

Using the chart below, find the metal(s) of concern. Determine the best pH range for maximum insolubility for the metal(s). If there is a combination of metals, then concentrate on the metal with the highest concentration and adjust the pH to this point. See the chart below to determine the best set point for the pH:

Metal	Insoluble pH
Aluminum (Al)	10
Cadmium (Cd)	11
Chrome (Cr)	9.0
Copper (Cu)	8.9
Lead (Pb)	9.5
Nickel (Ni)	10.2
Zinc (Zn)	8.8

Determining the Optimum pH for combined metals:

Typically facilities have 2, 3 or more different metals in their waste stream. To determine the optimal pH, use a concentration factor of each metal and calculate the optimal pH point. For example, a waste stream has copper at 85 ppm, Nickel at 300 ppm, and total chrome at 125 ppm. The calculations for the optimal pH is:

$$\text{pH} = \frac{(\text{Cu @ 85}) \times (\text{pH of 8.9}) + (\text{Ni @ 300}) \times (\text{pH of 10.2}) + (\text{Cr @ 125}) \times (\text{pH of 9})}{(\text{Cu @ 85}) + (\text{Ni @ 300}) + (\text{Cr @ 125})}$$

$$\text{pH} = 9.67$$

Do not reduce chrome prior to using IE-061

The usage of IE-061 does not require the reduction of trivalent chrome to hexavalent chrome. If chrome is present, simply adjust the pH as shown above and follow the treatment steps outlined below.

Jar Testing Procedure without an ORP Meter

- 1) Make a 10% solution of the IE-061 with distilled water (10 ml in 100 ml). 1 ml of the 10% solution of IE-061 in 1,000-ml. sample is 100 ppm.
- 2) Pour 1,000 ml of wastewater into a 1,000-ml beaker on a stirring plate with a stirring bar. Adjust the pH to the insoluble pH point using an alkaline solution (caustic, lime, magnesium hydroxide, etc.). Keep well stirred.
- 3) Add the IE-061 at the same dosage as the metal concentration. I.e. for 100 ppm, add 1.0 ml of IE-061 solution, for 150 ppm, add 1.5 mls of IE-061 solution. Stir for 60 seconds.
- 4) Add Floccin-A starting with ~ ½ teaspoon (about 1 gram). Check the flock for formation and observe the water clarity, add more until the desired results are achieved. The more mixing the Floccin product gets in the beaker, the better it works. Vary the mixing speed by starting at high speed to hydrolyze the product and then switch to lower speed and let the flock build.

Jar Testing Procedure with an ORP Meter

- 1) Make a 10% solution of the IE-061 with distilled water (10 ml in 100 ml). 1 ml of the 10% solution of IE-061 in 1,000-ml. sample is 100 ppm.

- 2) Pour 1,000 ml of wastewater into a 1,000-ml beaker on a stirring plate with a stirring bar, and adjust the pH to the insoluble pH point using an alkaline solution (caustic, lime, magnesium hydroxide, etc.). Keep well stirred.
- 3) Measure the ORP in mV (millivolts). It should read in the + mV range.
- 4) Add the IE-061 (20 ppm or 0.2 ml.) and watch the mV reading drop. Record the IE-061 dosage and mV reading to develop a graph. The more IE-061 added, the lower the mV reading until it slows and then stops dropping. The graph will show a leveling off, usually at a - mV reading. At this point, the metals have been precipitated (are insoluble).
- 5) Add Floccin-A starting with ~ ½ teaspoon (about 1 gram). Check the flock for formation and observe the water clarity, add more until the desired results are achieved. The more mixing the Floccin product gets in the beaker, the better it works. Vary the mixing speed by starting at high speed to hydrolyze the product and then switch to lower speed and let the flock build.
- 6) Test for metal concentrations of the supernatant and note on the graph. Redo steps 4 thru 6 at several IE-061 dosages and ORP mV readings to develop the ORP vs. metal concentration curve. The leveling off point is the set point of the ORP control system for full-scale operation.

Jar testing Table

IE-061 Dosage (ppm)	ORP Reading (mV)	Floccin Dosage (grams)	Metal-1 in Supernatant (ppm)	Metal-2 in Supernatant (ppm)	Metal-3 in Supernatant (ppm)

Graph of ORP Versus Metal Concentration and IE-061 Concentration

