PERFORMA 260

Electrolytic Alkaline (0,4 ÷ 0,7 %) Zinc-Iron Process

						I
Pag	Data	Redazione	Revisione	Approvazione	Indice	Ultima Modifica
					A	
1 di 11	01/03	G. SCHIAVON	F. DAL POZ	C. DE VAL	A	

1 – PROCESS PRESENTATION

PERFORMA 260 is an electrolytic process that allows to plate a zinc-iron co-deposit starting from an alkaline cyanide-free electrolyte.
The deposit has a very good resistance to corrosion, much higher than the conventional electrolytic zinc coatings.

The process main advantages:

∗ The zinc-iron deposit with iron content between 0,3 and 0,7% guarantees an excellent resistance to corrosion,

∗ Under neutral salt spray testing (ASTM B 117-64) a 10 μm thickness, black passivated, reaches 1.000 hours before red rust.

∗ Deposits are perfectly passivable yellow – iridescent and black with passivations based on Cr^{VI}.

∗ Deposits can be passivated also with systems Cr^{VI}-free , based on Cr^{III}, as Lanthane 315 (clear yellow colour) and Finidip 726 (black) with the transparent or black sealers.

∗ Suitable for rack and barrel application.

∗ High cathodic efficiency.

2 – ELECTROLYTE MAKE-UP

The preparation can be made in two alternate methods:

IMPORTANT: use only demineralized water for the make-up.

2.1 Using Zinc Oxide S. Gold (lead free);

2.2 Using a zincate solution prepared in the auxiliary bath tank;

2.1 Use Zinc Oxide S. Gold (lead free)

The maximum attention and the use of adequate safety protections are recommended during handling.

Add 50% of the water into the bath tank.

Dissolve cautiously the sodium hydroxide quantity, pay attention to the heat development.
When the solution is still very hot, add the zinc oxide dispersed in little water.
Agitate until the complete dissolution.

Verify that the zinc and sodium hydroxide ratios are within the indicated parameters, correct if necessary.

Leave the solution to cool down at least 30 °C.

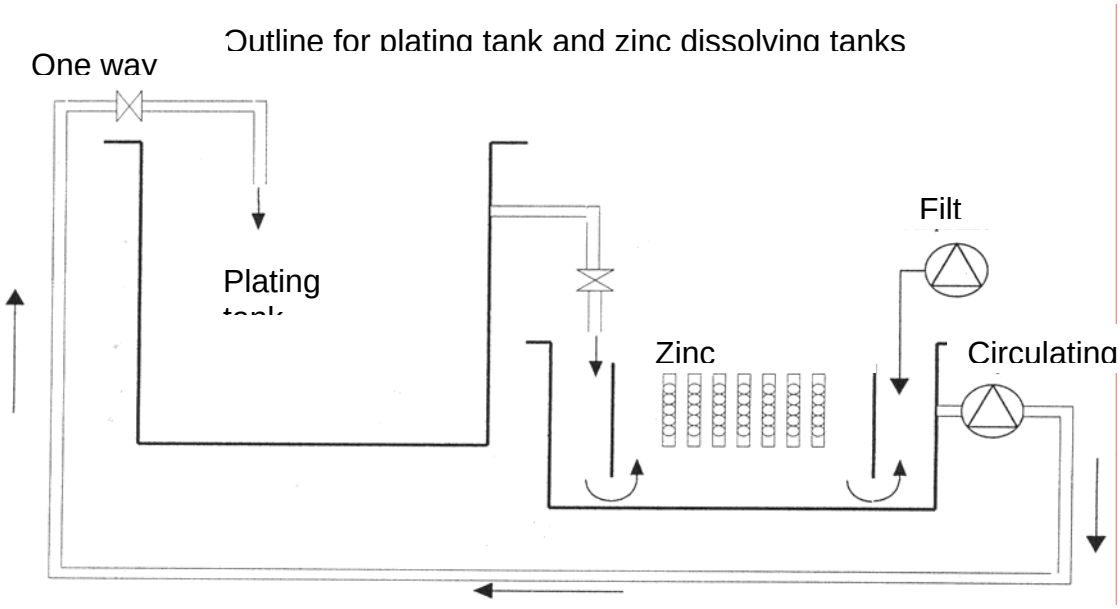
* Add the products Performa 260 Stabilisator, Base Fe in sequence.
  Then add the other specific additives for barrel or rack;
* Top up to the final volume with demineralized water;
* Install the anodes and verify the principal operating conditions parameters.

