



Toxic Metal Reduction (TMR) IPR Cr (VI)-Free, Low VOC Alternatives for Spray-in-Place, Mixed Metal Pretreatment (TMR 12-01)

18 August 2015

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Cr(VI)-Free Low VOC Alternatives for Spray-in-Place, Mixed Metal Pretreatment (TMR 12-01)

Project Description

- ARL will validate Cr(VI)-free spray applied chemical pretreatments for multimetal applications on approved Qualified Product List for TT-C-490
- ARL will assess commercially available metal pretreatment technologies on multiple substrates including mixed metal assemblies
- Using the results of the laboratory tests, ARL will down select to the best performers(s) for full scale demonstration at LEAD, RRAD and ANAD
- The end product will apply to all ground assets including MRAP, Stryker, and HMMWV



Requirement/Impact

- Addresses AERTA PP-2-02-04 by eliminating Cr⁶⁺ in wash primer (pretreatments)
- OSD Policy, DFARS 2009-D004 and local and Federal regulations limiting VOC emissions
- Will reduce Cr⁶⁺ by 24K lbs/year, VOCs by 2.4M lbs/year
- Performance will be equal to current wash primer
- Cancellation of DOD-P-15328 will create a technology gap for multi-metal spray-on pretreatment applications

Progress Report

- Key dates
 - Endorsement signed by PEO GCS: 2Q-FY13
 - End/transition point: 4Q-FY16
- Recent accomplishments/issues
 - Bonderite 7400 qualified and approved for use (Feb 2015)
 - Successfully transported LEAD trailer to Cape Canaveral site (June 2015)



Toxic Metal Reduction (TMR) IPR

Cr(VI)-Free Surface Activation and Preparation for Metal Plating (TMR 13-03)

18 August 2015

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Cr(VI)-Free Surface Activation and Preparation for Metal Plating (TMR 13-03)

Project Description

- ARL will validate Cr6+ free chemical strippers for anodized aluminum which meet technical, environmental, and performance requirements
- This project will establish a baseline for multiple parameters, identify effective commercially available alternatives, evaluate their performance and substrate effects, validate process for specification, and demonstrate use on military systems
- Applies to ground tactical and support equipment as well as aviation systems



Requirement/Impact

- Addresses AERTA PP-2-02-04 by eliminating Cr6+ in metal and anodize stripping
- Eliminate more than 1,400 lbs/year of chromic acid required by the current anodize stripping processes
- Reduce/eliminate Cr6+ (specifically chromic acid) from the solutions used to strip specific inorganic surface finishes during the overhaul & repair of Army assets

Progress Report

- Key dates
 - Endorsement signed by Scotty Arrington, Dir of Eng Quality, ANAD: 4Q-FY14
 - AMCOM TTA: 4Q-FY14
 - End/transition point (spec revision): 4Q-FY17
- Recent accomplishments/issues
 - Contracting delays longer than anticipated.
 - Achieved second contract award
 - SOP written for measuring coating thickness
 - All raw aluminum panels serialized and measured
 - Set up database to organize specimen results



Toxic Metal Reduction (TMR) IPR Cr(VI)-Free Hard Chrome Electroplating (TMR 14-01)

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Project Description

- AMCOM will develop, validate and demonstrate a Cr(VI)-free NLOS plating process that results in a hard chrome plate that meets aviation performance requirements and is ready for transition
- Lab testing will be conducted at Faraday for process optimization, followed by a demonstration at CCAD
- Affected weapon systems are all Army aviation platforms that receives hard chrome plating at an Army facility (specifically, landing gear, actuators, other dynamic components)



Requirement/Impact

- Addresses AERTA PP-2-02-04: Toxic Metal Reduction by eliminating carcinogenic hexavalent chromium from plating processes and replacing with trivalent chromium of equal or better performance
- Process regulated by 40 CFR 63 Subpart N Chromium Electroplating NESHAP
- Implementation of alternative process will eliminate use of Cr(VI) in hard chrome electroplating in Army depot operations (~5 tons of chromic acid / year at 3 depots)
- Successful demonstration of the tri-chrome plate process at CCAD on a pilot-scale line

Progress Report

- Key dates
 - Endorsement signed by AMCOM MG: 2Q FY13
 - TTA signed by CCAD and PEO Aviation: 1Q FY15
 - Project End/Transition: 1Q FY19
- Recent accomplishments/issues
 - Process optimization testing is in work
 - Focus is on duplicating the microstructure of Cr(VI)-based chrome plate



