Product Bulletin
Product Name: Mi-Phos Z-4000
Product Code: 2202011
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Mi-Phos™ Z-4000

Mi-Phos Z-4000 is a heavy immersion zinc phosphate formulated to provide excellent corrosion protection on ferrous metal parts by depositing in excess of 2000 milligrams per square foot of crystalline zinc phosphate. When used with Metal Guard 320 or a Metal Guard 560, Mi-Phos Z-4000 can surpass 168 hours of ASTM B-117 salt spray protection.

Features & Benefits

Meets GM 4435M, Ford S-2, and Chrysler PS-18 Specifications	Approved for automotive applications
Provides heavy zinc phosphate coating	Provides at least 168 hours of ASTM B-117 Salt Spray Protection

Operating Conditions

Concentration	3 – 4% by vol
Temperature	140°F – 180°F (160°F – 175°F, Optimum)
Immersion	15 – 30 min

Control ranges

Total Acid	35 – 60 points
Free Acid	5 – 10 points
Iron	1 – 14 points

Conversion Total Acid	1% by volume = 10 points
Iron (approximate)	1% by weight = 10 points
Coating Weight. Range	2,000-3,000 mg/square foot

Makeup

1. Fill clean tank with water.
2. Heat to approximately 120°F.

3. Add 3% by volume of Mi-Phos Z-4000 and mix thoroughly.
4. Heat to operating temperature, 160°F to 175° F and begin operation.

Note: Steel must be put through the tank immediately after initial heat of new solution. The
initial dissolved iron is needed to stabilize a new phosphate solution.

Bath maintenance
The Mi-Phos Z-4000 bath should be analyzed on a regular schedule for proper chemical concentration (i.e., once every 4 hours for heavy workloads to once every 8 hours for light workloads). Mi-Phos Z-4000 concentrate is used to maintain the total acid level (1% by volume = 10 points total acid). The operating concentration of Mi-Phos Z-4000 is dependent upon the ferrous iron content. The following chart gives the recommended total acid level for a determined amount of ferrous iron.

Operating guidelines

Ferrous Iron Points	Recommended Total Acid Points
0-1	35-40
1-2	35-40
2-3	35-40
3-4	39-42
4-5	42-45
5-6	45-48
6-7	48-51
7-8	51-54
8-9	54-57
9-10	57-60
10-11	60-63
11-12	63-66

The above guideline is recommended for operating Mi-Phos Z-4000 baths where the Mi-Phos Z-4000 concentrate is metered in by a metering pump. When manual additions are made, use the following formula:

3 X Iron points + 30 = Total acid level

Concentration control
The Mi-Phos Z-4000 bath should be titrated on a regular basis to ensure proper chemical concentration. The working bath is replenished using Mi-Phos Z-4000 concentrate. 1% by volume = 9.0 Points Total Acid.

The Total Acid is controlled as a function of the ferrous iron content of the bath using the following formula:

3 X IRON POINTS + 30 ± 2

For example: If the iron points are found to be 5.0 iron points, then total acid should be at or adjusted up to 45 points (or 43 to 47). If the acid points are higher than the control level, the phosphate coating will simply be put on faster. When the iron reaches a level deleterious to the coating, a portion of the bath should be discarded. After discarding, the level is restored with water and the proper ration of total acid to iron points adjusted with Mi-Phos Z-4000.

3 X 5 + 30 = 45 ± 2 = 43 - 47 POINTS

Analytical procedures

Ordinarily, the bath is controlled by titrating for iron and total acid, as well as, checking the temperature. Always keep in mind that the rate of reaction is determined by the time, temperature, and concentration. The free acid titration need only be run occasionally. It is almost never necessary to make any adjustments for free acid.

Iron

REAGENTS:

1. 0.1 N Potassium Permanganate Solution
2. 50 % Sulfuric Acid Solution

PROCEDURE:

1. Pipet a 10 mL sample of the phosphate solution into a 250 mL Erlenmeyer Flask.
2. Add 10-15 drops of 50 % Sulfuric Acid Solution and swirl to mix.
3. Titrate sample with 0.1 N Potassium Permanganate Solution to a pink color that persists for 30 seconds.
4. Record mL of 0.1 N Potassium Permanganate Solution used to reach pink endpoint.
5. Calculate iron as follows:

Iron (points) = mL of 0.1 N Potassium Permanganate Used

Total acid

REAGENTS:
1. 0.1 N Sodium Hydroxide Solution
2. Phenolphthalein Indicator

PROCEDURE:
1. Pipet a 10 mL sample of the phosphate solution into a 250 mL Erlenmeyer Flask.
2. Add 3-4 drops of Phenolphthalein Indicator and swirl to mix.
3. Titrate sample with 0.1 N Sodium Hydroxide Solution to a pink end point.
4. Record mL of Sodium Hydroxide used.
5. Calculate Total Acid Points as follows:

Total Acid Points = mL 0.1 N Sodium Hydroxide Solution Used

Free acid

REAGENTS:
1. 0.1 N Sodium Hydroxide Solution
2. Bromophenol Blue Indicator

PROCEDURE:
1. Pipet a 10 ml sample of the phosphate solution into a 250 mL Erlenmeyer Flask.
2. Add 3-4 drops of Bromophenol Blue Indicator.
3. Titrate sample with 0.1 N Sodium Hydroxide Solution to a blue end point.
4. Record mL of 0.1 N Sodium Hydroxide Solution required.
5. Calculate Free Acid Points as follows:

Free Acid Points = mL 0.1 N Sodium Hydroxide Solution Used

Typical processing procedure

Stage Operation
1. Clean in the appropriate Hubbard-Hall cleaner.
2. Rinse, overflowing water, 30 seconds at room temperature.
3. Optional acid pickle in the appropriate acid or acid salt.
4. Rinse, overflowing water, 30 seconds, room temperature.
5. Mi-Phos Z-4000, 4% by volume 180ºF ± 5ºF, 10-30 minutes.
   (3 X Iron points + 30 = TA).
6. Rinse, overflowing water, 30 seconds, room temperature.

7. Immerse into the appropriate Hubbard-Hall Metal Guard corrosion inhibitor.

Equipment
The process tank and piping for use with the Mi-Phos Z-4000 solution should preferably be of type 304, 316, or other 300 series stainless steel. Mild steel may also be used but, has a much shorter life and allows the build-up of zinc phosphate on the tank sides. The heat transfer surface should be of type 316 stainless steel, if steam heated or gas fired. The pump should be fabricated from any of the 300 series of stainless steel.

Waste Disposal

The Aquapure team will be able to recommend the proper disposal method.

Caution

Mi-Phos Z-4000 is an acidic material. Avoid contact with skin or clothing. Wear a face shield, apron and rubber gloves when handling this material. In case of contact with skin or clothing, wash immediately with large amounts of water. For eyes, flush with clean water for at least 15 minutes and obtain medical attention.

Our People. Your Problem Solvers.

For more information on this process,
please call us at 203.756.5521 or email: techservice@hubbardhall.com

Hubbard-Hall holds certifications for **ISO 9001:2015**, Responsible Distribution, as accredited by the **ACD** (Alliance for Chemical Distributors) and as a **Women-Owned Small Business**, as well as maintaining an association with **Omni-Chem**[136]