

E-Brite™ Ultra Alk™

Alkaline Non-Cyanide Zinc Plating Process

E-Brite Ultra Alk is a thoroughly tested, stable and production proven zinc plating brightener process. It is suitable for either rack or barrel plating. **E-Brite Ultra Alk** provides better zinc metal distribution than traditional alkaline zinc or chloride zinc plating systems. Operating parameters are wide and therefore it is an easy process to maintain.

E-Brite Ultra-Alk deposits are ultra bright and ductile over a wide current density range. It plates mirror bright to 120 ASF. The deposits readily accept all chromate conversion coatings. The process was developed to replace cyanide zinc plating without sacrificing the quality of the zinc deposit. Waste treatment is simplified and requires only a simple pH adjustment to precipitate zinc metal as zinc hydroxide.

Advantages

- Ultra bright zinc deposit. Approaching that of chloride zinc.
- Excellent ductility and adhesion. Maintains ductility even with thicknesses in excess of one mil.
- A low stress deposit.
- Superior zinc deposit plate distribution.
- Excellent chromate conversion coating receptivity.
- Zinc deposit appearance is comparable to cyanide or chloride zinc.
- Operates within wide range of bath chemistry.
- Temperature tolerance up to 120°F, which reduces cooling costs.
- Excellent brightener stability and brightener life.
- Suitable for either rack or barrel plating.
- A reliable, easy to maintain process.
- It contains no chelating agents.

Material Information

1. **E-Brite Ultra Alk “CR”** is a liquid carrier product that provides refining and partial brightness to zinc deposit. Used only when making up the plating bath.
2. **E-Brite Ultra Alk “B”** is a single additive maintenance liquid product that provides brightness and luster to zinc deposit. It is added with a pace feeder at 50-100 ml per 1000 amp hour.
3. **E-Brite Ultra Alk “P”** is a liquid purifier product that provides refining enhancement in high and mid current densities and it also treats heavy metals impurities.
4. **E-Brite Ultra Alk “LCD”** is a liquid product that provides low current density (LCD) brightness and luster to zinc deposit in LCD areas.
5. **E-Brite Ultra Alk “GLU”** is a liquid carrier type product that achieves overall brightness to the zinc deposit.
6. Preferably deionized or distilled water should be used when preparing a new solution. Consult with your **EPI** representative.

7. Sodium Hydroxide (caustic) must be Membrane or approved powder.

Equipment: Plating Tank

A low carbon steel tank may be used. To prevent stray current interference, a steel tank lined with Koroseal or an approved lining is preferred over an unlined steel tank.

- Steel Anodes: 0.125 – 0.375 inch thick low carbon steel plate or low carbon steel grating placed wall to wall in plating tank. All steel anodes are used when a zinc generating tank is used. See page 7 and 8 for zinc generator design.
- Zinc Anodes: Used only when not using a zinc generating tank (SHG 99.99% pure). Typically a combination of steel and zinc anodes are used.
- Anode Baskets: Mild steel, if using zinc anodes in the plating tank.
- Anode Bars: Submerged regular low carbon steel anode bars are used. If copper anode bars are used, they should be well above the plating solution and covered with plastic over entire bar except contact areas or plated with nickel.
- Agitation: Normally cathode movement along with 2-3 turnovers per hour of solution movement is recommended for rack plating operations.
- Filtration: Use 5-15 micron poly-pro filter cartridges or plates packed with a filter aid or use a sand filter. Filtration speed should be 1 to 2 tank turnovers per hour.
- Rectifier: Barrel: Up to 18 volts – remote or tap switch.
Rack: Up to 12 volts – remote control is suggested.
- Bussing: Must be adequate to carry high current.
- Temp. Control: It is suggested that the tank be equipped with heating and cooling coils to keep plating solution temperature in operating range of 70-120°F.
- Ventilation: Required

Equipment: Zinc Generator – Tank

A zinc generator is commonly used to supply zinc to the plating solution. Zinc metal is plated onto the parts from the plating solution and this action causes a reduction in zinc metal concentration in the plating solution. The zinc generator will provide zinc metal to the plating solution to maintain the zinc metal concentration. The zinc generator tank is off line and does not require any external power to generate the zinc. Zinc anodes in contact with steel creates a galvanic reaction and dissolves the zinc into solution. The zinc generator tank is made of low carbon steel. The Plating tank is connected to the generator with PVC or plastic pipe. It is highly recommended that a rubber mat be used under the zinc generator tank as insulation to prevent stray current. The zinc generator tank is also equipped with valves, a filtration unit and a pump for optimum efficiency and ease of operation.

