

Spot Corrosion Repairs Using the Radial Bristle Disc

Discs Now Approved for Use on Aircraft Substrates

Abrasive wheels and flap brushes have long been used for small corrosion and paint removal applications on aluminum surfaces. However, these technologies can also remove more than just corrosion—they remove critical portions of the metal substrate as well.

Recently, the Naval Air Systems Command (NAVAIR) authorized the use of the 3-inch radial bristle disc for removing coatings and corrosion from aluminum substrates. Introduction of this technology to the Fleet was conducted in accordance with Interim Rapid Action Change (IRAC) #26 to

the Aircraft Weapons Systems Cleaning and Corrosion Manual (NA-01-1A-509) and was introduced as a replacement for the flap brush and abrasive wheel. Naval Air Depot (NADEP) North Island issued IRAC #26 Date Time Group 171121Z April02. Laboratory testing is being conducted with the discs on high strength steel, magnesium, titanium and composite surfaces. Once testing has been completed, authorization for the use of bristle discs on these additional surfaces will be addressed via a separate IRAC.

Bristle Disc Characteristics

The bristle discs are comprised of a polymer that contains aluminum oxide and a proprietary element, which gives the discs their grit equivalency. Two types of discs have been approved for use within the fleet. For external aluminum surface application, an orange disc with a grit equivalency of 400 has been designed for use on light surface corrosion discrepancies, such as filiform, and is also ideal for edge feathering. A yellow disc with a grit equivalency of 360 has been designed for use on heavier corrosion and light

to moderate surface pitting discrepancies. The yellow disc is also capable of removing light amounts of sealant around access panels and other similar structures.

Naval Air Depot (NADEP) Jacksonville has successfully completed testing on both discs and has recommended the yellow and orange discs for application on high strength steel and titanium surfaces. A formal IRAC to the NA 01-1A-509 will be issued shortly to include the utilization of both discs for use on high strength steel and titanium substrates.

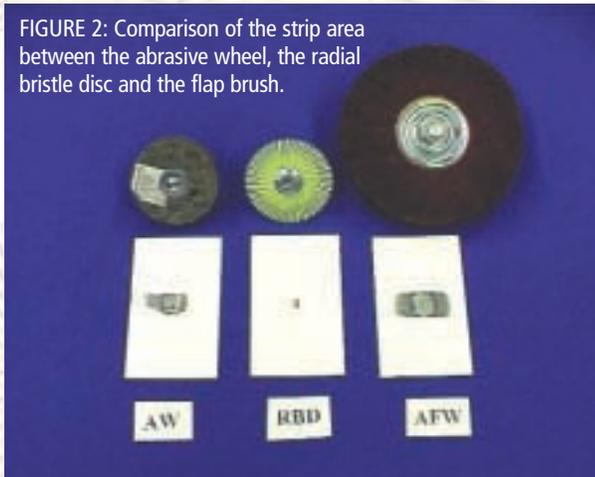


FIGURE 1: Pneumatic grinder and both types of bristle discs.



VAQ-131 corrosion control personnel aboard the USS Constellation in the Persian Gulf. (BACK) AM3 Jason Clark, AM3 Josh Lawson. (FRONT) AM3 Shane Lee, AM3 Joy Timpog.

FIGURE 2: Comparison of the strip area between the abrasive wheel, the radial bristle disc and the flap brush.



not recommended for utilization on moderate to heavy corrosion on high strength steel.

The 400-grit equivalent bristle disc is not recommended for any corrosion removal, as it is too light in abrasiveness; therefore it is only effective for organic coatings removal on high strength steel surfaces.

The working area of the discs is 0.75 inches. The effectiveness of the tool will expire once the bristle fingers are worn down to the disc hub. At this point, the tool is rendered ineffective and must be replaced with a fresh disc. Figure 1 displays the two types of available colors, with pneumatic grinder and mandrel assembly.