Toxic Metal Reduction IPR Cr(VI)-Free Conversion Coatings (TMR 14-02)

18 August 2015

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Cr(VI)-Free Conversion Coatings (TMR 14-02)

Project Description

- ARL will perform demonstrations at Army depots of Cr6+ free conversion coatings on Army tactical equipment, aircraft and GSE
- Elimination of toxic exposure from Cr6+ and toxic sludge generated from zinc phosphate
- Will conform to performance criteria of MIL-DTL-5541, MIL-DTL-81706 and TT-C-490
- Transition after two year field validation based upon baseline technologies



Requirement/Impact

- Addresses AERTA PP-2-02-04 by eliminating Cr6+ in conversion coatings; mounting policies restricting the use of Cr6+, including DFARS Prohibition (223.7302), OSHA Regulation 1910.1026
- Elimination of at least 90% of Cr6+ usage in conversion coatings
- Over \$2.4M in saving from toxic waste
- Non-chrome pretreatment for multi-metal application

Progress Report

- Key dates
 - End/transition point: AV (1QFY19); GSE (3QFY19)
- Recent accomplishments/issues
 - Completed TTA and submitted to PEO Aviation
 - A Support Agreement has been prepared and submitted to CCAD for demonstration
 - All panels prepared with pretreatments and galvanic testing for down selection initiated
 - ANAD and RRAD agreed with demonstration



Toxic Metal Reduction (TMR) IPR Cr(VI)-Free Aluminum Anodizing (TMR 15-01)

**Scott Howison
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Project Description

- AMCOM G-4 will execute a project intended to develop and optimize Sikorsky's Tartaric Sulfuric Acid Anodizing (TSAA) as an alternative to traditional Chromic Acid Anodizing (CAA)
- The TSAA process will be optimized and tested against a battery of materials and performance criteria generated by AMRDEC AEF
- This technology will address all aviation platforms processed at Corpus Christi Army Depot (CCAD) including UH-60, AH-64 and CH-47



Requirement/Impact

- Cr6+ confirmed human carcinogen, TLV and PEL 0.05 mg/m3 and controlled by 40 CFR 63 Subpart N Chromium Electroplating and Anodizing NESHAP
- Cr6+ increases risk to personnel and aircraft life cycle sustainability (e.g. another regulatory drop of TLV or PEL as in 2006 could make process unsustainable)
- CCAD only Army depot that uses CAA
- Alternative must meet fatigue, corrosion and repairability performance requirements

Progress Report

- Key dates
 - Endorsement signed: 2Q-FY13
 - TTA signed: 1Q-FY15
 - End/transition point: 4Q-FY19
- Recent accomplishments/issues
 - SOW Completed / Updated
 - Full Proposal provided from Sikorsky to ARL/PEDCO



Toxic Metal Reduction (TMR) IPR Cyanide-Free Copper and Silver Electroplating (TMR 15-02)

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Project Description

- AMCOM will demonstrate non-cyanide products and processes for copper and silver plating that are ready for transition into a production environment.
- AMCOM will demonstrate non-chromic acid and non-cyanide stripping methods to remove copper and silver that are ready for transition into a production environment
- Evaluate Cold Spray technology as an alternative
- Demonstrate copper and silver plating and stripping processes in the pilot line at CCAD
- Impacts UH-60; AH-64; AH-1; CH-47; OH-58



Cyanide (L) vs Non-Cyanide (R) Cu Plate

Requirement/Impact

- Addresses AERTA PP-2-02-04 by eliminating cyanide from copper and silver electroplating processes
- High acute risk if exposed, spent cyanide solutions are RCRA waste (F007 and F008), wastewater treatment must meet NPDES requirements and TRI Chemical reporting for compounds is required
- High risk for Depot personnel if exposed to Hydrogen Cyanide
- In the rare event of a cyanide alarm the entire building that houses the plating shop is evacuated for up to 1 hour

Progress Report

- Key dates
 - Endorsement signed: 2Q-FY13
 - TTA signed: 1Q-FY15
 - End/ transition point: 3Q-FY18
- Recent accomplishments/issues
 - Non-Cyanide Copper line set-up
 - Non-Cyanide Silver line set-up
 - Test Plan completed