BONDERITE M-ZN 300X
ZINC PHOSPHATE
(KNOWN AS BONDERITE 300X)

Issued 5/14/2014

1. Introduction:

BONDERITE M-ZN 300X (known as BONDERITE 300X) chemicals are conversion coating agents formulated for conversion, by immersion application, of steel surfaces to non-metallic, zinc phosphate coating of the proper texture to retain lubricant and facilitate cold forming of the metal. It has an added advantage of producing consistently heavier, uniform coatings, thus lending itself useful for heavy extrusions and cold heading operations. The coating facilitates drawing by:

A. Reducing metal-to-metal contact
B. Prolonging tool life
C. Reducing downtime and thereby increasing efficiency.
D. Reducing material breakage
E. Producing a smoother and more uniform surface on the finished product

2. Operating Summary:

Chemical:	Bath Preparation per 100 Gallons:
BONDERITE M-ZN 300X MU (known as BONDERITE 300X MAKEUP)	175 Pounds
Operation and Control:	
Total Acid (TA)	38 to 42 points
Acid Ratio (R = TA/FA)	5.5 to 7.5
Time	3 to 7 minutes
Temperature	170° to 185° Fahrenheit
Accelerator	1.5 points, minimum

3. The Process:

The complete process for the BONDERITE M-ZN 300X treatment normally consists of the following steps:

A. Cleaning
B. Water rinsing
C. Pickling
D. Double water rinsing
E. Treating with the BONDERITE M-ZN 300X processing solution
F. Water rinsing
G. Neutralizing
H. Applying a lubricant

4. Materials:

BONDERITE M-AD 300X ACCELERATOR (known as PARCO ACCELERATOR 300X)
BONDERITE M-ZN 300X MU (known as BONDERITE 300X MAKEUP)
BONDERITE M-ZN 300X R A (known as BONDERITE 300X REPL A)
Testing Reagents and Apparatus

5. Equipment:

Process tanks and housings may be fabricated from mild steel plate, however, equipment life will be greatly extended by using a 300 series alloy stainless steel, such as 304L or 316L. The 316L being preferred for maximum tank life. Process pumps should be constructed of 316 or 304 stainless steel alloys. In all cases approved welding techniques must be used.

Heat exchanger plates should be polished 316 stainless steel. If gas fired burner tubes are used, they should be made of Schedule-80 mild steel pipe or equivalent. All process circulation pump seals, valve seats, etc., which come into contact with the process solution and occasional acid equipment cleaners, should be EPDM, FKM or PTFE. Note that while CSPE is compatible with the process solution, it is not compatible with acid equipment cleaners which may be used.

Chemical feed pump parts and other elastomers which may come into contact with the concentrated replenishing chemical should be EPDM, CSPE, FKM or PTFE.

Support equipment available from Henkel Surface Technologies for this process includes: chemical feed pumps, level controls, transfer pumps and bulk storage tanks.

Your local sales representative should be consulted for information on Henkel Surface Technologies automatic process control equipment for this process and any additional questions.

6. Surface Preparation:

Cleaning:
All metal must be free from grease, oil, rust, scale or other foreign matter before the treatment. A complete line of cleaner products is available and the proper one will be recommended for each installation.

Water Rinsing:
After cleaning, the metal must be thoroughly rinsed with hot water. The rinse should be overflowed continuously at a rate which will keep it clean and free from scum and contamination.

Pickling:
Sometimes, the metal may go directly from the water rinse into the processing solution, but usually, scale and rust are present and must be removed. The usual mill practice of pickling in sulfuric or muriatic acid is satisfactory.

Water Rinsing:
After the acid pickle, the metal must be thoroughly rinsed in overflowing water to prevent carryover of acidic material into the processing solution. It is best to use a double water rinse. The first rinse may be cold, but the second should be heated, preferably as close as possible to the BONDERITE M-ZN 300X processing solution temperature.

7. Treating with the BONDERITE M-ZN 300X Coating Solution:

Buildup:
The usual amount of BONDERITE M-ZN 300X MU (known as BONDERITE 300X MAKEUP) recommended for initial bath preparation is 175 pounds (14 gallons) per 100 gallons of working solution, and operation at this strength is generally recommended. However, operating conditions, drawing requirements, lubricant type and other factors may require higher or lower concentrations. Our representative should be consulted.