Bristle Disc Operation

The bristle disc requires an air source of 90-110 pounds per square inch along with a high-speed pneumatic die grinder rated from 22,000 -25,000 revolutions per minute (rpm) and a

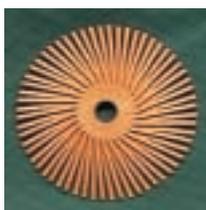


FIGURE 3: Correct angle of the disc fingers when mounted on the mandrel assembly. Note the disc fingers are angled toward the direction of the grinder rotation.

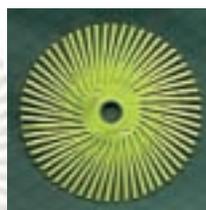


FIGURE 4: Incorrect position of the disc when mounted on the mandrel assembly. Note the disc fingers are angled against the direction of the grinder rotation.

mandrel assembly. (Note: The existing pneumatic grinders in the Fleet are not rated for the bristle disc technology. The existing grinders are not adequate because they only spin at 3,200 rpm.) Operating the grinder at its maximum rated speed is required to ensure maximum efficiency and effectiveness. It is only necessary to apply a small

amount of pressure to the tool in order to strip a surface. The tips of the bristles are the working element of the tool. Maintaining light pressure on the grinder and moving the grinder either in a vertical or horizontal manner over the affected area will achieve the best result. If too much pressure is applied, the bristles will fold and render the tool inoperative without damaging the surface. With the old abrasive wheels and abrasive flap wheels, increased pressure caused the wheels to grind into the bare metal causing “valleys” to form. The bristle disc creates a small, self-contained stripped area without removing excessive coating, as displayed in Figure 2.

Mounting the Bristle Disc on the Mandrel

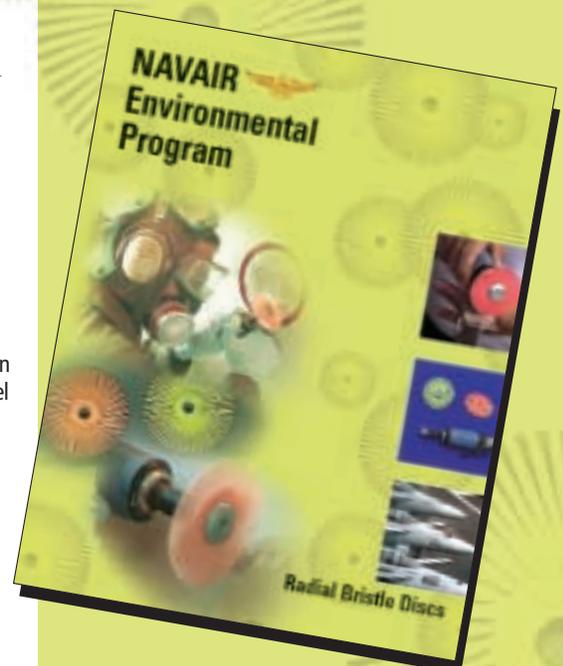
The bristle disc must be positioned on the mandrel assembly with the arrow facing in a clockwise direction. (Note the directional rotation arrow on the disc hub.) The disc fingers are angled

away from the direction of the grinder rotation as shown in Figure 3. (Note the angle of the tips of the disc fingers.) This is the correct installation procedure.

Placing the disc on the mandrel in a counter-clockwise fashion will damage the aluminum substrate and the tool. If the disc fingers are angled toward the direction of the grinder rotation, they will separate from the disc hub. When operating the tool in this manner, damage to the substrate and personal injury may result from disc finger separation. Figure 4 indicates the incorrect position of the disc when mounted on the mandrel assembly.

Bristle Disc Fact Sheet Available on the Web

A fact sheet on the proper use and procurement of the radial bristle discs is available for downloading via the NAVAIR environmental web site at www.enviro-navair.navy.mil (“dot-mil” restricted).



