Product Bulletin
Product Name: Black-Magic RT SS4
Product Code: 2260002
Revision Date: January 2, 2024

Black-Magic® RT SS4

Room temperature blackening solution for stainless steels.

Features & Benefits

Blackens at ambient temperatures	Reduction in energy costs
Used on different alloys	Works on 300-and-400-series stainless steel

Operating Conditions

Equipment
Acid-resistant equipment and tanks should be used for the Black-Magic RT SS4 solution as well as the acid pickle used to activate the stainless steel. Mild steel may be used for the cleaning, rinsing and sealant tanks.

Surface Preparation
Items to be blackened should be thoroughly cleaned in order to have effective and uniform activation and blackening

Cleaning
The type and degree of surface soil will determine the length of cleaning time as well as the cleaning temperature. Most parts can be cleaned in in the appropriate Hubbard-Hall's cleaner. For more difficult cleaning problems may require a longer immersion times and temperatures upwards of 180°F.

Activation
For uniform blackening, the passive stainless-steel surfaces must be activated. Following the cleaning and rinsing steps, the 300 series alloys are activated in a 50%v/v Muriatic Acid solution. For 400 series alloys, Quick Pik1 at a concentration of 2 lb/Gal water should be used.

Solution Makeup
Some experimentation should be done to determine the concentration of Black-Magic RT SS4 to be used. The type of stainless steel being processed as well as the immersion time requirements will determine the solution concentration. With 300 series stainless steels, try a 50% by volume solution in water as a starting point. With 400 series alloys, a 33% or 25% by volume solution may be used.

Passive stainless-steel surfaces can be further activated by having plain steel in contact with the stainless steel while immersed in the Black-Magic RT SS4 working solution. This can be accomplished by using plain steel hooks or racks to suspend the stainless-steel parts in the solution or by including some plain steel wire in the plastic dip baskets or rotating barrels used to contain the stainless-steel parts.

Finishing Procedure

A typical procedure would be as follows:

1. Appropriate Hubbard-Hall cleaner at elevated temperatures for 5 minutes.
2. Bottom-fed, overflowing water rinse for 30 seconds.
3. 50% Muriatic Acid activation, two to five minutes at room temperature. (Or Quick Pik 1, 2 lb./Gal for five minutes at 65°F. to 120°F.)
4. Bottom-fed, overflowing water rinse for 30 seconds.
5. Black-Magic RT SS4 at 50% by volume in water, two to three-minute immersion.
6. Bottom-fed, overflowing water rinse for 30 seconds.
7. To displace the rinse water, seal the finish, enhance the black, and impart corrosion resistance: immerse parts for one to two minutes in the appropriate Hubbard-Hall Metal Guard sealant. The ultimate depth of black will not develop until the sealant is completely absorbed into the Black-Magic RT SS4 surface and this may take several hours. A sealant must be applied before judging the depth of black.

Note: Rotating 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 contact with all surfaces.

Solution Replenishment and Maintenance

The blackening solution is gradually depleted through use but, may be replenished indefinitely with periodic additions of Black-Magic RT SS4 concentrate. The strength of the solution and the amount of concentrate to be added can be determined by titrating with Sodium Thiosulfate as outlined in the control procedure, or the strength can be maintained by noting the time of immersion. When the time required to produce the desired color increases, add enough concentrate to reduce the time to your established standard.

With automatic lines, a bath history should be established immediately after charging the tank by keeping a record of the number of loads processed versus the titrated strength to determine the point at which the bath is depleted, approximately 10% to 15% and replenishment is necessary. Timed metering pumps, triggered by the load, are recommended for maintaining a consistent strength.

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Test Kit Method

Equipment required	Chemicals required
4 oz Mixing Bottle	4 oz 6 N Hydrochloric Acid
2 Syringes (3 mL)	8 oz 15 %w/w Potassium Iodide
2 Syringes (5 mL)	0.5 N Sodium Thiosulfate
	0.5 w/v Soluble Starch Indicator

A sample of a freshly prepared 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 the "new" solution will provide the figure for D_1.

1. Using the 5 mL syringe, transfer 5 mL of the Black-Magic RT SS4 production bath
2. Using a clean 5 mL syringe, transfer 5 mL of the sample solution to the 120 mL mixing bottle.
3. Dilute with water to the 50 mL mark.
4. Add 2 mL 6 N Hydrochloric Acid.
5. Add 4 mL of the 15% by weight Potassium Iodide solution.
6. Add 2 mL of starch solution. The solution will become a dark blue to almost black color.
7. Add the 0.5 N Sodium Thiosulfate solution, from the dropping bottle - drop by drop - counting the drops while swirling the solution. The end point is marked by a sudden change in color from black to light brown.
8. Record the number of drops used.

Calculation

$$C_2 = \frac{D_1 - D_2}{D1} \times (C_1)$$

C_1 = Volume of concentrate in gallons used to make up the original "new" bath.
C_2 = Concentration in gallons to be added to the bath.
D_1 = Number of drops of Sodium Thiosulfate used to titrate the new production bath.
D_2 = Number of drops of Sodium Thiosulfate used to titrate the used production bath.

Example: New solutions of Black-Magic RT SS4 will titrate as follows:
1 to 1 water D_1 = 15 drops
1 to 2 water D_1 = 11 drops
1 to 3 water D_1 = 7 drops

Note: The volumes used in the above equation may be metric or English (i.e., liters, quarts, gallons, etc.)

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Caution

The Black-Magic RT SS4 solution is acidic. Avoid contact with eyes, skin and clothing. Wear eye shields, protective gloves and apron when mixing the solution and while working with the solution. The solution is toxic if taken internally.

Avoid contact of the Black-Magic RT SS4 concentrate and solutions with alkaline material.

DO NOT MIX BLACK-MAGIC RT SS4 WITH ANY OTHER CHEMICALS OR SOLUTIONS.

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