Per 1.000 liters of volume	Rack	Barrel
Zinc oxide	15 Kg.	15 Kg.
Sodium hydroxide	120 Kg.	120 Kg.
PERFORMA 260 STABILISATOR	75 l.	115 l.
PERFORMA 260 BASE FE (1)	2,5 l.	2,5 l.
PERFORMA 260 ADDITIVE	-	5,0 l.
PERFORMA 260 BASE RACK	10 l.	-
PERFORMA 260 BRIGHTENER RACK	0,5 l.	-

(1) Read point 5.1.2 Iron

2.2 Zincate solution preparation

• The zincate for the bath make-up and maintenance is produced in the AUXILIARY BATH TANK.
The auxiliary bath tank is 10-15% the dimensions of the working tank with which it is connected through a pump. As from the scheme:



ATTENTION: it is necessary to use DI water or with Water Hardness lower than 250 mg/l of calcium carbonate for the bath preparation.
It is advisable, especially when a high decorative effect is required, to use demineralized water at least for the zincate and the initial bath preparation.

- Prepare the auxiliary bath tank with a sodium hydroxide solution at about 250-300 g/l and at least 40-45°C.
- Immerse the spiral anodes or iron baskets to create the galvanic effect between the two metals and start the zinc dissolution.

When the zincate solution has reached the zinc concentration of about 30 g/l immerse it in the working bath tank.

- Repeat this operation until you reach the zinc solution quantity necessary for the topping up to the final volume.

ONLY for the bath make-up the zinc quantity to be used is connected to the bath volume and to the desired concentration.

Example: per 1.000 l of bath at 14 g/l. (14 kg.) of zinc

Calculating a dissolution efficiency of 3,5 g/dm^2 per 1 hour at 25 °C,
to dissolve 14 kg. of zinc in 24 hours, you have to immerse 93 kg of spheres ∅ 50 mm, which is about 170 dm^2.
⇒ These data may vary according to the function of the sodium hydroxide solution temperature and the reaction time.

- In normal maintenance, the zinc surface quantity to be immersed is derived from:

Ah x 0,24 = dm^2 of zinc to immerse

With Ah we mean the amperes indicated in the rectifier ampere-hour meter.

This formula is based on the calculation of the 70 % of cathodic efficiency and a dissolution efficiency of 3,5 g/dm^2 per hour at 25°C.

∗ Verify that the zinc and sodium hydroxide concentration ratio is within the indicated parameters, correct if necessary.

∗ Leave the solution to cool at least to 25°C.
∗ When the temperature is below 25°C, add the necessary additives quantity;
∗ Add the Performa 260 Stabilisator followed by Performa 260 Base Fe and then the other specific additives for rack or barrel;
∗ Top up to the final volume with demineralized water;
∗ Install the anodes and verify the principal operating condition parameters.

Per 1.000 liters of volume	Rack	Barrel
Zinc	12 Kg.	12 Kg.
Sodium hydroxide	120 Kg.	120 Kg.
PERFORMA 260 STABILISATOR	75 l.	115 l.
PERFORMA 260 BASE FE (1)	2,5 l.	2,5 l.
PERFORMA 260 ADDITIV	-	5,0 l.
PERFORMA 260 BASE RACK	10 l.	-
PERFORMA 260 BRIGHTENER RACK	0,5 l.	-

(1) Read point 5.1.2 Iron

3 – OPERATING CONDITIONS

Parameters	Rack	Barrel
Temperature	22 - 28 °C	22 - 28 °C
Cathodic c.d.	1,5 - 3,0 A/dm^2	0,5 - 1,0 A/dm^2
Anodic c.d.	2,0 - 3,0 A/dm^2	2,0 - 3,0 A/dm^2
Barrels rotation	–	3,0 - 4,0 rpm
Cathodic Bar Movement	2,0 - 3,0 m./min.	–
Plating rate at 1 A/dm^2	≅ 0,24 μm./min.	≅ 0,2 μm./min.

Additives	Rack make-up	Rack maintenance 10.000 Ah
PERFORMA 260 STABILISATOR	75 ml/l	3,8 ÷ 4,5 l.
PERFORMA 260 BASE FE (1)	2,5 ml/l	0,6 ÷ 0,7 l.
PERFORMA 260 BASE RACK	10 ml/l	1,5 ÷ 2,5 l.
PERFORMA 260 BRIGHTENER RACK	0,5 ml/l	0,5 ÷ 1,5 l.

