

DATA SHEET

REGAL ZINC CHLORIDE PLATING

Regal Zinc is a leveling bright zinc chloride plating process that produces an unusually bright, finish on a barrel or rack plated parts. It will easily plate carbonitrided steel and cast iron directly. The deposit is ductile, and has the ability to obscure defects in the base metal with a minimum plate thickness. Regal Zinc is a simplified two-component system, which can be maintained by using uncomplicated operating and replenishment procedures.

HOW TO USE:

Before making up a Regal Zinc solution, the tank must be cleaned and rinsed thoroughly. In addition, the tank should be leached for 24 hours minimum with 3% by volume hydrochloric acid to which has been added 0.1% by volume of Regal Zinc Wetter. At the end of the leaching period, the tank should be drained and rinsed thoroughly with water.

MAKEUP:	<u>1 Liter</u>	<u>1 Gallon</u>	<u>100 Gallons</u>
Zinc Chloride 50% liq.	59 ml.	222.0 ml.	6 gal
Potassium Chloride	264 gr.	35.0 oz.	220 lbs.
Boric Acid	22 gr.	3.0 oz.	18.75 lbs.
Regal Zinc Wetter	30 ml.	150.0 ml.	4 gal
Regal Zinc Brightener	1 ml.	5.0 ml	1 pint
Water to make	1 liter	1 gallon	100 gallons

SOLUTION COMPOSITION:

Zinc Metal	22.5 g/l (3.0 oz per gal)
Chloride	135 g/l (18 oz per gal)
Boric Acid	22.5 g/l (3.0 oz per gal)

OPERATING RANGE:

pH	4.5 - 5.5
Zinc Chloride	2.5 - 3.5 oz/gal
Boric Acid	16 - 19 oz/gal
Regal Wetter	2 - 3 oz/gal
Regal Brightener	3 - 4 %
	0.10 – 0.15%, or based on amperage and dragout

MAKE UP PROCEDURE:

1. Add water to one-half of tank volume. Use warm water 140°F if available.
2. Add the boric acid and dissolve.
3. Add the zinc chloride concentrate.
4. Add the potassium chloride and dissolve.
5. Check the pH with a meter (do not use paper).
6. Adjust the pH to 4.5 to 5.5 with potassium hydroxide (caustic potash).
 - a. Bring solution near operating level and recheck pH.
7. Add Regal Wetter, then Regal Brightener to tank.
8. Bring solution to operating volume and stir to achieve uniform composition.

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OPERATING CONDITIONS:

pH (by meter) 4.5 to 5.5 - check pH of the bath daily.
Standardize meter daily

TEMPERATURE:

21 to 41 degree C. (70-105 degree F.) Optimum for best operation and low brightener consumption is 24 to 29 degree C. (75-85 degree F.) **IMPORTANT:** DO NOT ATTEMPT TO OPERATE THE REGAL ZINC BATH ABOVE 41°C. (105 degree F.) AS AN ABSOLUTE MAXIMUM. If the Regal Zinc bath becomes chilled, crystallization of the salts may occur. These will redissolve on heating the bath to 21 degree C. (70 degree F.) and agitating.

WARNING: Do not allow bath to chill for long periods below 21 °C. (70 °F.) Organic additives may also salt out.

VOLTAGE:

Rack plating: 1 to 3 volts.

Barrel plating: 4 to 9 volts.

CATHODE CURRENT DENSITY:

0.1 to 5A/dm sq. (1 to 50 A/ft. sq.)

FILTRATION:

Filtration is recommended to remove iron sludge contamination, which will cycle out from the complexing system built into the plating bath for that purpose. Filter rate sufficient to process solution once or twice per hour recommended for optimum performance.

RECOMMENDED PROCESS CYCLE:

1. Soak Clean
2. Thorough water rinse
3. Anodic clean (12 volt rectifier)
4. Cold water rinse
5. Hydrochloric acid 50% plus Inhibitor K-1 5%
6. Thorough water rinse
7. Regal Zinc Plate
8. Thorough water rinse
9. Sour rinse--nitric acid--1/2 oz/gal.
10. Chromate dip
11. Cold water rinse
12. Warm water rinse
13. Dry

Rack plating, 6V rectifier

Barrel plating, 6V rectifier

Rinse after Regal zinc plating must be thorough, and the last rinse tank should be clear at all times. (Agitate rinse tanks and hold water in final rinse tank long enough for water to clear). In a barrel plating installation, it is sound practice to allow the barrels to drain before they enter the Regal Zinc bath, and also allow them to drain the zinc solution back into the plating tank or a drop out tank. This practice minimizes flooding of the plating tank as well as excessive drag-out of plating solution resulting in high cost operation.

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MAINTENANCE:

Analyze for zinc and chloride and make required additions using potassium chloride or zinc chloride concentrate. Check pH electrometrically and adjust with hydrochloric acid or potassium hydroxide (caustic potash).

Add Regal Brightener at the rate of 60 to 120 ml (2 to 4 fl. oz.) per 1,000 ampere-hours of operation. Add 130 ml Regal Wetter and 100 g. boric acid for every kilogram of potassium chloride added (1.6 gal Regal Wetter and 10 lbs. boric acid for every 100 pounds) to replace drag-out losses.

As brightener consumption and bath composition are affected by drag-out, drag-in and temperature, it is recommended that routine analysis and Hull Cell tests be made to better determine the need for additions of Regal Brightener and Regal Wetter. Always perform a cell test before making large additions to the bath. Excessive additions of Regal Brightener may cause a brittle deposit.

TREATMENT OF IRON CONTAMINATION. Care should be taken to avoid iron contamination. Fallen parts should be removed from the tank immediately. If the plating solution turns a brown, murky color, it is an indication that the bath is contaminated with iron.

