



Electroplating 3 (Cr, Ni, Zn, Cu, PO4)

A plating plant in the upper midwest finishes in zinc, zinc phosphate, zinc nickel, zinc cobalt, zinc tin, cyanide copper, tin, chromate conversion coating, bright nickel, and zinc iron. The average rinse flow from all sources is approximately 140gpm, including 7gpm from cyanide destruct. There is an existing chemical precipitation waste treatment system.

A sample was provided of the combined acid/alkaline, cyanide destruct, and chromium streams. The sample had no cyanide, had a pH of 6.08, and measured conductivity of 2,770 microsiemens. It showed a high zinc concentration at 119mg/l, with lesser concentrations of cobalt, chromium, and nickel.

Conclusion

This waste appears to be a good application for the Kaselco electrocoagulation process. If the existing equipment is serviceable, it can be modified to include EC reaction between collection and solids removal steps. A line diagram of the system that shows dimensions or capacities of reaction vessels, clarifier, filter press, etc. will be required for design.

Bench Scale Kaselco Electrocoagulation Treatment

Test #1: Process as received:

The sample was processed in a type 05 reactor, chosen because of the measured conductivity. The sample pulled the target amperage at only 10 volts, and should have been processed in a type 07 reactor. The conductivity showed an unusually steep increase at mid-reactor (1A), then fell sharply by the reactor exit to 2,590 without a reduction in voltage. The pH climbed less than normal from 6.08 to 8 because of the low voltage and type of reactor. The metals concentrations were reduced to below normal discharge limits in a single pass (1B), but the residual iron remained high because of the low pH. Floc formation was definite and the sludge separated well.

Test #2: Raise pH:

The pH of the waste was raised to 7.05 using the equivalent of 0.02 gallons of 50% sodium hydroxide per 1,000 gallons of waste. This adjustment raised the ending pH to 8.42 after one pass (1B). This is adequate for removal of much, but not all, of the excess iron. This project may require a final pH of 9 for acceptable iron levels.

TEST #1

PROFILE: pH is 6.08. Conductivity is 2,770 μ S. Appearance is brown water. Run in #05 steel reactor.

<u>PASS</u>	<u>pH</u>	<u>COND</u>
1A	7.2	4460
1B	8	2590

<u>PASS</u>	<u>Zn</u>	<u>Cr</u>	<u>Co</u>	<u>Ni</u>	<u>Fe</u>	<u>PO₄</u>
PROFILE	118.7	5.1	15.93	4.012	<0.005	1.6
1A	8.161	0.14	1.857	0.945	53.6	1.5
1B	0.611	<0.005	0.127	0.278	43.2	1.2

COMMENTS: 1A Clear water with dark brown floating floc. 1B Clear water with dark green floating floc. The floc sinks with agitation.

Wet sludge from 1000ml sample, 130ml @15min, 80ml @ 30min and 70ml @ 60min.

Dry sludge from 100ml sample is 0.087g.

TEST #2 ADDED 0.05 ml 50% NaOH

ADJUSTED PROFILE: pH is 7.05. Conductivity is 2,920 μ S. Appearance is Light Yellow Water, Brown Floc At Bottom. Run in #05 steel reactor.

<u>PASS</u>	<u>pH</u>	<u>COND</u>	<u>AMPS</u>	<u>VOLTS</u>	<u>%</u>
1A	8.21	2,710	4	15	44
1B	8.42	2,540	4	12	40

<u>PASS</u>	<u>Zn</u>	<u>Cr</u>	<u>Co</u>	<u>Ni</u>	<u>Fe</u>	<u>PO₄</u>
PROFILE	72.21	4.216	.651	4.748	<0.005	1.5
1A	.304	<0.005	.405	.197	9.71	0.1
1B	.032	<0.005	.167	.060	7.48	0.4

COMMENTS: 1A Clear water with green floating floc. 1B Clear water with dark green floating floc, a red film is present at the top. The floc sinks with agitation.

Wet sludge from 1000ml sample, 140ml @15min, 90ml @ 30min and 80ml @ 60min.

Dry sludge from 100ml sample is 0.098g.

Glossary

- Profile: The characteristics of the waste being tested.
- Cond: Conductivity of the water in micro siemen.
- 1A: Equivalent of half a pass through a full-scale production reactor.
- 1B: Equivalent of one full pass through a full-scale production reactor.
- Type: KASELCO EC reactors come in three electrical configurations and is chosen based on the wastewater's conductivity.