Black-Magic® RT S30

Room temperature blackening solution for iron and steel. Recommended for blackening powdered metal, cast and malleable irons, and forged steels. It is designed for low smut rather than jet black.

Features & Benefits

Maintains black over time with high silicon alloys	Blackens difficult alloys
ROHS and REACH compliant	Product good for use in Europe

Operating Conditions

Black-Magic RT S30 liquid concentrate is diluted with water. The black developed and the reaction rate with various metal surfaces is controlled by varying the concentration and the length of immersion. Prior to charging a production tank, some experimentation should be done with properly prepared sample parts to determine the conditions required to produce the desired finish.

Equipment
Acid-resistant tanks, tumbling barrels, baskets, hooks, and racks must be used with the RT S30 and Black-Magic Predip P solutions. PVC, plastic lined or rubber lined tanks and plastic-coated hooks and racks are suitable. Mild steel may be used for the cleaning, rinsing and sealant tanks.

Surface Preparation
Items to be blackened must be thoroughly cleaned and deoxidized. Some experimentation should be done with sample parts to determine the degree of cleaning and activation required to produce a uniform black finish. Parts to be blackened should be protected from rust during fabrication and in-plant storage prior to blackening to minimize surface preparation.

Cleaning
The type and degree of surface soil will determine the length of time required for cleaning and the number or cleaning steps and cleaning temperature. Lightly soiled parts can be cleaned in the appropriate Hubbard-Hall's cleaner. Heavily soiled parts may require a longer immersion time and temperatures upwards of 180°F.

Deoxidizing
Surface rust, if present, should be removed with 5 to 20% solution of Acid Brite 40 for cast iron at room temperature. Immersion times will normally range from one to five minutes. Muriatic acid should not be used to remove rust from cast iron. Use Acid Brite 40 only.

Activation
Black-Magic RT Predip P is used as an activator for difficult-to-blacken passive steel surfaces or as a conditioner to enhance the evenness of color between machined and un-machined areas. Black-Magic RT Predip P is normally used at 10 % by volume at room temperature. Immersion times will normally range from two to five minutes.

Blackening
Prior to charging a production tank, some experimentation should be performed with properly prepared sample parts, using various dilutions of Black-Magic RT S30 and different immersion times to determine the conditions required to produce the desired depth of black. As a starting point a 10% by volume is the best concentration. Determine by test, the shortest immersion time necessary to produce the desired depth of black, usually two to three minutes, depending upon the alloy and surface hardness. If the required immersion time exceeds five minutes, the concentration should be raised and the immersion time re-evaluated.

Finishing procedure
1. Clean and prepare surface as determined above.
2. Rinse for a minimum of 30 seconds in overflowing cold water to remove residual cleaner.
3. Immerse parts in the Black-Magic RT S30 solution for the length of time necessary to produce the desired depth of black.
4. Rinse for minimum of 30 seconds in overflowing cold rinse.
5. To displace the rinse water, seal the finish, enhance the depth of black and impart corrosion resistance: immerse parts for one to two minutes in Hubbard-Hall's Metal Guard sealants. The ultimate depth of black will not develop until the sealant is completely absorbed into the Black-Magic RT S30 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 solution 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 the Black-Magic RT S30. 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.

The frequency of additions will depend upon the volume of work processed. For optimum results, the solution should be maintained at 85% of its original strength or better with frequent small additions.

With automatic lines, a bath history should be established immediately after charging the tank by keeping a record of the processed verses the titrated strength to determine the point at which the bath is depleted approximately 6% to 7% and replenishment is necessary. Timed metering pumps triggered by the load are recommended for maintaining a consistent strength. The life and the coverage of the solution will be increased by continuous circulation and filtration.

For more complete operation instructions for the appropriate Hubbard-Hall cleaner, Metal Guard, and Acid Salt products, please see the individual instruction sheets.

Titration Method

Equipment required	Chemicals required
250 mL Erlenmeyer Flask	6 N Hydrochloric Acid
10 mL Graduated Cylinder	15 %w/w Potassium Iodide
50 mL Burette	0.1 N Sodium Thiosulfate
pH Meter	2 %w/w Soluble Starch Indicator
250 mL Beaker	0.1 N Sodium Hydroxide

Black-Magic RT S 30 - Concentration

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 this "new" solution will provide a standard.

1. Transfer a 15 mL sample of the production bath into the 250 mL Erlenmeyer flask.
2. Dilute with water to the 50 mL mark.
3. Add 10 mL 6 N Hydrochloric Acid to the flask.
4. Add 10 mL of the 15 %w/w Potassium Iodide solution.
5. Add 15 mL of 2 %w/w starch solution. The solution will become a dark blue to almost black color.
6. Titrate using the 0.1 N Sodium Thiosulfate solution while swirling the flask. 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.

7. Record mL used.

Calculation

Concentration = mL 0.1 N $Na_2S_2O_3$ x 0.7

Acid Content

1. Transfer a 30 mL sample of the production bath into the 250 mL Beaker.
2. Dilute with water to the 50 mL mark.
3. Use a pH meter and titrate to pH 7.0 using 0.1 N Sodium Hydroxide solution.
4. Record mL used.

Calculation

% Acidity = mL 0.1 N NaOH x 0.56

Test Kit Method

Equipment required

4 oz mixing bottle
2 syringes (5 mL)
2 syringes (3 mL)

Chemicals required

4 oz 6 N Hydrochloric Acid
8 oz 15 %w/w Potassium Iodide
0.1 N Sodium Thiosulfate
0.2 % Soluble Starch
0.1 N Sodium Hydroxide

Black-Magic RT S 30 - Concentration

1. Transfer a 5 mL sample of the production bath into the mixing bottle.
2. Dilute with 30 mL water.
3. Add 2 mL 6 N Hydrochloric Acid to the flask.
4. Add 4 mL of the 15 %w/w Potassium Iodide solution.
5. Add 2 mL of 2 % starch solution. The solution will become a dark blue to almost black color.
6. While swirling the mixing bottle, add the 0.5 N Sodium Thiosulfate solution dropwise. 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.
7. Record the number of drops used.

Calculation

Concentration = # Drops 0.5 N $Na_2S_2O_3$ x 0.33

Acid Content

1. Transfer a 10 mL sample of the production bath into the mixing bottle.
2. Dilute with water to the 30 mL mark.
3. Use a Phenolphthalein indicator.

4. Titrate using 1.0 N Sodium Hydroxide dropping bottle to a pink endpoint.
5. Record the number of drops used.

Calculation

$$\% \ Acidity = \# \ Drops 1.0 \ N \ NaOH \times 0.56$$

Caution

The Black-Magic RT S 30 solution is mildly acidic. Avoid contact with eyes, skin and clothing. Wear eye shields, protective gloves, and apron. The solutions are toxic if taken internally.

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please call us at 203.756.5521 or email: techservice@hubbardhall.com

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