Sketches of generator tanks are given on page 7 and 8 of this technical data sheet.

The zinc metal level in the plating solution is easily maintained with adjustment of the zinc anode area in the zinc generator tank. The generator tank volume may be 10-20% or in some rare cases up to 50% of the plating solution.

The zinc generator tank size depends on many factors, such as number of hours of plating operation, low or high drag-out, operating bath temperature and current density, etc.

Zinc Anodes: Use special high grade (SHG 99.99% pure) zinc balls or slab zinc anodes in the zinc generator tank.

Agitation: Air or solution pumps (submersible or exterior) must be used to move the zincate solution throughout the tank continuously. Otherwise a hard crust will form on the anodes which will have to be removed.

Anode Baskets: Low carbon steel baskets are required in the generator tank. Do not use titanium anode baskets.

Note: Consult your **EPI** representative for details on equipment for the plating and generator tanks.

Plating Cycle

1. Soak clean with **E-Kleen SR product line or E-Kleen 157**. Consult with **EPI**.
2. Rinse
3. Anodic electroclean (parts are positive) with **E-Kleen SR 1020** or **129/129-L**. Consult with **EPI**.
4. Rinse
5. Optional permanganate descale for heat treat or weld scales with **E-Pik 272** solution.
6. Rinse
7. Acid Activation. 30% to 50% HCl (Muriatic Acid) with **E-Hib 979**.
8. A still conditioning rinse with 2-4 oz/gal of Sodium Hydroxide and 1-2% by volume of **E-Brite Ultra Alk "GLU"**. This will neutralize any acid film and reduce drag-in of iron into the plating solution.
9. Plate in **E-Brite Ultra Alk** solution
10. Rinse
11. Rinse
12. 0.5% Nitric Acid bright dip
13. Chromate conversion finish with **E-Chrome/E-PASSivate** hexavalent or trivalent chromates or with **E-Tec** non chromate sealant.
14. Rinse
15. Rinse
16. Dry

Operating Parameters and Conditions

| | <u>Optimum</u> | <u>Range</u> |
|--------------------------------------|-----------------------|--------------------------------|
| Zinc Metal | 15 g/l (2.0 opg) | 7.5-22.5 g/l (1.0 to 3.0 opg) |
| Sodium Hydroxide (total) | 135 g/l (18.0 opg) | 120-156 g/l (16 to 21 opg) |
| Sodium hydroxide to zinc metal ratio | 10:1 Rack, 7:1 Barrel | 9.5 -10.5 Rack; 6.5-7.5 Barrel |
| Sodium Carbonate | < 75 g/l (10 opg) | 0-75 g/l (10 opg) |
| E-Brite Ultra Alk "CR" | 2.0% | 1.00 to 2.50% by volume |
| E-Brite Ultra Alk "B" | 0.05% | 0.05 to 0.08% by volume |
| E-Brite Ultra Alk "P" | 0.50% | 0.3 to 0.8% by volume |

| | | |
|--------------------------------|----------------|--------------------|
| E-Brite Ultra Alk “GLU” | 1.2% by volume | 1.0-1.5% by volume |
| Temperature | 80 – 90° F | 75 - 120°F |
| Current Density Range | 20 ASF | 2 – 120 ASF |
| Voltage | | 3 – 18 volts |
| Anode to Cathode Ratio | 1:1 - 2:1 | |

Optional

E-Brite Ultra Alk “WC” water conditioner if needed: 1.0 to 2.0 oz/gallon. It is a powdered product that reduces water hardness that can cause matte, dull or hazy appearance. Use depends upon water hardness.

E-Brite Ultra Alk “FS” fume suppressant if needed: 1 pint/1000 gallons. Used with tanks with poor ventilation.

Bath Make Up

Caution: Wear protective rubber apron, rubber gloves, and rubber boots, OSHA approved face and eye protection prior to beginning the bath make up.

1. Clean and leach out the plating tank with ~ 4.0 oz/gal Sodium Hydroxide for 12 hours and then rinse the tank with clean water. Also clean bus bars.
2. Add deionized water to clean tank to ~ 60% of the final volume.
3. Add recommended level of **E-Brite Ultra-Alk “Z”** zincate solution.
4. Add deionized water to ~ 90% of the final volume
5. Add the recommended amount of **E-Brite Ultra-Alk “CR”, “B” and “P”**
6. Analyze Sodium Hydroxide and zinc level and adjust if needed.
7. Run Hull Cell plating test to evaluate zinc deposit appearance.

