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TECHNICAL DATA

Insta-Blak® 333

Room Temperature Blackening for Iron, Steel and Powdered Metals and Architectural Finishes

Insta-Blak 333 represents a major breakthrough in the room temperature blackening of iron and steel. In fact, it produces a black finish equal in depth of blackness and in corrosion resistance to that obtained with the conventional hot black oxide processes.

It is recommended for blackening cold and hot rolled carbon steels, alloy steels, tool steels, as well as cast iron, forged steels and powdered metal. It will not blacken stainless steels. We have also found that it works in blackening sterling silver.

Insta-Blak 333 works well for properly cleaned steel sheets and parts for interior architectural steel finishes.

BLACKENING PARTS BY IMMERSION (GO TO PAGE 3 & 4 FOR SWAB ON/HAND FINISHING PROCEDURE)

Equipment Required – Immersion Finishing

Acid resistant tanks, tumbling barrels, baskets, hooks, and racks must be used with the **Insta-Blak 333** solution. Polypropylene, polyethylene or PVC dipping baskets, polypropylene rotating barrels, plastic lined or rubber lined tanks and plastic coated hooks and racks are suitable. Stainless steel cannot be used with **Insta-Blak 333**. Mild steel or stainless steel must be used for the **E-Kleen** solution and the **E-Tec** solutions. The **E-Prep 255** or **258** solution may be contained in plastic or rubber lined tanks. Stainless steel tanks may be used for **E-Prep 255**. Do not use mild steel for the **E-Prep 255** or **258** solution. An electric immersion heater is required for the **E-Kleen** tank. A filtration system is required for the **Insta-Blak 333** solution. In some infrequent installations an ion exchange system may be required for the rinse water after the blackening solution to remove heavy metals. **EPI** will advise if this is necessary. Complete turnkey tank systems are available from **EPI**.

Immersion Finishing Procedure Items to be blackened must be thoroughly cleaned, derusted, and/or activated. Parts to be finished with **Insta-Blak 333** should be protected from rust during fabrication and in-plant storage prior to blackening to minimize surface preparation.

Items to be blackened are contained in plastic dip baskets or hung on plastic coated racks or hooks, depending upon the shape, weight, and production requirements. Rotating (1 to 2 RPM)

perforated plastic barrels are recommended for processing large volumes of small parts. If dip baskets or racks are used, the parts should be agitated when first introduced into each solution and water rinse to break air bubbles and to assure uniform solution contact with all surfaces. When processing parts in a dip basket, agitate or shake parts several times during the immersion to avoid nesting of the parts and the possibility of a non-uniform finish.

The blackening process will consist of either five (5) or seven (7) steps depending upon the condition of the iron or steel surfaces and necessity for derusting or activation steps. In most installations, only a simple five step procedure will be required as follows:

1. Clean with **E-Kleen SR 148-E** alkaline cleaning solution. Immerse parts for 5 minutes to 10 minutes in a 10% to 15% by volume in water solution of **E-Kleen SR 148-E** maintained at 120°F to 150°F. Time and temperature required will depend upon the type and degree of soil.

NOTE: Mill scale or heat treat scale must be removed prior to blackening in order to achieve the best and most uniform finishing results.

2. Rinse for a minimum of 30 seconds in a bottom fed overflowing cold water rinse tank to remove residual cleaner.
3. Blacken in 10% by volume **Insta-Blak 333** solution as described below under solution make-up and use.
4. Cold water rinse
5. To displace the rinse water, seal the finish, impart corrosion resistance and enhance the depth of black, immerse the parts while still wet from the preceding rinse, for one (1) to two (2) minutes in **EPI's** water displacing corrosion inhibitor, **E-Tec 501** for an oily finish, **E-Tec 503** for a very slightly oily to a semi-dry finish or **E-Tec 504** or **E-Tec 505+** for a soft, non-tacky, dry-to-the-touch finish. The rinse water will be displaced to the bottom of the tank and can be periodically drained off. The ultimate depth of black will not be developed until the **E-Tec** is completely absorbed into the **Insta-Blak 333** surface and may not develop for several hours, depending upon the surface roughness. An **E-Tec** must be applied before judging the depth of black. For a dry finish, **E-LAQ 525** glossy, water based dip lacquer with a pencil hardness of 2H. For a wax finish **E-Tec 521**.

Immersion Process Insta-Blak Solution Makeup and Use

Prior to charging a production tank, some experimentation should be performed with properly prepared rust free sample parts, using various dilutions of the **Insta-Blak 333** concentrate and different immersion times to determine the conditions and parameters required to produce the desired depth of black. As a starting point, dilute one (1) part **Insta-Blak 333** concentrate with nine (9) parts water for a 10% by volume solution. Determine by test, the shortest immersion time necessary to produce the desired black, usually two to three minutes, up to a maximum of 5 minutes, depending upon the alloy and surface hardness. Immersing parts for an excessive amount of time will not increase the depth of blackness and may result in the formation of an undesirable smut or rub-off. If a smut develops with an immersion of less than 5 minutes, prepare and evaluate a solution of one (1) part concentrate and six (6) parts water. If the required immersion time exceeds five (5) minutes, the dilution should be increased to twelve (12) parts water and the immersion time re-evaluated. If satisfactory results cannot be obtained with the

various dilutions and light gray or iridescent finishes result, then the steel surface will require activation and conditioning as described below.

