HAVABLACK SS
BLACK OXIDE FOR STAINLESS STEEL

HAVABLACK SS
is a specially developed process for producing jet black conversion coatings on stainless steel.

HAVABLACK SS
does not produce hydrogen embrittlement of the ferrous alloys making it an excellent finish for springs and tools.

HAVABLACK SS
coatings impart minimal dimensional changes to the part (av.10 millionths of an inch) has good wear resistance, excellent adhesion properties and will not flake off or chip even when parts are exposed to extreme deformation.

HAVABLACK SS
is economical to run and lends itself to small part / high surface area throughput.

HAVABLACK S
is also capable of blackening cast and malleable irons as well as steel, for superior quality finishes

OPERATING CONDITIONS:

<table>
<thead>
<tr>
<th>Concentration</th>
<th>See SOLUTION MAKE-UP below</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>250 – 260 °F (121-127 °C),</td>
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<tr>
<td>Time</td>
<td>2 - 15 minutes</td>
</tr>
</tbody>
</table>

EQUIPMENT:

HAVABLACK SS processing tanks should be constructed of steel with the gauge of steel used being sufficient to hold a solution weighing 14 pounds/gallon and tank joints secured with double oxide free welds.

Steam may be used for solution heat if 80 pounds/in² is available. The coil should be installed at one side or end of the tank and tank walls and bottom being insulated with one-inch magnesia insulation held on by steel casing. Steam coils should NOT be put on the bottom of the tank.

If high-pressure steam is not available, gas pipe burners can be used. Tank walls should then be insulated on all four sides with one-inch magnesia insulation held together with steel casing, allowing 1-2 inches of spacing between tank wall and the insulation to allow heat to rise on the side of the tanks. (Note: It will take approximately 1700 BTU’s to heat one gallon of solution from room temperature to 285 °F.)
EQUIPMENT (Cont.):

Electrical immersion heaters may also be used to control temperature, with 100 gallons of solution requiring 60 KW to heat tank in one hour from room temperature to 285 °F. The electrical heater should be installed on one side of the tank and NOT on the bottom. Usually, heaters are designed for 220 or 440 volts to keep the required amperage down.

PROCESSING EQUIPMENT:

Work can be processed on racks, in baskets or in barrels. This processing equipment should be made of steel. **There should be no copper, lead or other non-ferrous metals in contact with the solution.** Racks should be agitated to assure solution contact on all areas. Bulk handling equipment, such as barrels, cylinders or baskets should be tumbled occasionally to assure contact areas are coated.

SOLUTION MAKE-UP:

Compute the amount of **Havablack SS** salts required by using the equation shown below.

Rectangular Tank – Solution level 6" from top.

\[
\text{Havablack SS required for initial make-up} = \frac{L'' \times W'' \times (D'' - 6'') \times 4\frac{3}{4} \text{ lb/ gal}}{231 \text{ cubic inches per gallon}}
\]

1. Measure the tank volume to the operating level 6" from the top (divide cubic inch volume by 231 to obtain gallons).
2. Fill tank half full with cold water.
3. SLOWLY, add the required amount of **HAVABLACK SS** to the water with constant stirring. The temperature will rise as the salts are added. An iron paddle should be used to stir the solution.

**CAUTION:** There can be splattering, boil-over or caustic spray of this material as it is added. Therefore, personal protective equipment must be worn by the operator. If mist or is present consideration should be given to wearing a respirator. Refer to the MSDS for more information.

4. After all salts are dissolved (check bottom of tank with paddle), water should be added with constant stirring until the solution is 2" below the operating level.
5. Then, start heating the tank while stirring until the bath starts to boil.

**NOTE:** Operating, boiling temperature should be 250-260° F. If the boiling temperature is below 250 °F, SLOWLY add salts until the boiling point of 255 °F is reached. If the boiling point exceeds 265 °F, add water until the boiling point is within range. The heat should then be lowered to provide a gentle roll.
**CAUTIONARY NOTES:**

Water additions to the tank can create splattering, eruptions or boil-over due to the high temperature. There are two methods that can be used to control water content in the bath, which determines the boiling point and concentration. Usually, the boiling point increases due to evaporation.

1. **Automatic Method:** Use a Bristol automatic temperature controller, an electric, lock-in relay, and a 1/2 hp motor-operated valve on a 1/2" water line.

2. **Manual Method:** Use a dial thermometer for easy observation by operator and a hand-operated water valve on a 1/2" water line.

The water pipe should be 1/2" black iron and extend to a point just above the normal solution level and the pipe should be capped with a 1/8" hole drilled on the side that faces the tank wall.

A shield should be constructed to prevent splattering toward the operator. The pipe and splash shield should be located on the backside of the tank away from the operator or loading end of the tank. Water should be added while the solution is heated to the boiling point. This will provide agitation to get water mixed into solution. If agitation is not maintained while water is being added, other methods of agitation must be provided.

**Note:** The water, otherwise, may not mix and can form a layer on top of the solution. This can result in an eruption that could cause boil-over of the solution from the tank.

**PROCESSING PARTS (TYPICAL CYCLE):**

1. Clean in alkaline cleaner, **CLEANER SSP-140**, 8 oz/gal (60 g/l), 180-200 °F (82-93 °C), to remove soils.

2. Cold water rinse.

3. Hydrochloric Acid pickle.

4. Cold water rinse.


6. Rinse in cold, running water.

7. **OPTIONAL:** For lacquering, paints or phenolic varnishes, dip for 3-5 minutes in 0.5-1.0 oz/gal. (3.8-7.5 g/l) chromic acid solution.

