Just the Right Package

A Better Way To Treat Magnesium Parts

Two engineers from the Naval Air Depot (NADEP) Cherry Point, NC have developed just the right package for applying a corrosion resistant, surface treatment to magnesium parts prior to repainting.

Background

The processes and materials for pretreatment and prevention of corrosion on magnesium alloy SAE AMS-M-3171 Type VI (Society of Automotive Engineering, Aerospace Materials Specification (formerly MIL-M-3171 Type VI)) are specified in the Aircraft Cleaning and Corrosion Control Manual (NAVAIR 01-1A-509), commonly referred to as the "Corrosion Control Manual." This material is primarily used to touch-up and repair small areas on magnesium parts such as transmission housings and gearboxes. It provides a corrosion resistant, surface treatment to the magnesium parts prior to repainting without the use of a chromate conversion coating. Lacking this protection, these parts can easily corrode causing irreversible damage.

Magnesium Treatment Kit.

Until now, this magnesium treatment material has not been readily available in premixed form. Instructions required users to "make" this material themselves by mixing hazardous chemicals or obtaining the premixed materials from Depot-level activities. These requirements often led to long process delays while maintenance personnel waited for the appropriate materials to be prepared. Lack of material availability can have a serious and direct impact on readiness. Magnesium surface treatment, as specified in many technical procedures for touch-up repair of magnesium alloys, has been particularly difficult to obtain, particularly in limited quantities, for corrosion repair of small areas at Fleet-level activities. In addition to safety and environmental concerns, the existing instructions for the proper touch-up repair of magnesium alloys were deficient. Enter Wesley Lamb and James Whitfield.

Scope

Wesley Lamb and James Whitfield are two materials engineers in the Materials Engineering Division at NADEP Cherry Point, NC who recognized the need to package a magnesium treatment kit that was:

- Easy for the Sailors and Marines to obtain,
- Premixed to minimize occupational hazards to maintenance personnel,
- More efficient to apply, and
- More environmentally sound.

"We knew the Marines and Sailors did not have the materials needed to do their job and didn't know how to get them," said Lamb. "As a result, we were seeing a lot more corrosion than we should have."

So Lamb and Whitfield investigated several packaging options. Initial evaluations included 1- and 2-ounce bottles, brush-top bottles and dispensers (identical to the those used in the Alodine 1132 Touch-N-Prep™ pens). Considerations were given to ease of use, storage conditions and

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material quantities required per job. None on these variants were considered adequate.

From a convenience and safety standpoint, Lamb and Whitfield hoped that the Alodine 1132 dispenser would satisfy user requirements, but hands-on evaluation revealed several significant drawbacks. These drawbacks included difficulty in properly treating tight areas, such as recesses and o-ring grooves. In addition, Lamb and Whitfield recognized the dangers associated with users applying this material without rinsing (in a manner similar to Alodine 1132). Unlike Alodine 1132, magnesium treatment material must be completely rinsed from the surface with fresh water after treatment to prevent the reformation of corrosion.

After evaluating several different container styles, Lamb and Whitfield determined that an 8-ounce, screw top bottle was the best choice. Once Lamb and Whitfield found the optimal package, they worked with Henkel Surface Technologies of Madison Heights, MI (currently the sole source vendor) to package this material in small, ready-to-use kits. Their objectives were to make this product easy to use, affordable and readily available via a National Stock Number (NSN). In addition, the material needed to be consistent with chemistry and process requirements specified in the Corrosion Control Manual.

Results

After extensive hands-on evaluations and obtaining feedback from users, Lamb and Whitfield determined the appropriate packaging for the Magnesium Treatment Kit. (This kit contains products formulated for treating magnesium alloys to produce a chromate conversion coating conforming to the SAE AMS-M-3171, Type VI specification.

Lamb and Whitfield worked with a Henkel to package the magnesium treatment material in small, ready-to-use kits. The kit includes an 8-ounce bottle of premixed treatment material, two 250-milliliter plastic beakers, two disposable acid brushes and a plastic trigger spray bottle for water rinsing.

Magnesium Treatment Kit Contents

Quantity	Description
1	8 ounce bottle, magnesium treatment
2	Beaker, polyethylene, 250-milliliter
1	16 ounce spray bottle (empty) for water rinsing
2	Acid brush (disposable)

Example of corrosion touch-up on CH-53E magnesium gearbox.

The kit also includes a Material Safety Data Sheet and technical procedures consistent with those listed in the Corrosion Control Manual. An Interim Rapid Action Change (IRAC) to the same manual is being drafted to include applicable instructions and source data. The kit is available via NSN 8030-01-512-2416 and is sold in cases of 12 kits.

Along with squadron- and Depot-level requirements within the Navy and Marine Corps, this effort may have Air Force, Army, Coast Guard and commercial applications as well. ⚓

CONTACTS

Wesley Lamb
Naval Air Depot Cherry Point, NC
252-464-8241
DSN: 451-8241
LambWM@navair.navy.mil

James Whitfield
Naval Air Depot Cherry Point, NC
252-464-7342
DSN: 451-7342
WhitfieldJA@navair.navy.mil