Black-Magic® Infusion Powder

A hot black oxide process for steel, Black-Magic Infusion Powder converts outer micron of steel to black oxide passive phase for corrosion protection acting as a micro layer to hold corrosion inhibitors and oils.

Black-Magic Infusion Powder is the new standard against which all other black oxide processes will be compared for performance and quality. This formulation contains a unique blend of activators, rectifiers, catalysts, and penetrates designed to produce the darkest black available. Black-Magic Infusion Powder's unique formulation also allows the user to decrease the immersion without a sacrifice in quality. In fact, Black-Magic Infusion Powder is designed to minimize the common problem of red iron oxide adherence on to the work.

Features & Benefits

Military Spec MIL C 13924, Mil C 46110 AMS 2485	Conforms to specifications for black finishes
ROHS Compliant	Reduction of hazardous chemicals
Wear-in-Break-in function	Friction/Torque reduction
No dimensional change	High tolerance operations

Operating Conditions

Black-Magic Infusion Powder oxidizing salts are a free-flowing, dust-free granular mixture which is used at a concentration of 5 to 1/2 to 6 lb per gallon of water. The solution is operated at a low temperature of 280°F to 285°F to blacken a wide range of carbon steels, alloy steels and hardened tool steels.

<u>Solution Make-up</u>

Rectangular Tank – solution level 6" from top.

$$\text{Black-Magic Infusion Salt required for initial solution} = \frac{L'' \times W'' \times (D''-6'') \times 5\text{-}1/2 \text{ lb per gallon}}{231 \text{ cubic inches per gallon}}$$

Compute the amount of salts required by using the above equation. Fill the tank a little less than half full of cold water. Do not apply heat currently. Start adding the salts to the water with continues stirring to avoid the formation of lumps. When the required amount of Black-Magic Infusion Powder salts has been added, continue to stir and fill the tank with water to within 6” from the top.

Heat is applied to the solution, and as the temperatures rises, it should be stirred frequently to ensure thorough mixing and a uniform temperature throughout. When the temperature reaches 270°F to 280°F, it should begin to boil. If it does not, water should be added slowly with stirring until it begins to simmer. The resulting Black-Magic Infusion is used as a supersaturated solution, and it should be allowed to boil for at least one hour before additional salt is added to ensure that the true boiling point has been reached with all the salts thoroughly dissolved.

When the Black-Magic Infusion solution is boiling a range of 280°F to 285°F., it is ready for processing work. Although the temperature of the solution can be maintained by manually adding water, we recommend that an automatic indicating temperatures controller be used. The only reason for boiling point rise is due to the evaporation of water. The automatic temperature controller will replenish this water as needed to maintain the correct boiling point and concentration. It will also protect against the undesirable and detrimental overheating of solution. An automatic controller also relieves the operator of the responsibility for maintaining the temperature; and it ensures consistent, uniform, high-quality finishes.

If the temperature of the solution climbs above 290ºF, water must be added to replenish evaporated water and reduce the temperature. Extreme care must be taken when adding water at high temperatures to avoid splattering and eruptions. In order to safely add water and control the boiling point of the solution, water should be introduced by a water feed pipe, hung across the backside of the tank, near the top, with 1/8” or 3/16” holes, drilled 2” apart which directs incoming water against the tank wall, allowing water to uniformly cascade down the tank wall into the black oxide solution.

Do not introduce water below the surface of the solution. We recommend that an automatic indicating temperature controller and motor operated water inlet valve be used to safely control the additions of water. The automatic controller will replenish evaporated water as need to maintain the correct boiling temperature and concentration. It will also protect against the undesirable and detrimental overheating of the solution. Automating the water additions will relieve the operator of the responsibility for maintaining the temperature and ensures consistent, uniform, high-quality black finishes. Hubbard-Hall can recommend suppliers of automated temperature controllers and water inlet valves with the preferred drilled piping to introduce the water along the rear wall of the tank above the solution level. Consult us for advice prior to installing a water inlet to a tank.

Equipment

The Black-Magic Infusion tank must be constructed of mild steel. The cleaning and rinse tanks may also be constructed of mild steel. Acid pickling tanks should be plastic or rubber-lined steel or rigid Polypropylene.

Gas-heated tanks are preferred and should be under fired and insulated. Immersion electric units should be constructed of mild steel and be insulated. Racks, hooks and baskets must be constructed of mild steel. Non-ferrous metals such as galvanized iron, bronze, copper, tin or aluminum should not be used for racks or baskets as these materials will contaminate the Black-Magic Infusion solution. Aluminum reacts violently with the hot solution.
Hubbard-Hall can recommend suppliers to assist you in selecting and installing the proper controls as well as the complete tank system required for the process.

