AQUABOND
Chemistry for Tomorrow

Weldphos Zn

Heavy Zinc Phosphate

Weldphos Zn is a uniquely balanced heavy zinc phosphate formulated to exceed the requirements of most auto specifications, as well as provide an excellent pre-paint coating. It is an immersion process. Weldphos Zn provides very good corrosion protection on ferrous metal parts by depositing in excess of 1,800 milligrams per square foot of crystalline zinc phosphate, which serves as an excellent base for supplementary coatings and processes. When used with a water emulsion oil product, Weldphos Zn achieves over 120 hours salt spray and with oil wax it can surpass 168 hours. Weldphos Zn contains no nickel as is common in most zinc phosphates. Weldphos Zn can be applied in drawing, cold forming or extruding operations.

Features/Benefits

- Hard water stable.
- Contains no nickel.
- Produces fine grained, non-metallic coating.
- Exceptional oil absorptive conversion coating.
- Excellent corrosion resistant base with rust preventative oil, wax or as black phosphates.
- Applied coating weight in excess of 1,800 mg/ft^2.
- Economical single step system.
- Liquid material for ease of use.

Equipment

Type 304, 316 or other 300 series stainless steel is preferred for the processing tank and piping. Mild steel may also be used, but will result in a much shorter life and build-up of zinc phosphate on the tank sides. The heat transfer surface should be type 316 stainless steel, if steam heated or if gas-fired. The pump should be fabricated from any of the 300 series of stainless steel.

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Weldphos Zn

Operating Conditions

Concentration	2 to 6 % by volume Weldphos Zn
Temperature	60 to 82 ºC (140 to 180 ºF) 71 to 79 ºC (160 to 175 ºF), normal
Time	10 to 30 minutes
Control Ranges	Iron, 1 – 14 points Free Acid, 5 – 10 points Total Acid, 35 – 60 points
Conversion (approx.)	Iron 1 % by weight = 10 points Total Acid 1 % by volume = 10 points

New Solution Make-Up

1. Fill clean tank with water.
2. Heat to approximately 48 ºC (120 ºF).
3. Add 4 % by volume of Weldphos Zn and mix thoroughly.
4. Add 2 lb. of clean steel wool or clean scrap steel per 100 gallons of solution.
5. Allow to stay in solution for 2 to 3 hours, then remove steel wool or scrap steel.
6. Add water to operating level and check solution for the proper strength.
7. Heat to operating temperature 71 to 79 ºC (160 to 175 ºF), and begin operation. Note: Steel must be put through tank immediately after initial heat of a new solution. The initial dissolved Iron is needed to stabilize a new phosphating bath and insure the formation of a complete, fine grain coating on the work.

Typical Phosphating Cycle

	Stage Operation	Immersion Time	Temperature
1.	Alkaline soak clean	5 to 10 minutes	60 to 82 ºC (140 to 180 ºF)
2.	Rinse, overflowing water	30 seconds	Room temperature
3.	Black pre-dip, Weldphos Black*	10 to 60 seconds	18 to 37 ºC (65 to 100 ºF)
4.	Rinse, overflowing water	30 seconds	Room temperature
5.	Hot rinse	30 seconds	60 to 71 ºC (140 to 160 ºF)
6.	Phosphate, Weldphos Zn (3 x Iron points + 30 = TA)	10 to 20 minutes	71 to 79 ºC (160 to 175 ºF)
7.	Rinse, overflowing water	30 seconds	Room temperature
8.	Seal rinse	30 to 60 seconds	60 ºC (140 ºF)
9.	Rust Preventative Oil, H30Phos Oil	30 to 60 seconds	60 to 82 ºC (140 to 180 ºF)

*Optional

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Operational Guidelines

Weldphos Black, a black pre-dip solution, is used prior to zinc phosphating ferrous metals. More crystalline coatings will be obtained when a black pre-dip solution is used. A black deposit is produced in the pre-dip solution that is subsequently sealed in by the heavy zinc phosphate. A good rinse is necessary following the pre-dip. This stage is optional.

For optimum performance, the Weldphos Zn working solution should be titrated before each shift. The working solution can be applied by immersion with parts that are in barrels or racked. For barrel application, it requires barrel rotation of 1 to 2 rpm to minimize scratching of the smutty surface for best results and complete coatings. For rack application, the immersion time is approximately 33 % as compared to work tumbled in the barrel to produce the same coating weights.

The coating will appear darker on hardened parts and have a much finer grain than on cold-rolled and low-carbon parts. The average build-up on a surface treated with Weldphos Zn process is about 0.0002 to 0.0004 inches (0.2 to 0.4 mil). To obtain a dense, fine grained coating on some articles where close tolerance is essential, it may be necessary to change the cleaning procedure to include a sand tumble or a hand wiping operation.

To obtain the highest efficiency, production should be processing practically all the time. That is, when one load of production is taken from the tank, another should be ready to replace it.

If the pH of the working solution ranges above or below the 2.5 pH-operating limit, it can be adjusted to the recommended value with the addition of a neutralizer (Weldphos Zn concentrate or Caustic Soda). An excessive amount of Free Acid can be adjusted by the addition of a neutralizer (Caustic Soda) to the bath. This is rarely required.