Additives	Barrel make-up	Barrel maintenance 10.000 Ah
PERFORMA 260 STABILISATOR	115 ml/l	4,0 - 4,8 l.
PERFORMA 260 BASE FE (1)	2,5 ml/l	0,6 - 0,7 l.
PERFORMA 260 ADDITIVE	5 ml/l	3,2 - 3,7 l.

(1) Read point 5.1.2 Iron

4 – ANALYTICAL VALUES

4.1 Rack Process

Parameters	Optimum	Minimum	Maximum
Zinc	12,0 g/l	10,0 g/l	13,0 g/l
Iron (1)	0,07 g/l (70 mg/l)	0,05 g/l (50 mg/l)	0,09 g/l (90 mg/l)
Sodium Hydroxide	120 g/l	105 g/l	130 g/l

(1) Read point 5.1.2 Iron

Barrel Process

Parameters	Optimum	Minimum	Maximum
Zinc	12,0 g/l	10,0 g/l	13,0 g/l
Iron (1)	0,07 g/l	0,05 g/l	0,09 g/l

	(70 mg/l)	(50 mg/l)	(90 mg/l)
Sodium Hydroxide	120 g/l	105 g/l	130 g/l

(1) Read point 5.1.2 Iron

The analytical methods are available, if required, at our customer service laboratories or our Technical Department.

5 - MAINTENANCE AND CORRECTIONS

5.1 Inorganic contents

5.1.1 Zinc

The zinc concentration must be adjusted through the electrolytic dissolution in the dissolving bath tank, following the instructions at paragraph 2.
To keep the zinc concentration it is possible to use the zinc oxide (S. Gold, lead free) dissolved in a sodium hydroxide solution at 80 ÷ 100 g/l.

5.1.2 Iron

The iron concentration in bath determines the metal content in the alloy deposit.
The values indicated in the previous tables can be increased or decreased according to the passivation film intensity and colour.

- If the alloy iron content is high (> 0,4%), with values of 80 ÷ 100 ppm of solution iron, the yellow passivation film colour is deep and dark (green-blue colour)

- Increasing the alloy (0,7 ÷ 0,9%), with iron values until 110 ÷ 130 ppm in solution, you can have a deeper BLACK passivation film but the corrosion performance drops down in excess of iron over 0.8 %.

The alloy must be verified in each case for each plant because its composition depends also from other factors as the applied cathodic c.c.d., electrolyte or objects agitation or not, temperature, etc.

The iron concentration must be anyway analytically controlled.
The maintenance is carried out through the PERFORMA 260 BASE FE:

© 2,5 ml/l of PERFORMA 260 BASE FE insert 70 mg/l of Iron

E.g. to add:

© 20 mg/l of Iron insert 0,7 ml/l of PERFORMA 260 BASE FE

The additions of the additive containing the Iron complex must be constant and regular. We advise the use of an ampere-hour meter.

5.1.3 Sodium hydroxide

Periodically control the sodium hydroxide concentration.

5.2 Additives

The additives consumption is different between rack and barrel treatment.
In paragraph 3 of the Operating Conditions, the relative tables indicate the consumptions verified on the operating plants.
Strictly observe the indicated dosages. In case you have to strongly change the consumptions (more than 10%), it is necessary to consult our technical service.

5.2.1 Performa 260 Stabilisator

The additive adjusts the iron co-deposition in the deposit.

5.2.2 Performa 260 Base Rack

The Base Rack is responsible of the deposit streamlining eliminating “burnings” phenomena at high c.c.d. and keeping, together with the Brightener Rack, an excellent throwing power and deposit brightness.
It improves the metal distribution.

5.2.1 Performa 260 Brightener Rack

Brightener used to increase the deposit brightness. We recommend not exceeding the advised dosages.

5.3 Temperature

The temperature is a fundamental parameter to guarantee the alloy constancy and uniformity.

• Too high temperatures increase the deposit iron percentage, highly limiting the throwing power, and lead to organic break down.

5.4 Agitation

The cathodic bar horizontal agitation is very important to keep the alloy constant and uniform.
The bar speed must be of 2,0 -3,0 m/min.
It is advisable to keep the electrolyte in agitation with a pump with a capacity 4 times/h the total volume.
Do NOT use air agitation.

