Tagnite PEO Process for Gearbox Overhaul
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29

**19a. NAME OF RESPONSIBLE PERSON**
Environmentally Clean Magnesium Finishing

TAGNITE®

HAE

Dow 17

- 5% * chemical concentration
- 25% * chemical concentration
- 56% * chemical concentration

HAE contains heavy metals; Dow 17 contains heavy metals and chromium

*Approximations
Coating Morphology

Dow 17

HAE

TAGNITE®

All photos shown at 500x magnification.
Superior Corrosion Resistance

TAGNITE®, HAE & Dow 17 (Type I) on magnesium alloy ZE41 after 168 hours in salt spray

Only Tagnite Provides Inherent Corrosion Resistance
Widely Specified
Magnesium Oil Pan

Magnesium Transmission Housing

Magnesium Gearbox

Magnesium Jet Engine Gearbox

Environmentally Clean Magnesium Finishing Since 1994
Why Anodize a Magnesium Component During Overhaul

- Magnesium Corrosion is a Costly Issue Affecting Most All DoD Platforms
- Current Overhaul Coatings are Mostly Chromate Conversion Based Processes That Provide Little Corrosion Protection
- These Poor Performing Conversion Coatings Have Resulted in High Life Cycle Costs for Most Magnesium Components
Superior Corrosion Resistance Without the Environmental Headaches of Hexavalent Chromium

Dow 19 Chromate Conversion 9 Hours Salt Fog Exposure

Dow 7 Chromate Conversion 9 Hours Salt Fog Exposure

Tagnite Anodize 168 Hours Salt Fog Exposure
Why Use An Ineffective Chromate Conversion Coating During Overhaul?

Because You Can’t Anodize in Presence of Ferrous Metal Inserts. Chromate Conversion Coatings are Compatible with Ferrous Metal Inserts.
Successfully Anodized
After Masking:

6 Steel Bearing Liners
42 Helicoils
52 Studs

The Solution is to Mask The Ferrous Metal Inserts to Allow Successful Anodization to Occur
Why Spend Hours Masking Ferrous Metal Inserts to Allow Anodization When Chromate Conversion Coatings Are Inexpensive and Easy to Apply?

Replacement Cost: Over $45,000

Because Magnesium Castings are Expensive And Require Long Lead Times to Replace
Masking Ferrous and Anodizing Could Allow Overhaul Parts to be Better Protected Than OEM New
Matting Faces are Often Times Re-Machined After Bearing Liners are installed. This Now Bare Magnesium is Then Typically Treated with a Chromate Conversion Coating
Before Bearing Liner Installation

Post Bearing Liner Installation Machining

Next Step – Apply Chromate Conversion Coating to Now Bare Magnesium
Before Bearing Liner Installation

Post Bearing Liner Installation Machining

Next Step – Apply Chromate Conversion Coating to Now Bare Magnesium
Solution – Mask Ferrous Metal Inserts and Apply Chromate Free Anodize
Before Bearing Liner Installation

Post Bearing Liner Installation
Machining
Next Step – Apply Chromate Conversion Coating to Now Bare Magnesium
Solution – Mask Ferrous Metal Inserts and Apply Chromate Free Anodize
Post Bearing Liner Installation Machining

Next Step – Apply Chromate Conversion Coating to Now Bare Magnesium

Before Bearing Liner Installation
Solution – Mask Ferrous Metal Inserts and Apply Chromate Free Anodize
As received condition of scrap castings as part of an IBIF III project
Key to Successful Anodization of Used Magnesium Castings is Starting with a Clean Casting that is free of paint and old anodize coatings

After Media Blasting
After Media Blasting and Tagnite Anodization
Small Data Markings Still Clearly Visible

Hand Scripted
S/N still intact
Approved by Many Aerospace and Defense Companies, Brush Tagnite is an Effective Method to Touch-up Magnesium Castings Without Using Hexavalent Chromium
Why Go Through the Expense of Masking Ferrous Metal Inserts? Magnesium Castings are Expensive and Conversion Coatings are Ineffective

Bare ZE41A 9 Hours Salt Spray Exposure

Dow 7 ZE41A 9 Hours Salt Spray Exposure

Dow 19 ZE41A 9 Hours Salt Spray Exposure
Tagnite In Use Now on Used KC-135 and B-52 Magnesium Components

• By selecting Tagnite the Air Force was able to eliminate hexavalent chromium and attain corrosion resistance superior to standard chromate conversion coatings typically used during overhaul.

• Tagnite has been employed now on 33 different part numbers between the B-52 Bomber and KC-135 Tanker.

• Well over 500 KC-135/B-52 Bomber components have been successfully coated with Tagnite.
Over 75 Units of This Production Part Number Have Been Successfully Anodized After Masking Ferrous Metal Inserts.

Bearing Liner is flush with magnesium on one side And raised above magnesium on other side. On raised side a core passage way comes directly to bearing liner.

Multiple Pressed in Steel Bushing
Summary

• It is Possible to Avoid Hexavalent Chromium When Finishing New or Used Magnesium Aerospace and Defense Components

• Masking of Ferrous Metal Inserts is Expensive and Time Consuming but that Cost Represents a Small Fraction of the Replacement Cost of the Parts