

Dev-Kote 77

Dev-Kote 77 is a calcium-modified zinc phosphate which produces lighter, tighter, more adherent and uniform coatings than regular light zinc phosphates. **Dev-Kote 77** deposits a light zinc phosphate coating (150-550 mg/ft.²) on steel.

The **Dev-Kote 77** coating is a superior basis for paint producing a finer finish with less paint usage than regular zinc phosphate. The zinc phosphate coating produced is also an excellent carrier for tube and wire lubricants. At the same time it provides better corrosion protection and "creep" resistance than iron phosphate. **Dev-Kote 77** may be used in either spray or immersion processes.

Operating conditions are general guideline, but may vary widely depending upon the individual application.

OPERATING MAKE-UP:

	<u>Spray System</u>	<u>Immersion System</u>
Time:	30-90 seconds	200 - 300 seconds (2-5 minutes)
Temperature:	120 - 150 °F	140 - 180 °F
Spray Pressure:	8 - 12 psi	-----
Concentration:	1.5 - 3.0 % Vol.	3.0 - 5.0%/Vol.
Analysis Points:	8 - 15 pts	15 - 25 pts
Conversion:	1% Vol. = 5 points total acid	

OPERATING CYCLE:

<u>Spray System</u>	<u>Immersion System</u>
1. Soak Clean	1. Soak Clean
2. Spray Rinse	2. Water Rinse
3. Dev-Kote 77	3. Dev-Kote 77
4. Spray Rinse	4. Spray Rinse
5. Neutral Seal	5. Neutral Seal

OPERATING NOTES:

Mild steel equipment is satisfactory, except for pump and spray nozzles, where stainless steel is recommended. Use stainless steel whirl-jet type nozzles.

Dev-Kote 77 and additive solutions should be added while circulating pump is operating.

When starting a freshly made up solution of **Dev-Kote 77**, the solution should be used immediately after the initial heat-up to the operating temperature. The initial iron which dissolves into the bath acts as a stabilizer.

ANALYSIS AND CONTROL:

For ease of operation, we have developed a simple operator controllable analysis, which can be performed routinely every 2 - 6 hours depending on workload.

For greater product control, see pages 3 to 8 for additional component analysis procedures along with operating information.

For spray applications, we recommend replenishment by the metering method.

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TOTAL ACID ANALYSIS:

Reagents:

- 0.1N Sodium Hydroxide (NaOH)
- Phenolphthalein indicator

Procedure:

1. Pipette a 10 ml sample of Dev-Kote 77 bath into a clean 250 ml Erlenmeyer flask.
2. Add 50 – 100 mls DI water.
3. Add 3-5 drops of phenolphthalein indicator.
4. While swirling, titrate with 0.1N Sodium Hydroxide to a pink end-point.

Calculation: Mls 0.1 N NaOH x 0.194 = % by volume
 Mls 0.1 N NaOH = Total Acid Points (Pointage)

PACKAGING: 55 GALLON DRUMS (720 LBS. NET)

CONCENTRATION CONTROL METHOD

The **Dev-Kote 77** bath may need to be analyzed regularly for proper chemical concentration (i.e., once every 4 hours for heavy work loads to once every 8 hours for light work loads.) **Dev-Kote 77** concentrate is used to maintain the total acid level. 2% by volume = 10 points total acid

The operating concentration of Dev-Kote 77 is dependent upon the ferrous iron content. the following chart gives the recommended total acid level for a determined amount of ferrous iron.

<u>Ferrous Iron Points</u>	<u>Recommended Total Acid Points</u>
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

OPERATING GUIDELINES

The above guideline is recommended for operating **Dev-Kote 77** baths where the concentrate is metered in. When manual additions are made, use the following formula:

$$3 \times \text{Iron points} + 30 = \text{Total acid level}$$

For example: If iron points are found by analysis 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 **Dev-Kote 77**.

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ANALYTICAL PROCEDURE

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

IRON ANALYSIS

Reagents:

- 0.2 N Potassium Permanganate
- 50% Sulfuric Acid (1 to 1 by Volume)

Procedure:

1. Pipette a 10 ml sample of the phosphate solution into a 250 ml Erlenmeyer flask.
2. Add 10 - 15 drops of 50% sulfuric acid
3. Titrate sample with 0.2N potassium permanganate until a clear to pink end point.