To precipitate and remove the iron by filtration, add hydrogen peroxide (30%) at the rate of 10 ml per 100 liters (1.2 fl. oz. per 100 gallons) of plating solution. Dilute the hydrogen peroxide with 4 parts water and spread as evenly as possible over the surface of the solution to achieve the maximum effect. Always add the hydrogen peroxide at the end of the working day. Daily additions may be necessary where the plating solution is continually contaminated with iron.

PRECAUTIONS:

Regal Zinc solution ingredients can be quite irritating to sensitive skin. If the materials are spilled or splashed on the skin, remove by washing the area with soap and water immediately.

EQUIPMENT REQUIRED:

Tank--Steel, lined with PVC, rubber, or polyethylene (if fiberglass is used, leaching must be most thorough). Furthermore, the tank or lining manufacturer should warrant that no mold release was used in tank construction, or impregnation from the fiberglass.

Anodes--Anodes should be warranted as to analysis of the anode (not the zinc pig from which the anode was cast). Anodes should be pure zinc special high grade A.S.T.M. Specification (99.99% zinc), drilled and tapped for anode hooks (titanium hooks preferred). No inert or bipolar anodes can be used. Baskets made of commercially pure titanium may be used with appropriate pure zinc anode metal if applied voltage does not exceed 8 volts. Baskets must be kept full, with all the zinc below the level of the solution. Baskets and anodes should be kept clean to maintain good contact between the basket and the zinc anode metal. Stray alternation currents, current interruptions, excessive ripple in the power source must be avoided. Baskets may also be constructed of expanded metal and coated with Plastisol, using a titanium or zinc strip as a lead-in conductor to the anode metal. Anode area must be sufficient to keep anode current density below 25 ASF.

Filter--Filter capacity sufficient to filter solution once or twice per hour recommended. All filter parts in contact with solution must be non-metallic. Stainless steel or iron not acceptable. Do not use paper or cellulose in any form as a filtering media. Dynel or diatomaceous earth is suggested.*

* (For filter recommendation, ask your Deveco Representative)

Agitation--Cathode rod agitators can also be: 1 to 2 meters (3 to 6 feet) per minute. Solution pump circulation is acceptable. In a large tank in an automatic plating machine, intake and discharge of the filter or circulating system should be at opposite ends of the tank countercurrent to work flow. It is helpful to introduce a stirring mixture with the blade set at an angle so that the solution is made to roll and move in the tank.

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Power--Rack plating: 6 volt power source; barrel plating: 9 volt power source. Rectifier must have low ripple (5% maximum). Be sure that the current for the plating tank is being measured with a reliable meter.

Bus bar protection--Cover bus bars with tape, clear binyl or Plastisol except at points of anode hook contact, to minimize corrosion and possible contamination of solution.

Heating--Heating coils: Teflon, Teflon-coated copper tubing titanium coil isolated from direct current circuit; graphite heat exchanger; quartz immersion heater. In areas where room temperature will not keep the bath above 21 degrees C. (70 degrees F.) a means of heating the solution is required because the bath is so efficient that it doesn't heat by reason of passage of electric current.

Cooling--To obtain maximum performance, cooling may be required in barrel or rack operation in extreme ambient temperature. Cooling coils: Teflon, Teflon-coated copper, PVC tubing, titanium coil isolated from direct current circuit; graphite or quartz heat exchanger, tap water of refrigeration unit as required.

ANALYSIS AND CONTROL:

Zinc Metal:

1. Pipette 5 ml. of plating solution into a 250 ml. Erlenmeyer flask.
2. Add 100 ml. of distilled water.
3. Add concentrated ammonium hydroxide until the solution turns from cloudy to clear.
4. Add a small amount of Ericchrome Black T indicator until a deep violet-red color develops.
5. Titrate with 0.0575 M EDTA solution to a blue endpoint (disappearance of any red color).

Calculation: $\text{oz/gal. Zinc} = \text{ml. } 0.0575 \text{ M EDTA} \times 0.1$

To increase Zinc content 0.1 oz/gal. add 30 fl. oz. Zinc chloride concentrate per 100 gallons of plating solution.

BORIC ACID:

1. Pipette 8.2 ml of plating solution into Erlenmeyer flask.
2. Add 100 mls of 10% Mannitol.
3. Add 1 ml Bromocresol Purple.
4. Titrate with 1.0 N NaOH solution until a bluish purple endpoint from light yellow appearance.

Calculation: $\text{oz/gal Boric Acid} = \text{ml of } 1.0\text{N NaOH used for titration.}$

To raise Boric Acid 1.0 oz/gal add 6.25 lbs. of Boric acid per 100 gals. of plating solution.

1. Pipette a 1 ml sample of the plating bath into an Erlenmeyer flask.
2. Add about 5 ml of 10% sodium chromate to give the solution a yellow color.
3. Add 75-100 ml of distilled water.
4. Titrate with 0.1N silver nitrate until a permanent reddish-brown color forms.

Calculation: $\text{oz/gal of Cl} = 0.473 \times \text{mls of silver nitrate.}$

To increase composite Cl 1 oz/gal add 12.5 lbs. potassium chloride (KCl) per 100 gallons of plating bath.

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MEASUREMENT OF pH:

Measure pH with pH meter. Adjust with hydrochloric acid or potassium hydroxide (caustic potash)

RANGE: 4.5 to 5.5

PACKAGING:

Regal Zinc Brightener and Regal Zinc Wetter are packaged in 55 gallons non-returnable polyethylene containers.

SHIPPING DATA:

Classifications:

Regal Zinc Wetter -	Soap NOI, liquid
Regal Zinc Brightener -	Compounds or agents, proprietary electroplating additive; chemicals NOI, liquid.

Read Material Safety Data Sheet before using this product.

DISCLAIMER:

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