Note: New bath make up can also be accomplished by using zinc balls in mild steel baskets and sodium hydroxide. Please contact **EPI** to obtain detailed information for this second method. We do not recommend this method as high levels of contaminants may exist and therefore solution may require electrolysis for some time, which can cause a delay in production.

Solution Maintenance

| | |
|-------------------------------|--|
| E-Brite Ultra Alk “CR” | Used for bath make up. |
| E-Brite Ultra Alk “B” | Add 50-100 ml per 1000 amp hour. By Hull Cell appearance and distribution. One (1) amp for 30 minutes |
| E-Brite Ultra-Alk “P” | By Hull Cell appearance. One (1) amp for 30 minutes. |
| Sodium Hydroxide | By Chemical analysis. Use only membrane or approved powder caustic. Maintain a minimum of 10:1 NaOH: zinc ratio for Rack, 7:1 for Barrel |
| Zinc Metal | By chemical analysis. Concentration adjusted by zinc anode area in the zinc generator tank or zinc anode area in the plating solution. Frequent analysis must be performed at regular intervals on the plating and generating solutions. |
| Sodium Carbonate | By chemical analysis. The carbonate level will slowly increase. |

The maximum recommended amount is 75 -90 grams/liter. Dilute the bath by 50% and replenish with the appropriate amount of zincate solution from the generating tank, sodium hydroxide, **Alk-GLU, CR, B & P**. High carbonates results in lower bath efficiency and slower plating speeds.

Analytical Controls

Zinc Analysis

1. Pipette 5 ml bath sample into a 500 ml Erlenmeyer Flask.
2. Add 5 ml of 30% Hydrochloric Acid
3. Add ~ 150 ml of distilled or deionized water
4. Add 30 ml Acetate buffer (double strength)
5. Add 0.5 ml Xylenol Orange indicator to give a fuchsia color (bright reddish pink)
6. Titrate with 0.1M Disodium EDTA solution until the color changes to yellow. This change is very rapid, proceed very slowly.
7. Calculation: ml of EDTA titration x 0.176 = zinc metal in oz/gal
oz/gal zinc metal x 7.5 = zinc metal in g/l

Sodium Hydroxide (Caustic) Analysis

1. Pipette 5 ml of the bath into an Erlenmeyer flask.
2. Add water to 100 ml.
3. Add with a measuring cylinder 20 ml of 10% barium chloride solution and swirl.
4. Add 2-3 drops phenolphthalein indicator.
5. Titrate with 1 N hydrochloric acid until the red color disappears.

Calculation: oz/gal NaOH = ml of titration X 1.066.

Sodium Carbonate Analysis

1. Pipette 10 ml of bath sample into a 250 ml Erlenmeyer Flask.
2. Add a.) 100 ml of hot deionized water (120 - 140°F)
b.) 35 ml of 10% Barium Nitrate solution and allow to settle
3. Filter out the precipitate and wash the filter 2 – 3 times with hot deionized water.
4. Transfer carefully filter paper with precipitates into a 250 ml glass beaker and add 100 ml room temperature deionized water. Add few drops of Methyl Orange Indicator.
5. Titrate with 1.0N Hydrochloric Acid to end point from Orange to Pink.
6. Calculation: ml of HCl x 0.707 = oz/gal Sodium Carbonate

Caustic to Zinc Metal Ratio

1. Calculation: oz/gal caustic ÷ oz/gal zinc metal

Waste Treatment

1. Reduce pH with dilute acid to 9.0. Mix vigorously.
2. Filter out or clarify and decant the precipitated zinc hydroxide.
3. Adjust pH of the filtrate according to the local environmental pollution control regulations before discharge.

Note: The use of **EPI Coagulant** and **EPI Polymer** will significantly reduce sludge volume.

Caution:

Alkaline non-cyanide plating solutions containing **E-Brite Ultra ALK** addition agents (“**CR**”, “**B**”, “**P**”, “**WC**” and “**FS**”, “**Z**”) are hazardous and may be fatal if swallowed. They can cause severe irritation to skin and eyes on contact. Persons who handle or work with this solution must wear OSHA approved chemical resistant safety goggles or full-face shield, rubber gloves, rubber apron and rubber boots. If solution is swallowed, seek medical attention immediately. In case of contact with eyes, immediately flush with cold water for approximately 15 minutes and seek medical attention. In case of contact with skin wash it with cold running water for 5 – 15 minutes and seek medical attention if necessary. Read and understand the MSDS for each of the **EPI** products before working with them.