Key Features

of the Radial Bristle Disc

- **Labor Reductions**
Bristle discs can result in a 50 percent reduction in labor for small corrosion removal and paint applications on aluminum. This is because the uniform concentration of mineral provides a high cut rate for a faster, more uniform finish.
- **Saves the Substrate**
Bristle discs will not degrade bare metal like the flap brushes can. The flexible bristles of the discs conform to the contours of the part for consistent results without removing base material. This reduces the amount of damage done and the rework required.
- **Reduced Surface Temperature**
The bristle disc produces about 100 degree Fahrenheit (F) surface temperature, while the abrasive wheels yielded temperatures around 200 degrees F.
- **Reduced Treatment Area**
Since the bristle discs are more precise and do not remove excess paint, the treatment area required is reduced.
- **Approved for Use on Aluminum**
The bristle discs have been approved for use on external aluminum surfaces for small corrosion and paint removal applications.*
- **Approval for Use on High-strength Steel and Titanium Surfaces**
Pending until a formal IRAC is issued to the NAVAIR 01-1A-509.
- **Easier to Use**
The bristle disc requires 1.5 pounds of pressure to be applied (via the grinder) in order to remove corrosion. Abrasive wheels require 12 pounds of pressure to accomplish the same task.

**The bristle discs have been approved for use only on aluminum surfaces for small corrosion and paint removal applications. They are not to be used inside fuel tanks. Use of the discs on metallic surfaces other than aluminum, may result in damage to the surface. Use of the discs on composite surfaces will result in severe fiber damage to composites.*



LEFT: The old method utilized a low-speed grinder and either an abrasive wheel or flap brush.

RIGHT: The new method employs a high-speed grinder and the radial bristle discs.

Safety and Health

The use of the radial bristle disc generates dust particles that may contain chromates from primers. Therefore, eye and respiratory protection equipment is required when operating the tool. Improper mounting of the disc on the grinder-mandrel assembly as indicated in Figure 4 can cause personal injury due to separation of the disc fingers from the disc hub. Additionally, damage to the substrate and disc can occur.

Training

The training required to ensure for the proper operation of the discs is minimal. Naval Air Technical Data and

The bristle disc creates a small, self-contained stripped area without removing excessive coating.



The orange radial bristle disc is shown being utilized on an E-2C engine nacelle at VAW-120 Norfolk, VA.

Engineering Service Command (NATEC) representatives will perform training as part of regular training to the fleet, and the bristle disc technology will also be included in the Naval Aviation Maintenance Training (NAMTRA) corrosion control curriculum. In an attempt to reach all aviation activities, especially those units afloat and deployed to remote operating areas, a training CD has been prepared by NAVAIR and will be distributed throughout the Fleet. This CD should be available in the spring of 2003.

Procurement

At the present time, no other commercial off-the-shelf bristle discs meet NAVAIR's specification standards.

Although many types of discs are available on the open market, the only authorized discs are manufactured by the 3M Corporation:

- Orange discs (for light surface corrosion removal): 3M part number 61-5001-8792-9, National Stock Number 4920-01-493-2510, and
- Yellow discs (for heavier corrosion): 3M part number 61-5001-8790-3, National Stock Number 4920-01-493-2514.

The radial bristle discs can be procured in several ways. Discs can be ordered using Military Standard Requisitioning and Issue Procedures (MILSTRIP) or through the federal stock system under the Electronic Mall (EMALL) contract SP0410-01-D-E006. The discs can also be ordered using a unit or squadron credit card directly from the vendor by calling the 3M federal systems requisition representative at 800-944-4181. The bristle discs are packaged in a case of 40, four boxes to the case. Each box contains ten discs. The cost for the discs are \$3.05 each or \$122.00 per case. The pneumatic grinder is approximately \$79.00 and the associated mandrel assembly is \$7.81. National stock numbers and additional information are contained in IRAC #26. ⚓

CONTACT

Tom Doughty
Aerospace Materials Laboratory
NAVAIR Patuxent River
301-342-8052
DSN: 342-8052
DoughtyTG@navair.navy.mil