Derusting or Activation of Surfaces

Parts which are rusty must be derusted with a dip in **EPI's E-Pik 215** solution used at 8 weight ounces to 16 weight ounces per gallon of water at room temperature. Immersion times will vary from 2 to 5 minutes. Do not use muriatic or hydrochloric acids prior to **Insta-Blak 333** because they will produce a smutty black finish.

If the desired depth of blackness is difficult to obtain with the simple 5 step process, then the activation of the surface prior to blackening will be required by immersing parts for 1 to 2 minutes in a warm (120°F) 5 to 10% by volume solution of **EPI's E-Prep 255**. **E-Prep 258** is also an excellent activator which is used at 20% by volume in water at ambient temperatures (65 to 85°F). It also will remove light rust.

The process will then consist of the following steps:

1. Clean in **E-Kleen SR 148-E**

NOTE: Mill scale or heat treat scale must be removed prior to blackening in order to achieve the best and most uniform finishing results.

2. Cold water rinse
3. a. Derusting with **E-Pik 215**
or
b. Activation with **E-Prep 255** or **E-Prep 258**
4. Cold water rinse
5. Blacken with **Insta-Blak 333**
6. Cold water rinse
7. Seal with appropriate **E-Tec** water displacing corrosion inhibitor.
8. For dry finish use **E-Tec 520**, **E-Tec 521** or **E-LAQ 525**.

Instructions for making up, using and maintaining solutions of **E-Kleen SR 148-E**, **E-Pik 215**, **E-Prep 255**, **E-Prep 258** and **E-Tec 503** will be found in the individual Technical Data Sheet for these **EPI** products.

BLACKENING SWAB ON/HAND FINISHING PROCEDURE:

Equipment Required - Swab on/Hand Finishing:

Sponge/Q-Tip/brush/cotton cloth, safety glasses, gloves, plastic container/sheet to catch excess run off.

Swab on/Hand Make up and Use:

Although, for swab on applications **Insta-Blak 333** can be applied at full strength, it is generally helpful to make up a 10-33% by volume solution. Use a solution of one part **Insta-Blak 333** to 9 parts water for a slower reaction or a solution of one part **Insta-Blak 333** to 2 parts water for a faster reaction. Testing should be on scrap pieces of the same steel alloy and finish of steel to develop optimized blackening.

Please [CLICK HERE](#) watch EPI's **Insta-Blak 333 GEL** video on YouTube.

1. Degrease the area to be refinished with alcohol, chlorinated solvents, vapor degreasing, a liquid detergent or **EPI's E-Kleen 163**, a room temperature soak cleaner. Do not use petroleum solvents. Let the cleaner work 1-3 minutes. If the part(s) has been sand blasted or mechanically prepared the cleaning step can be skipped as long as the parts are free from any oils, lacquers, finger prints, or other soils. If this is the case skip ahead to step #4.
2. Rinse with running water, a damp sponge or damp cloth if a liquid detergent or **E-Kleen 163** was used. If water breaks occur during rinsing, try using **E-Kleen 163** again. Water breaks mean the substrate is not clean.
3. Remove any rust with steel wool or abrasive paper. A steel scribe works well for narrow scratches.
4. Apply the full strength or the diluted solution of **Insta-Blak 333** generously with a cotton swab, sponge or brush using a light rubbing action. Use care to ensure a smooth and even coverage. Continue light rubbing action for 1 to 3 minutes. It also helps to keep adding some of the full strength or previously diluted **Insta-Blak 333** solution if the reaction has stopped. The depth of blackness is controlled by the length of time the solution is left in contact with the metal surface.
5. Rinse with running water, a damp cloth or damp sponge several times to remove residual blackening solution. Adding a small amount of baking soda to the rinse water will help insure the complete removal and neutralization of the residual acidic **Insta-Blak 333** solution. If the residual solution is not completely removed, it may cause rusting of the surface as it dries.
6. Wipe dry or force dry with a heat gun. Do not use compressed air to dry.
7. Rub area with a soft cloth or brush to remove the non-adherent layer of spent chemicals from the surface.
8. Repeat steps 4, 5, and 6 if a darker finish is desired.
9. To enhance the depth of blackness and impart corrosion resistance the finish must be sealed with one of **EPI's E-Tec** brand of corrosion inhibitors. **E-Tec 502** will leave a slightly oily finish, **E-Tec 505** a soft, non-tacky dry finish, **E-Tec 520** a hard clear acrylic finish and **E-Tec 521** a clear wax finish. For architectural interior finishes use **E-Tec 520**, **E-Tec 521**, **RENWAX** or **E-LAQ 525**.