Packaging Of Additives

5 and 55 gallon non returnable containers

275 gallon tote

IMPORTANT NOTICE! For Industrial Use Only

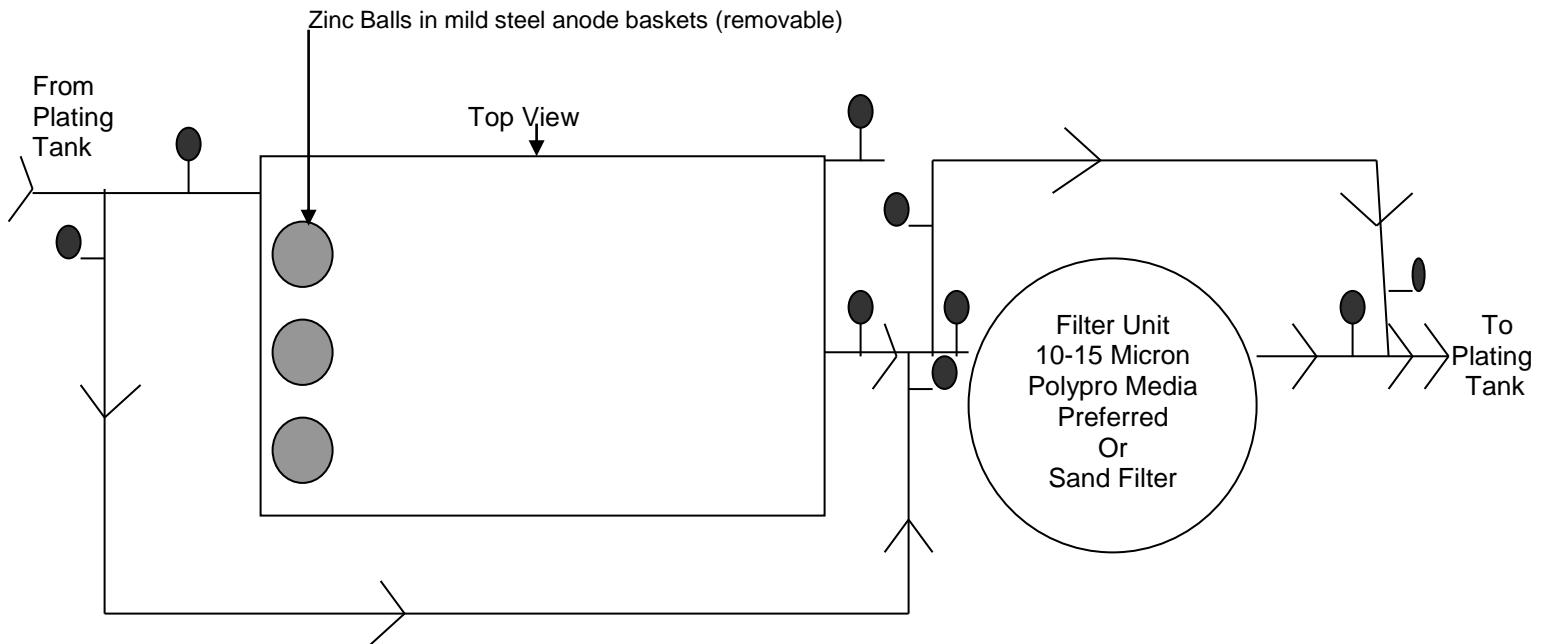
The following is made in lieu of all warranties, expressed or implied, including the implied warranties of merchantability and fitness for purpose: seller’s and manufacturer’s only obligation shall be to replace such quantity of the product as proved to be defective. Before using, user shall determine the suitability of the product for its intended use, and user assumes all risk and liability whatsoever in connection therewith. **Neither seller nor manufacturer shall be liable either in tort or in contract for any loss or damage, direct, incidental or consequential, arising out of the use or the inability to use the product.**

E-Brite Ultra Alk

Maintaining The Zinc Concentration

The zinc in the plating solution can be replenished from zinc anodes in the Plating solution or by dissolving zinc anodes in a separate “zinc generator tank”. If zinc anodes are used in the plating solution they will have to be removed Periodically to keep the zinc concentration within range or the solution must be pumped out when the solution is not being plated. Therefore, the preferred method is using a zinc generator tank.

Zinc Generating Tank – Mechanical Method



Anode baskets and anodes must be cleaned before use.