If the bath is taking too long to heat up and not holding temperature, it usually indicates that the coils need cleaning. If a fresh, new phosphate bath is heated to the operating temperature and left idle, then the bath may become inoperative. To reactivate the bath, add 1.5 lb. of urea per 100 gallons of solution to change the nitrites that formed in the unused bath back into nitrates. (Always use a fresh bath after the initial heat up, and avoid this possible start-up problem.)

If oil accumulates in the processing tank (usually as a result of poor cleaning or rinsing), it can best be removed in the morning before turning on the heat. It can be either skimmed or blotted off. While sludge is not a problem, it is recommended to pump out the bath into a storage tank at least once a month to remove any iron parts and sludge that might have accumulated.

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Maintenance

The Weldphos Zn working solution should be analyzed on a regular basis for proper chemical concentration. It is recommended to perform analysis once every 4 hours for heavy work loads to once every 8 hours for light work loads. Weldphos Zn concentrate is used to maintain the Total Acid level (1 % by volume = 10 points Total Acid). The operating concentration of Weldphos Zn is dependent upon the Iron content.

The following chart is a guideline for operating Weldphos Zn baths, where Weldphos Zn concentrate is metered in. It provides the recommended Total Acid level for a determined amount of Iron.

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

For manual additions of Weldphos Zn concentrate, use the following formula:

3 x Iron points + 30 = Total Acid level

If the Iron is analyzed to be 5 Iron points, then the Total Acid should be at or adjusted to 45 points (or 43 to 47 points). If the acid points are higher than the control level, the phosphate coating will simply be depositing faster.

When the Iron reaches a level deleterious to the coating, a portion of the bath should be discarded. The bath is to be restored with water and adjusted with Weldphos Zn concentrate to obtain the proper ratio of Total Acid to Iron points.

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Weldphos Zn

Analysis of Weldphos Zn

The bath is maintained and controlled by titrating for Iron and Total Acid, and checking the temperature. The rate of reaction is determined by the concentration, temperature, and time. The analysis of Free Acid need only be run occasionally and adjustment for Free Acid is rarely required.

Iron Analysis

Apparatus: 10 mL Volumetric Pipette, Type A
50 mL Burette, Class A
250 mL Erlenmeyer Flask
10 mL Graduated Cylinder

Reagents: 50 % (v/v) Sulfuric Acid (H_2SO_4), ACS grade
0.2 N Potassium Permanganate ($KMnO_4$)

Procedure:
1. Pipette a 10 mL sample of Weldphos Zn solution into a 250 mL Erlenmeyer flask.
2. Add 2 mL of 50 % H_2SO_4.
3. Titrate with 0.2 N $KMnO_4$ to a pink end point (colour must remain for 10 seconds).
4. Calculation: mL of 0.2 N KMnO4 titrated = Iron points

Total Acid Analysis

Apparatus: 10 mL Volumetric Pipette, Type A

50 mL Burette, Class A
250 mL Erlenmeyer Flask

Reagents: 1 % (w/v) Phenolphthalein Indicator solution
0.1 N Sodium Hydroxide (NaOH)

Procedure:
1. Pipette a 10 mL sample of Weldphos Zn solution into a 250 mL Erlenmeyer flask.
2. Add 3 – 4 drops of Phenolphthalein Indicator solution.
3. Titrate with 0.1 N NaOH to a pink end point.
4. Calculations: mL of 0.1 N NaOH titrated = Total Acid points

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Analysis of Weldphos Zn

Free Acid analysis

Apparatus: 10 mL Volumetric Pipette, Type A
50 mL Burette, Class A
250 mL Erlenmeyer Flask

Reagents: 0.04 % (w/v) Bromophenol Blue Indicator solution
0.1 N Sodium Hydroxide (NaOH)

Procedure:

1. Pipette a 10 mL sample of Weldphos Zn solution into a 250 mL Erlenmeyer flask.
2. Add 3 – 4 drops of Bromophenol Blue Indicator solution.
3. Titrate 0.1 N NaOH to the absence of yellow (a blue end point).
4. Calculation: mL of 0.1 N NaOH titrated = Free Acid points

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Trouble Shooting Guide

	Problem	Possible Causes	Recommended Actions
1.	White powdery coating	• Low in Free Acid • High in pH • Bath temperature exceeds 200 °F	• Adjust with Weldphos Zn concentrate • Adjust with Weldphos Zn concentrate • Lower temperature to optimum
2.	Blush rust appearance on coating	Insufficient phosphate coating due to:	
		• Low bath temperature • Short immersion time • High Free Acid • High Iron	• Heat to optimum bath temperature • Increase immersion time in solution • Adjust with a neutralizer (Caustic Soda) • Decant bath or addition of iron-reduction agent
3.	Dark coarser coating	• High Iron	• Decant bath or addition of iron-reduction agent

The data and statements contained in this bulletin are based on testing information and are believed to be accurate and reliable. This bulletin is not a Guarantee or Warranty, express or implied regarding the products use. The product is sold on the condition that the purchaser will do their own tests to determine the suitability of the product in a particular application.

READ THE MSDS BEFORE USING THIS PRODUCT

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