5.5 Filtration

The continuous filtration is necessary to avoid the roughness of the deposits.
• Filter capacity = 4 ÷ 5 volumes/h
• Filter aid = diatomaceous earth
The filter aid is necessary to avoid the filters clogging.

5.6 Troubleshooting

Problem	Possible cause	Remedy
Brittle deposit	Excess of Performa 260 Additive or Brightener Rack High iron content in the bath	Stop the dosage Control the iron and Stabilisator contents
Problems of deposit adhesion and/or blistering	Insufficient preparation Performa 260 Additive excess Lack of Performa 260 Stabilisator. Too thick deposit	Properly verify the preparation. Stop the dosage Analyze and correct Adjust thickness to 10 µm maximum

High iron content in the deposit	Too high iron content in the solution. Lack of Performa 260 Stabilisator Low zinc content	Dilute the solution or consume electrolytically Analyze and correct Analyze and correct
Poor plating rate	Low zinc content Too low temperature High carbonates content > 80 g/l	Analyze and correct Control and correct Crystallize at 5°C
Bright but dark deposit	Too high iron content > 0,7%	Analyze and correct
Dark yellow and matt passivated	Metallic impurities in the deposit Too high iron content > 0,7%	Electrolytically purify and verify the zinc metal quality Analyze and correct
Dark grey deposit at low c.c.d.	Too high zinc > 12 g/l Poor Performa 260 Stabilisator content Poor Performa 260 Additive or Base Rack content when zinc and Stabilisator are in the right content	Analyze and correct Analyze and correct Add the Additive in small doses in the barrel and the Base Rack in the rack baths.
Poor brightness at high c.d. and poor throwing power	Too high temperature Lack of Performa 260 Additive in the barrel Lack of Base Rack in the bath High zinc content > 12 g/l	Control and correct Add in small doses Add 2 ml/l of Base Rack Analyze and correct

6 - PROCESS SEQUENCE

In the operating cycle, the preparation is fundamental to have a perfect adherent coating and without any surface defect.

To have the desired resistance to corrosion it is necessary to carry out the different passivations based on hexavalent and trivalent chromium after the zinc/iron deposit.

- FINIDIP 765: chromate treatment based on hexavalent chromium, silver-free.
- FINIDIP 350: yellow-iridescent chromate treatment based on hexavalent chromium.
- FINIDIP 726: black passivation based on trivalent chromium, silver-free.
- LANTHANE 315: iridescent passivation based on trivalent chromium.

To avoid misunderstandings, we recommend evaluating and comparing the different finishing aspect.

7 – EQUIPMENT

∗ Carbon steel tanks internally covered with plastic material;
∗ Cathodic bar horizontal movement 2.0 – 4.0 m/min.
∗ Heating-cooling: mild steel
We advise a thermostat.
∗ Filtration: filter pump with capacity of 2 - 3 times the electrolyte volume.
∗ Intake: advised.
∗ Insoluble anodes: we recommend using mild steel anodes with thickness of 4 - 5 mm.
∗ Zinc anodes: we recommend using zinc 99,9% anodes immersed in iron baskets or spirals.
∗ Auxiliary bath tank: carbon steel connected to the electrolysis tanks with a circulation pump provided with a filter.

8 - HEALTH & SAFETY

This solution is strongly alkaline and caustic; be very careful to splashes.

Take proper precautions wearing protective glasses, gloves, etc.

Wash with water in case of solution or products spreading.

Carefully read and follow the instructions for the handling of the products that are on the package labels and safety datasheets.

9 - WASTE WATERS

In the PERFORMA 260 process there is a complexing agent to keep the iron within the solution in a strongly alkaline environment.
The complexing agent, at pH lower than 12.0, does not interfere in the waste water treatment.

10 - PRODUCT SHELF-LIFE

We recommend checking the use-by date on the label and on the Certificate of Conformity.
We recommend to always storing the products in closed packages, away from heat sources, protected from rain and light.
For further information, please consult our health & safety sheet.

The instructions here contained are the result of careful verification and were prepared for guidance purposes.
They represent, at the present time, the best of our information and they refer to the normal use of the products.
As the correct use of the product is not under our direct control, we can guarantee the product quality only until delivery. Therefore, the information above should not be considered as an explicit or implicit warranty of the results deriving from the use of the said products.