

# Black-Magic<sup>®</sup> Infusion

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

## Features & Benefits

Meets Military Specs: MIL C 13924 Class 1, 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

The Black-Magic Infusion solution is operated at a temperature of 285°F., to blacken a wide range of carbon steel, alloy steels and hardened tool steels.

A new bath started by filling the tank with Black-Magic Infusion solution, as received, to within six inches from the top. Heat is applied and the solution is brought to a gentle rolling boil at approximately 275°F. Black-Magic Infusion is used as a supersaturated solution and it should be allowed to boil for a while to evaporate some water and reach a boiling temperature of 285°F. Thereafter, the solution must be maintained at 285°F to 290°F for blackening steel.

Maintain the proper working level in the tank by the addition of Black-Magic Infusion solution preferably by means of a metering pump directly from the shipping container. If the Black-Magic Infusion solution is added manually, care should be taken to avoid too rapid an addition, which could lead to splattering, or an eruption on the surface. Allow the



Black-Magic Infusion solution to slowly run an along a corner of the tank. If the temperature of the solution climbs above 290°F, 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 safety control the additions of water. The automatic controller will replenish evaporated water as needed 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 supplier 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.

### 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 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 sealer to obtain the desired finish and / or corrosion protection.

NOTE: If 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 in the appropriate Hubbard-Hall dry acid salt. Rinse thoroughly with water following descaling and de-rusting.



### 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 solution 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-half gallon of solution, including the weight of barrels, baskets or racks. Optimum loads would be approximately 1 pound of work per 1 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 surface.
7. A thorough final rinse after blackening will minimize contamination of the sealant solutions.

### **Caution**

Product will freeze. Store above 55° F.

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.



**Cleaning**  
the Hard to Clean



**Finishing**  
the Hard to Finish



**Treating**  
the Hard to Treat

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. Specific instructions and precautions should be followed to assure correct use and personal safety.

**CAUTION...THIS MATERIAL CONTAINS CAUSTIC SODA. CAUSES 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.

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## **Our people. Your problem solvers.**

For more information on this process please call us at  
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