Calculation: Mls. 0.2 N Potassium Permanganate = iron points

FREE ACID ANALYSIS

Reagents:

- 0.1 N Sodium Hydroxide
- Bromophenol blue indicator (goes from yellow to blue)

Procedure:

1. Pipette a 10 ml sample of the phosphate solution into 250 ml Erlenmeyer flask.
2. Add 3-4 drops Bromophenol blue indicator
3. Titrate sample with 0.1N sodium hydroxide from a yellow to a blue purple endpoint.

Calculation: Mls 0.1 N Sodium Hydroxide = Free acid points

TYPICAL PROCESSING CYCLE FOR THE PHOS AND OIL

Stage

Operation

1. Hot alkaline soak clean, 5-10 minutes, 140 – 180 °F
2. Rinse, overflowing water, 30 seconds, room temperature
3. Pickle, mineral acid pickle solution, 5-10 minutes, 65 – 115 °F
4. Rinse, overflowing water, 30 seconds, room temperature
5. Hot rinse, 30 seconds, 140 – 160 °F
6. Phosphate, Dev-Kote 77, 30 sec. to 5 min, 165 – 185 °F, (3 x Iron points + 30 = TA)
7. Rinse, overflowing water, 30 seconds, room temperature.
8. Neutral Seal
9. Oil, Deveco water emulsion oil, or oil & wax bath, 30 - 60 seconds, 135 – 145 °F.

Note: Consult your Deveco sales engineer for further process information assistance.

EQUIPMENT

The processing tank and piping for use with the **Dev-Kote 77** solution should preferably be of the type 304,316 or other 300 series stainless steel. Mild steel may be used, but has a much shorter life. The pump should be fabricated from any of the 300 series of stainless steel.

OPERATING INFORMATION

- It is important that there be good rinsing following any acid dip.
- For optimum performance, a bath should be titrated before each shift.
- This bath may be used for dip operations when parts are racked or are in baskets.
- The immersion time when work is dip coated on hooks or racks is approximately one-third as long as when the work is tumbled to produce the same coating weights.
- Barrel operations require barrel rotation of 1-2 rpm in all stages of zinc phosphating for best results and complete coatings.
- A coating having a white powdery appearance usually indicates a bath low in free acid, high in pH or that the temperature of the bath has exceeded 200°F.
- If the pH of the bath should drop below the 2.5 pH operating limit, the bath may be brought back to the recommended pH by the addition of a neutralizer. An excessive amount of free acid may also be corrected by the addition of a neutralizer to the bath. This is rarely required. Consult Deveco for assistance.
- If the coating shows a "blush rust" appearance, it indicates insufficient phosphate coating. This could be due to low bath temperature, a short immersion, high free acid or high iron in the solution.
- On hardened parts, the coating will appear darker and have a much finer grain than on cold rolled and low carbon parts. Deveco can provide special additives to produce darker phosphate deposits on all steel work. Consult Deveco for assistance if darker deposits are required.
- If the bath is taking too long to heat up and not holding temperature, it would indicate normally that the coils need cleaning.
- 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.
- If a fresh, new phosphate bath is heated to the operating temperature and left idle, then the bath may become inoperative. To bring back the bath to operating condition, add 1.5 lbs. of urea per 100 gallons of solution to change the nitrites, which 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 may be either skimmed or blotted off.
- The average build-up on a surface treated with **Dev-Kote 77** process is about 0.0002" to 0.0004" (0.2-0.4 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 work tank, another should be ready to replace it.
- More crystalline coatings will be obtained when 20-40% by volume hydrochloric acid dip is used prior to phosphating. Sulfuric may be used; however, hydrochloric acid is preferred.

SAFETY PRECAUTIONS:

Dev-Kote 77 is an acidic material. Avoid contact with skin or clothing. Wear a face shield, apron and rubber gloves when handling 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. Read the Material Safety Data Sheet before using this product.

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