Fill the tank about three-fourths full with water. Add the proper amount of BONDERITE M-ZN 300X MU (known as BONDERITE 300X MAKEUP) and sufficient water to bring the solution up to the working level. Mix thoroughly; add heat to the operating temperature. Note: There is no need to add Accelerator to this bath. The Accelerator is already built into the BONDERITE M-ZN 300X.

Operation:
Time: 3 to 7 minutes.
Temperature: 170° to 185° Fahrenheit.

The best processing time and temperature for the BONDERITE M-ZN 300X treatment depend on the metal surface, the cleaning procedure used and the type of forming operation involved. After the time and temperature have been established for an installation, they should be followed closely, and it is desirable to hold the temperature within ± 5° Fahrenheit of the value found to give best results.

8. Testing and Control:
Never pipet by mouth, use a pipet filler.

Total Acid:
Pipet a 5 ml sample into a 150-ml beaker. Add 10 ml of Reagent Solution 150 and 5 drops of Indicator 3. Titrate with Titrating Solution 11 to the development of a persistent (30 seconds) faint pink color. The ml of Titrating Solution 11 used is the total acid value in points.

Total acid range: 38 to 42 points

To increase value 1.0 point: 2.7 pounds (1.7 pints) of BONDERITE M-ZN 300X R A(known as BONDERITE 300X REPL A) per 100 gallons of solution volume.

Replenishing is best accomplished by adding the chemical continuously with a metering pump into a turbulent area of the tank. Adjust the metering rate to hold the total acid value within the specified range.

Mechanical Loss:
Replace any drop in points due to a mechanical loss of solution (sludge cleanout, leaks, etc.) by adding 4.2 pounds of BONDERITE M-ZN 300X MU (known as BONDERITE 300X MAKEUP) for each 100 gallons of working solution volume for each total acid point required.

Free Acid:
Pipet a 5 ml sample into a 150-ml beaker. Add 5 drops of Indicator 11. Titrate with Titrating Solution 11 until the yellow color just changes to bluish green by daylight or fluorescent light, or to blue-violet by incandescent light. The ml of Titrating Solution 11 used is the free acid value in points.

The free acid value is used to calculate the acid ratio below.

Acid Ratio:
The acid ratio is obtained by dividing the total acid value by the free acid value. Thus, if the total acid is 39.0 and the free acid is 6.0, then the acid ratio is:

39.0 divided by 6.0 = 6.5

Maintain the acid ratio in the range of 5.5 to 7.5. If it gets below 5.5, discontinue the use of BONDERITE M-ZN 300X R A(known as BONDERITE 300X REPL A) and use BONDERITE M-ZN 300X MU (known as BONDERITE 300X MAKEUP) instead. Use 4.2 pounds of the Makeup material per 100 gallons for each point of total acid required. When the acid ratio returns to 5.5, resume the use of the Replenishing chemical.

If the acid ratio frequently gets below 5.5, it is probably due to BONDERITE solution loss through leaks or excessive drag out, and corrective steps should be taken.

If the acid ratio should get above 7.5, processing may be continued, but a sample of the solution should be obtained and our representative should be notified immediately.

Accelerator:
Pipet a 5.0 ml sample of BONDERITE M-ZN 300X into a 250-ml Erlenmeyer flask and dilute with 50 ml of deionized (or distilled) water. Add 10 ml of Reagent Solution 44 and two drops of Indicator 12. Titrate with Titrating Solution 141 until one drop changes the color from orange to blue. Caution! Do not over titrate.

Into this same sample, pipet 10 ml of Titrating Solution 141, place on hot plate and heat just to boiling. Remove from hot plate and cool to ambient temperature. Add 2 drops of Indicator 12 and titrate with Titrating Solution 31 until the color changes through blue to orange.

The accelerator concentration is determined using the equation:

Accelerator Concentration (points) = 10 - (ml Titrating Solution 31 x C)
Where C = Correction Factor for Titrating Solution 31.

Accelerator Concentration range: 1.5 points minimum.

