW1	1300	grab	----	-----	----	-----

H. F. BARR COMPANY
ATTLEBORO, MASSACHUSETTS
MARCH 6, 1973

ANALYTICAL RESULTS

STATION	TIME	SAMPLE TYPE	METALS ug/l							
			COPPER		ZINC		NICKEL		RHODIUM	
			TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
CNOI	1030	grab	---	2180	900	250	---	165	0	0.
CNOI	1230	grab	---	770	---	500	---	80	0	0
CNOI	1430	grab	---	890	---	850	---	80	0.	0
CNOE	1030	grab	1520	260	0.0	0.0	75	K25.0	0.	0
CNOE	1230	grab	1390	270	0.0	0.0	105	K25.0	0	0
CNOE	1430	grab	1030	280	0.0	0.0	25	K25.0	0.	0
ACOI	0925	grab	320	300	---	50.0	2540	2500	0.	0
ACOI	1130	grab	---	14,300	960	170	---	7300	0.	0
ACOI	1330	grab	380	320	---	50	3625	3075	0	0
ACOE	0925	grab	880	20	240	50	515	K25.0	0.	0
ACOE	1130	grab	160	20	0.0	0.0	175	K25.0	0.	0
ACOE	1330	grab	150	10	0.0	0.0	200	K25.0	0.	0
HFBCW1	1300	grab	160	160	0.0	0.0	K25.0	K25.0	0.	0.

K - actual value known to be less than value shown

SAMPLING AND ANALYSES OF SMALL METAL FINISHING INDUSTRIES
March 1973
CONNECTICUT AND MASSACHUSETTS

On March 1 and 6, personnel from the Environmental Protection Agency, Region I sampled a total of five small metal finishing industries in Connecticut and Massachusetts.

At the request of Permits Branch, Surveillance and Analysis Division's Technical Studies Section established a sampling program at three metal finishing industries in Connecticut and two in Massachusetts. The criteria for choosing the sampling locations were: 1) the industry must discharge less than 76 cubic meters (20,000 gallons) per day effluent, and 2) the industry must have an operating waste treatment system employing current technology. Approximately 20 industries were canvassed before finding five which met the established constraints. Four of the industries selected incorporated integrated systems developed by Lancy Laboratories, and one was a batch treatment system. Table 1 is a listing of the industries sampled, their location, waste flow, and type of treatment, and Table 2 is a listing of abbreviations. Field reports and analyses are appended.