Alkaline cleaning, acid pickling and the Black-Magic Infusion solutions must be exhausted. The duct work may be of the same materials as recommended above for the tanks. Galvanized steel should not be used.

Notice: Before using this material, read and understand the OSHA Safety Data Sheet for Black-Magic Infusion Powder. Specific instructions and precautions should be followed to assure correct use and personal safety.

Finishing Procedure

Pieces to be blackened may be processed in mild steel baskets, tumbling barrels, hung on racks or hooks, depending upon the shape and weight and production requirements.

1. Thoroughly clean and degrease pieces with the appropriate Hubbard-Hall cleaner. A typical cleaning time is five to ten minutes.
2. Rinse in bottom-fed, overflowing cold water rinse.
3. Immerse in Black-Magic Infusion solution (boiling at 285°F to 290°F) until a uniform, deep black color is developed. Immersion time will be from 5 to 20 minutes, depending upon the mass of parts and type of steel alloy and condition of the surface.
4. Rinse in bottom-fed, overflowing cold water rinse.
5. If work being processed requires a non-chrome seal per Mil-DTL-13924E, Class 1, Emerald Seal 303 or Emerald Seal 308 should be used.
6. Seal the finish by immersing for one minute in the appropriate Hubbard-Hall Metal Guard to obtain the desired finish and / or corrosion protection.

Note: If the pieces to be blackened have scale or rust on the surface, it must be removed following cleaning and rinsing (Steps 1 and 2) in a 50% by volume Muriatic Acid Solution or an 8 ounce to 2lb/Gal solution of Hubbard-Hall's Acid Salt W, dry acid salts. Rinse thoroughly with water following descaling and de-rusting. When meeting specifications all testing, and procedures must be followed usually omitting acid activation.

Operating Tips

Problems will rarely arise with a properly maintained and controlled Black-Magic Infusion solution. Its unique rectification eliminates the necessity for frequent sludge cleanout as is required with conventional formulations. Most problems can be traced to insufficient cleaning of the work or an incorrect boiling temperature. Other tips would include:

1. A glass mercury thermometer should be used to check the accuracy of the automatic temp. control.
2. Frequent small additions of replenishment salts will produce more uniform results than large amounts added less frequently.
3. Ideally, the temperature of the solution should not drop below boiling when work is introduced. Enough heat should be maintained to ensure that the solution does not drop below the boiling point for more than a few minutes, even with the heaviest loads. Maximum loads should not exceed one pound of work per one gallon of solution. Optimum loads would be approximately one pound of work to one gallon of solution including the weight of barrels, baskets or racks.
4. Operating the bath at temperatures approaching 300°F or over will cause the buildup of red iron oxide, which can cause a red smut or an off-color on the surface of the blackened parts.
5. The bath should be periodically de-sludged to remove accumulation of sodium carbonate, iron oxide and other solids. In addition, the surface of the solution should be periodically skimmed with a sludge skimming tool to remove hydrated iron oxide from the surface.
6. Transfer time from the Black-Magic Infusion bath to the rinse water should be as short as possible to avoid the development of an off-color on the metal surface.
7. A thorough final rinse after blackening will minimize contamination of the sealant solutions.

Caution

Before using this material, read and understand the OSHA Safety Data Sheet for Black-Magic Infusion Powder. Specific instructions and precautions should be followed to assure correct use and personal safety.

This material contains Caustic Soda and can cause severe burns.

Avoid contact with eyes, skin and clothing. Do not take internally. When handling the solution and working near the bath, wear goggles or face shield, rubber gloves and rubber apron. While preparing solutions and making additions, take care to avoid violent spattering.

In case of contact, immediately flush skin or eyes with plenty of water for at least fifteen minutes. For eyes, call a physician.

Avoid contact of Black-Magic Infusion solutions with any other chemicals or solutions.

WARRANTY: THE QUALITY OF THIS PRODUCT IS GUARANTEED ON SHIPMENT FROM OUR PLANT. IF THE USE RECOMMENDATIONS ARE FOLLOWED, DESIRED RESULTS WILL BE OBTAINED. SINCE THE USE OF OUR PRODUCTS IS BEYOND OUR CONTROL, NO GUARANTEE EXPRESSED OR IMPLIED IS MADE AS TO THE EFFECTS OF SUCH USE, OR THE RESULTS TO BE OBTAINED.

Our people. Your problem solvers.

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