To increase value 1 point: Add 1.14 lbs. (14.5 oz) of BONDERITE M-AD 300X ACCELERATOR (known as PARCO ACCELERATOR 300X) or 5.0 lbs (1.6 quarts) of BONDERITE M-ZN 300X R A(known as BONDERITE 300X REPL A) per 100 gallons of operating bath. It is best to use the concentrated Accelerator 300X, especially if the total acid is near the high end of the normal operating range. Note: BONDERITE M-ZN 300X has Accelerator built into the make-up chemical. There is no need to add Accelerator at build up.

Correction Factor for Titrating Solution 31:
Titrating Solution 31 is not stable and must be standardized weekly or whenever a fresh supply is added to the buret reservoir. Determine its Correction Factor as follows:

Pipet 10 ml of Titrating Solution 141 into a 150-ml beaker. Add 25 ml of Reagent Solution 44 and 2 drops of Indicator 12. Titrate with Titrating Solution 31 until the blue color changes to a reddish brown. The Correction Factor may then be obtained from the following equation.

$$\text{Correction Factor "C"} = \frac{10}{\text{ml Titrating Solution 31}}$$

9. After Treatment:

Water Rinsing:
After bonderizing, the work is thoroughly rinsed in cold water. The rinse should be continuously overflowed and the overflow should be regulated with the rate of production so that the main body of the rinse never becomes excessively contaminated.

Neutralizing :
The bonderized metal, after the cold water rinse, is treated with a hot, dilute neutralizing solution for 30 to 60 seconds to eliminate any residual acidity. The solution is generally heated to about the same temperature as the lubricant, but in some installations, satisfactory results may be obtained by operating at lower temperatures.

A number of neutralizing materials are available, and the proper one for each installation will be recommended.

Applying the lubricant:
The type of lubricant to use depends upon individual requirements. Suitable lubricants for this purpose are available and the proper one for the particular application will be recommended.

10. Storage Requirements:

We recommend that ALL CHEMICALS be stored and used in locations which will not permit direct access to sanitary or surface drains. These areas should be constructed in such a manner that any chemicals lost can be either salvaged or suitably treated to prevent pollution.

This Chemical should be protected from freezing and stored in heated indoor area; keep container closed, and in a well ventilated area. If the chemical does freeze after extended storage at low temperature, thaw in a warm place and stir thoroughly before using.

11. General Maintenance:

In the operation of the process, some insoluble residue, normally referred to as sludge, is formed as a by-product of the chemical reaction. This material settles to the bottom of the tank and should be removed regularly before its presence causes dusty coatings. An excellent method of removal is an arrangement whereby a portion of the solution and sludge is pumped into a settling tank from which the settled sludge may be periodically discharged into containers, preferably after the solution is returned to the processing tank. The pump (for sludge removal) should preferably be made from stainless steel, but mild steel may be used with a somewhat shorter life. Another satisfactory method is to transfer the solution to a rinse tank, leaving as much sludge as possible in the bottom of the processing tank. The sludge may then be removed by any convenient means.

When the solution has been heated for some time, scale will form on the heating unit and must be removed at intervals so that adequate heat transfer will occur and the proper processing temperature will be maintained. To remove the scale, dry the heat transfer surface either by removing it from the solution or by pumping the solution from the tank. The scale may then be removed by a suitable chemical or mechanical method.

12. Waste Disposal Information:

Applicable regulations covering disposal and discharge of chemicals should be consulted and followed.

Disposal information for the chemical used, in the form as supplied is given on the Material Safety Data Sheet for the product.

The processing bath is acidic and contains phosphate and heavy metal. Waste treatment and neutralization may be required prior to discharge to the sewer.

The processing bath and sludge can contain ingredients other than those present in the chemical as supplied and analysis of the solution and/or sludge may be required prior to disposal.

13. Precautionary Information:

When handling the chemical products used in this process, the first aid and handling recommendations on the Material Safety Data Sheet for each product should be read, understood and followed.

The processing bath is acidic and may cause irritation of the skin and eyes. Do not get in eyes, on skin or on clothing. See Material Safety Data Sheet for appropriate protective clothing. In case of contact, follow the recommendations on the Material Safety Data Sheet for BONDERITE M-ZN 300X MU (known as BONDERITE 300X MAKEUP) or Replenisher.