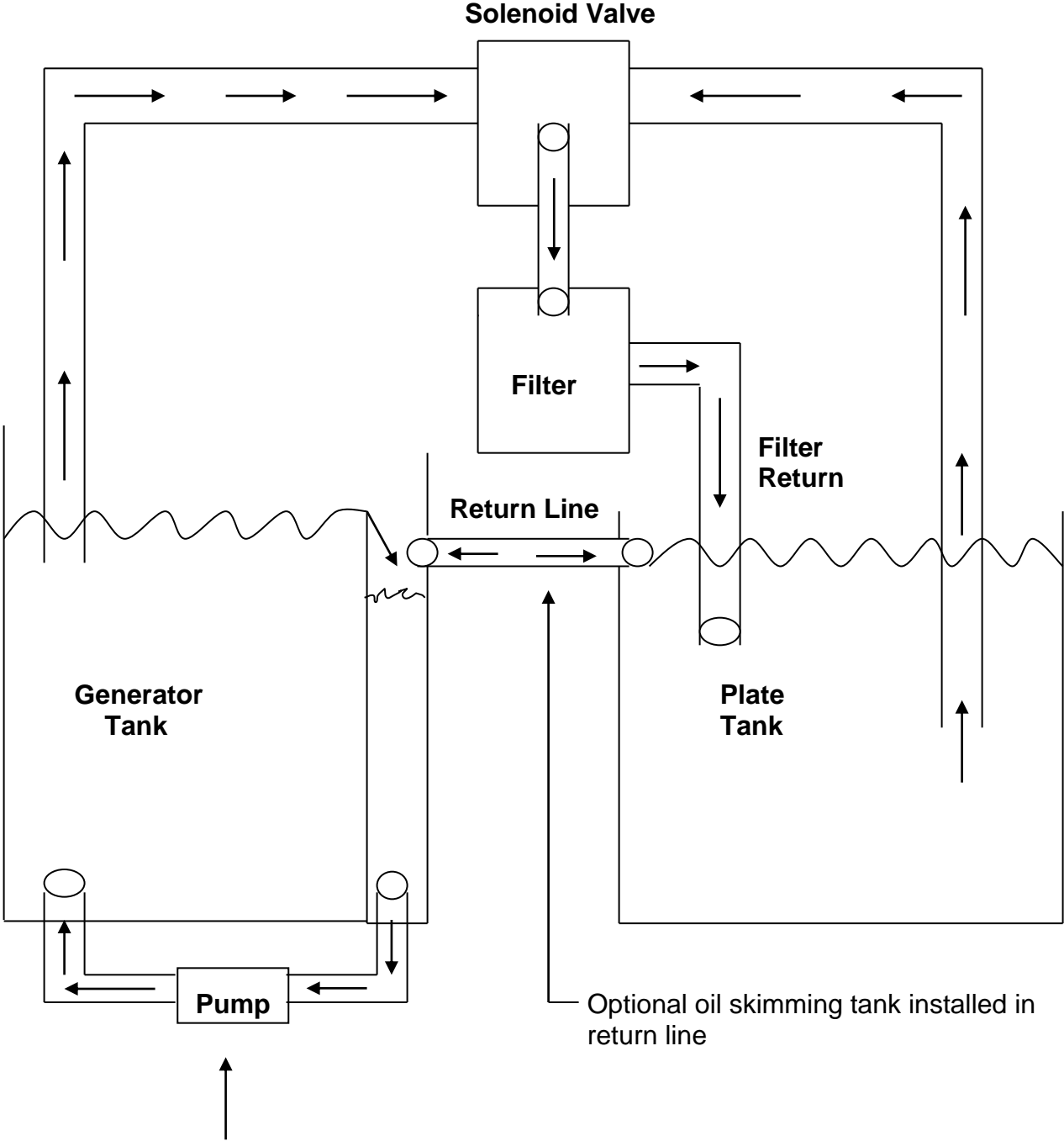
The dissolution rate of zinc in an alkaline zinc solution when in contact with steel at 75°F is approximately 1.2 oz per sq.ft. per hour. This figure can be used to determine the estimated surface area of the zinc anodes in the generator tank. Also, sq.ft. of zinc anode area = (total amps) x 0.02.

The temperature and caustic concentration will have a great affect on the dissolution rate. Typically the volume of a zinc generator tank is 10 to 20% of the volume of the plating tank. Consult your EPI representative for specific recommendations.

See page 8 for an automatic method.

Zinc Generating Tank: Automatic Method

Filter draws from either the plater or generator based on an ampere hour meter off the plating rectifier. When the filter pumps from the generator tank, plating solution flows back from the plate tank through the return pipe.



This pump continually re-circulates the generator solution over the weir.