8. Cold water rinse.
TYPICAL CYCLE (CONT.):

9. Dip in hot water to dry parts prior to lacquering or applying wax or oil finishes.

10. Immerse in DIS-PRO-TEC or HAVASOL EC-73 for 1-5 minutes. Agitate parts to aid in displacement of water from the surface of parts. This may be accomplished by raising and lowering baskets loaded with parts, rotation of barrels loaded with parts, while in the DIS-PRO-TEC / EC-73 etc.

10b. Immerse dry parts in water based lacquer, HP HAVA-LAC. Do not heat the solution. Allow parts to drip dry.

SOLUTION REPLENISHMENT:

Salts are lost by drag-out and water is lost by evaporation. Salts are added only to raise level of tank and boiling point. If solution level falls below working level, add water until solution boiling point is 250-260 °F. Then add salts SLOWLY with stirring and maintain at a gentle boil or roll.

ADDITIONAL PROCESSING INFORMATION:

By nature, stainless steel surfaces are passive, thus in preparing the metal surface prior to blackening, it is necessary to use an acidic pickle. This de-passivates the surface slightly to enable the blackening solution to react with it to produce the black finish on occasion, the 50% by volume Hydrochloric acid solution may not sufficiently activate the metal surface. In this instance, stronger measures are required with the following pickle:

\[
\text{90% by volume Hydrochloric acid} \\
\text{5% by volume Sulfuric acid} \\
\text{5% by volume water}
\]

This pickle is also used at room temperature, with a minimum immersion time of 5 minutes. Note that in preparing this solution, the sulfuric acid must be slowly added to cold water. This mixture must be allowed to cool before adding the Hydrochloric acid.

A third, stronger activation procedure consists of the following:

After pickling at room temperature in one of the above Hydrochloric acid solutions, proceed as follows:
A. Immerse in HAVABLACK SS ACTIVATOR to produce the required de-passivation. Used at a concentration of 1 to 2 lbs. Of SS ACTIVATOR salts per gallon of water, the solution temperature is maintained between 150 – 160 degrees F., with immersion times of 30 seconds to 3 minutes. A 25% by volume sulfuric acid solution can be used as an alternative.
B. Rinse in bottom-fed, overflowing cold water rinse and continue with blackening step #5.
OPERATING TIPS:

Problems will rarely arise with a properly maintained and controlled solution. Most problems can be traced to insufficient surface reparation of the work or an incorrect boiling temperature. Other tips would include.

1. A glass thermometer should be kept on hand to check the accuracy of the automatic temperature controller.
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. Sufficient 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 1 lb of work per ½ gallon of solution. Optimum loads would be approximately 1lb. of work to one gallon of solution, including the weight of barrels, baskets and racks.
4. Transfer time from the HAVABLACK SS bath to the rinse water should be as short as possible to avoid the development of an off-color on the metal surface.
5. A thorough final rinse is non-adherent, an immersion time in the HAVABLACK SS solution of 2 minutes is recommended.

TROUBLESHOOTING:

Failure to Blacken:

1. Work has passivated in HAVABLACK SS solutions that were not up to operating temperature. To correct, remove parts and rinse; dip in hydrochloric acid or sulfuric acid; rinse and re-blacken at proper temperature.
2. If solution is boiling and parts do not coat, check temperature with another thermometer since thermometers often get out of adjustment.
3. If work turns yellow or yellow-red in color, the solution is too high in temperature and concentration. Water should be added to lower the boiling point.
4. A yellow or yellow-red color can also be caused by improper rinsing of steel that has previously been pickled. An immersion in HP ACID SALTS FLWET will remove the rust or iron residue from the parts.
5. If the bath becomes contaminated by iron salts from pickling, the resulting coating can have a reddish smut. For corrective action, refer to Purification Procedures below.
6. Contamination of the solution with copper causes work to turn a red color. For corrective action refer to the section of Purification Procedures below.
PURIFICATION PROCEDURES:

1. Transfer solution to a separate tank and dilute to 50% strength with water. The iron contamination will precipitate out.

2. Add 1.0-1.5 pounds of sodium sulfide/1000 gallons of the 50% strength solution. Dissolve the sodium sulfide in water before additions. Copper sulfide will form as a black precipitate.

3. Allow to settle for 4-8 hours before transferring the top one-half of the solution back to the working tank. Clean the working tank of all sludge, scale and parts before returning solution.

4. Bring the working tank back to operating strength with fresh salts. The remaining CLEAR solution can be used as replenishing solution. This will reduce the salts consumed in purification to a minimum.

SAFETY & HANDLING:

THIS MATERIAL CONTAINS SODIUM HYDROXIDE AND CAN CAUSE SERIOUS BURNS. Do not get in eyes, on skin or clothing. Avoid breathing dusts or mists. Do not take internally. When handling, wear goggles or face shield. While making solutions, add slowly to surface of solution to avoid violent reaction and spattering. In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. For eyes, call a physician.

WASTE DISPOSAL:

Wastes must be tested using methods described in 40 CFR Part 261. It is the generator’s responsibility to determine if the waste meets applicable definitions of hazardous wastes. Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

When empty, containers may still be hazardous because of product residue. All labeled hazard precautions must be observed.

NON-WARRANTY:

The data contained in this bulletin is believed by Haviland Products Company to be true, accurate and complete. However, since final methods of use for this product are in the hands of the customer and beyond our control, we cannot guarantee that the customer will obtain the results described in this bulletin. Haviland Products Company cannot assume any responsibility for the use of this product by the customer in any process, that may infringe the patents of third parties.