Testing Reagents and Apparatus
(Order only those items which are not already on hand)

Code	Quantity	Item
89000-202**	2*	Beaker, 150-ml
17579-482**	1	Buret Assembly, 25-ml Automatic
89000-794**	2*	Flask, Erlenmeyer, 250 ml
592398	1 pt	Indicator 3 (phenolphthalein)
592402	1 pt	Indicator 11 (bromphenol blue)
592403	1 pt	Indicator 12 (orthophenanthroline, ferrous complex)
89003-482**	2*	Pipet, 5-ml Volumetric
89003-350**	2*	Pipet, 10-ml Volumetric
53497-009**	1	Pipet Filler
53600-108**	1	Pitcher, Graduated, Plastic
593846	5 pt	Reagent Solution 44 (50% H_2SO_4)
592421	1 gal	Reagent Solution 150 (20% sodium gluconate)
30250***	1	Thermometer, Floating
592427	1 gal	Titrating Solution 11 (0.1N NaOH)
592432	1 qt	Titrating Solution 31 (0.1N $FeSO_4$)
592419	1 qt	Titrating Solution 141 (0.1N Ceric ammonium sulfate)

* Includes one more than actually required, to allow for possible breakage.
** VWR Parts – 800-932-5000 or vwr.com
***Thomas Scientific Parts

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Company _____ Technical Process Bulletin No. 231781
Plant _____ Unit _____
Henkel Surface Technologies Representative _____
Telephone _____ Sales Office Telephone _____

BONDERITE M-ZN 300X

Tank — Tank No. _____.
Working Volume _____ gallons.
_____ gallons per inch.

Buildup (Section 7) _____ pounds _____ ounces of BONDERITE M-ZN 300X MU (known as BONDERITE 300X MAKEUP).

Operation (Section 7) — Time: _____ minutes _____ seconds.
Temperature: _____ ° to _____ ° Fahrenheit.

Testing and Control (Section 7) — Total Acid: Test every _____.
5 ml sample,
5 drops Indicator 3,
Titrating Solution 11 to a permanent, faint pink.

Range: _____ to _____.
Add _____ pounds _____ ounces of BONDERITE M-ZN 300X R A(known as BONDERITE 300X REPL A) for _____ point.

Mechanical Loss:
Add _____ pounds _____ ounces of M-ZN 300X MU (known as BONDERITE 300X MAKEUP) for each total acid point required.

Free Acid: Test every _____.
5 ml sample,
5 drops Indicator 11.
Titrating Solution 11 to bluish green or blue violet.

Acid Ratio:
Acid Ratio = Total Acid divided by Free Acid.

Range: _____ to _____.
If acid ratio is low, use BONDERITE M-ZN 300X MU (known as BONDERITE 300X MAKEUP) in place of BONDERITE M-ZN 300X R A(known as BONDERITE 300X REPL A) to maintain the bath.
Add _____ pounds _____ ounces of M-ZN 300X MU (known as BONDERITE 300X MAKEUP) for each _____ point needed.

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BONDERITE M-ZN 300X

Testing and Control (Continued)

Accelerator: Test Every _____.
5 ml sample,
50 ml deionized water,
10 ml Reagent Solution 44,
2 drops Indicator 12.
Titrating Solution 141 to a color change from blue to orange.
10 ml Titrating Solution 141.
Heat just to boiling on a hot plate.
Cool.
Add 2 drops Indicator 12.
Titrating Solution 31 to color change through blue to orange.

Accelerator = 10 - [ml Titrating Solution 31 x Correction Factor (see Section 8)]

Range: _____ to _____ points (ml).
Add _____ pounds _____ ounces of BONDERITE M-ZN 300X R A(known as BONDERITE 300X REPL A) or _____ pounds _____ ounces of BONDERITE M-AD 300X ACCELERATOR (known as PARCO ACCELERATOR 300X)
for _____ point.

Chemical	lb per gallon
BONDERITE M-ZN 300X MU (known as BONDERITE 300X MAKEUP)	12.5
BONDERITE M-ZN 300X R A(known as BONDERITE 300X REPL A)	12.8
BONDERITE M-AD 300X ACCELERATOR (known as PARCO ACCELERATOR 300X)	10.1

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