Immersion Finishing Procedure for Insta-Blak 333 on Sterling Silver

All parts to be blackened with Insta-Blak 333 must be handled in the same manner prior to blackening (as per above instructions).

The process for blackening sterling silver will consist of:

1. Clean in **E-Kleen SR 148E** - 10% by volume, 140°F, 3-5 minutes

2. Cold water rinse
3. Deoxidizing with **E-Pik 215** – 8-16 oz/gallon, 70°F, 3-5 minutes
4. Cold water rinse
5. Blacken with **Insta-Blak 333** – 10% by volume, 70°F, 3-5 minutes
6. Cold water rinse
7. For architectural finishes, seal with **E-LAQ 525** (gloss finish), **E-Tec 520**, **E-Tec 521** or **RENWAX**

Immersion Solution Replenishment and Maintenance

The **Insta-Blak 333** solution is gradually depleted through use, but may be replenished indefinitely with periodic additions of **Insta-Blak 333** concentrate. The strength of the solution and the amount of concentrate to be added can be determined by titrating the solution per burette titration control procedure CP-1, available from **EPI** or with a sample dropping bottle test as outlined below.

The strength of the solution can also be fairly accurately maintained by the immersion time required to produce the desired depth of black. As the time increases, add sufficient concentrate to reduce the time to your established standard. A sample of a freshly prepared bath should always be retained as a control.

The frequency of additions will depend upon the volume of work processed through the solution. Coverage will be on the order of 400 sq/ft per gallon of concentrate added to the bath as replenishment.

For optimum results, the strength of the solution should be maintained at 85% of its original strength or greater at all times and frequent small additions are recommended. With automatic lines a bath history should be established while running the first several (15 to 25) racks or barrels, and by titrating the strength after every 5 loads to determine the point at which the solution is depleted approximately 10-15% - and replenishment is necessary. Timed metering pumps, triggered by the load, are recommended for replenishing the solution and maintaining a consistent strength.

If the ambient temperature in the plant drops consistently below 68°F then an electric heater may be used to maintain a consistent **Insta-Blak 333** solution temperature of 68 to 90°F.

The life of the solution and coverage will be increased by continuous circulation and filtration through a 50 micron filter. An alternative with smaller baths is to allow the solid by-products of the reaction to settle to the bottom of the tank and transfer the solution to a plastic holding drum to be retained for recharging the tank after the solids have been removed.

Immersion Dropping Bottle Control Procedure

A sample of a freshly prepared **Insta-Blak 333** production bath should always be taken as a control solution prior to running any parts through the bath. If a sample was not taken, a laboratory prepared solution at the same concentration may be used as the control solution. Titration of this “new” solution will provide the figure for D₁.

1. Transfer a 5 ml sample of the production bath into a 125 ml Erlenmeyer flask.
2. Dilute with water to the 50 ml mark.
3. Add 2 ml 6N (1:1) Hydrochloric Acid to the flask.

4. Add 4 ml of the 15% by weight Potassium Iodide solution.
5. Add 2 ml of Starch solution. The solution will become a dark blue to almost black color.
6. Add the 0.5N Sodium Thiosulfate solution, from the dropping bottle - drop by drop - counting the drops while swirling the flask.
7. The end point is marked by a sudden change in color from dark black to light brown.

Note: Upon standing, the light brown color will turn dark again, but additional Sodium Thiosulfate solution should not be added. The first end point is correct.

8. **Calculate** the amount of concentrate to be added as follows:

$$C_2 = \frac{D_1 - D_2 (C_1)}{D_1}$$

C₂= Insta-Blak 333 concentrate in gallons to be added to the bath

D₁= Number of drops of Sodium Thiosulfate used to titrate the new production bath.

D₂=Number of drops of Sodium Thiosulfate used to titrate the used production bath.

C₁=Volume of **Insta-Blak 333** concentrate in gallons used to make up the original "new" bath.

A test kit for the above procedure is available from **EPI**.

CAUTION

The **Insta-Blak 333** solutions are mildly acidic. Avoid contact with eyes, skin, and clothing. Wear eye protection (glasses, goggles, or face shield), protective rubber gloves and aprons when preparing solutions and while working with the solutions. Do not mix the **Insta-Blak 333** concentrate or solutions with cyanide or alkaline materials, or any other chemical substances. The **Insta-Blak 333** solutions are toxic if taken internally.

Do not work with the **Insta-Blak 333** solutions or other **EPI** products without first reading and understanding the **MATERIAL SAFETY DATA SHEET** furnished by **EPI**.

Packaging

One (1), 5, and 55 gallon non-returnable containers.

IMPORTANT NOTICE! For Industrial Use Only

The following is made in lieu of all warranties, expressed or implied, including the implied warranties of merchantability and fitness for purpose: seller's and manufacturer's only obligation shall be to replace such quantity of the product as proved to be defective. Before using, user shall determine the suitability of the product for its intended use, and user assumes all risk and liability whatsoever in connection therewith. **Neither seller nor manufacturer shall be liable either in tort or in contract for any loss or damage, direct, incidental or consequential, arising out of the use or the inability to use the product.**

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