

748th Supply Chain Management Group

Development of MIL-STD for ZnNi Plating, Low Hydrogen Embrittlement Electrodeposition ASETSDefense Workshop 2018

David Frederick
417 SCMS/GUEA

E-mail – David.Frederick.1@us.af.mil

Craig Pessetto
ES3

Craig.Pessetto@es3inc.com



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Parts on the Shelf and Contracts in Place



Agenda

- Timeline
- SBIR Phases
 - Feasibility
 - Qualification
 - Implementation
- Process Control
 - USAF Drawing
 - MIL-STD





Timeline

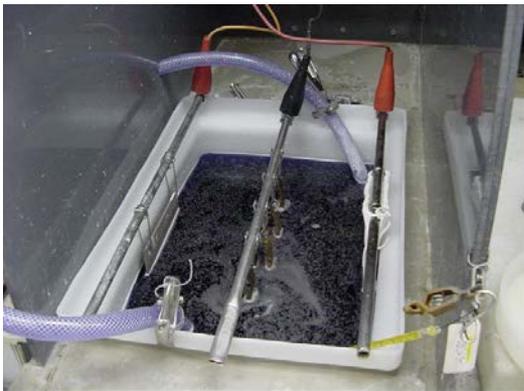
- SBIR (Small Business Innovation Research) Project
- SBIR is a Three Phase Project
 - Phase I: Feasibility (2007)
 - Phase II: Qualification (2008 - 2010)
 - Phase III: Implementation (2010 - Present)
 - ESTCP – Environmental Security Technology Certification Program
 - CSAG – Consolidated Sustainment Activity Group (Landing Gear Funding)
 - GSD – General Support Division (Landing Gear Funding)
 - P2 – Pollution Prevention
 - DMAG – Overhaul Shop





Phase I: Feasibility (2007)

- Selected Coating to Replace Cadmium
 - Required to protect Steel
 - Galvanic Potential is close to steel and has good corrosion properties
 - Low Hydrogen Embrittlement for High Strength Steel
 - Used supplier developed technical data
 - Bench top tank (8 gal)



Metal or Plating	Galvanic Series Measurements in 3.5% NaCl Δ mV from Steel
Steel	0
IZ-C17+ Zn-Ni with IZ-264 Tri-Cr CC	-30
IZ-C17+ Zn-Ni with No CC	-40
LHE Ti-Cd with No CC	-90
LHE Ti-Cd with Hex-Chrome CC	-80
LHE Cd with Hex-Chrome CC	-80
LHE Cd with No CC	-70
Zn	-380
Zn-Ni (Low Ni)	-460
Hot Dip Zn	-525

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Phase II: Qualification (2008 – 2010)



- Identified Required Testing for Acceptance and Qualification
 - Based on testing required for other electroplating processes such as Cadmium
- Developed parameters for chemical maintenance, coating composition, etc.
- Scaled up prototype plating tank (325 gal)

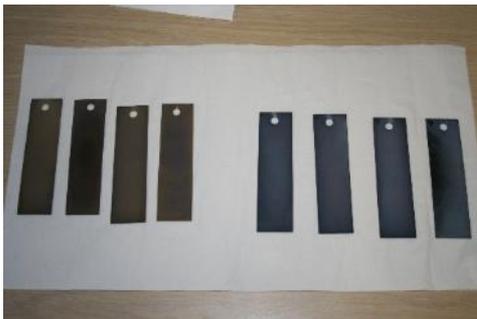




Phase II: Qualification

■ Testing performed to validate process/coating integrity

- Corrosion (Salt Fog and Environmental)
- Base Metal Adhesion
- Paint Adhesion
- Hydrogen Embrittlement
- DeZincification
- Reembrittlement
- Fatigue



- Open Circuit Potential
- Galvanic Potential
- Repairability (Brush Plating)
- Compatibility on Other Metals
- Compatibility with Other Coatings
- Liquid Metal and Solid Metal Embrittlement
- Coating Removal
- Waste Treatment
- Chemical Controls/Maintenance
- Process Control
- Anode Development



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Phase III: Implementation (2010 – Present)



- Reviewed AMS 2417 Specification for ZnNi plating – This spec was too broad (lessons learned from QQ-P-416 and Mil-Std-870)
- Developed USAF Drawing 201027456 for process control and Source Control Drawing 201027457
- Installation of Prototype Production Tank (3200 gal) – Converted to full production August 2013
- Development of Conformal Anodes for Component Plating

APPLICATION		REVISIONS																				
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DRAWING PER 48 IN SQUARE		DRAW		TITLE		Low Hydrogen Embrittlement Plating Process Specification Zinc - Nickel																
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Conversion of USAF Drawing to MIL-STD (2016 – Present)



- Need for a MIL-STD was identified as landing gear spares procurement started requesting LHE ZnNi on landing gear. Job shops were not able or reluctant to convert without a more available standard.
- Initiated steps of publishing MIL-STD
- Developed format and verbiage for MIL-STD
- Completed internal USAF review of MIL-STD – Engineering, Plating Shop
- Collaborated with industry partners to maintain similar parameters
- Submitted MIL-STD draft to Hill AFB Data Acquisition & Defense Standardization Office



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MIL-STD Publication (TBD)



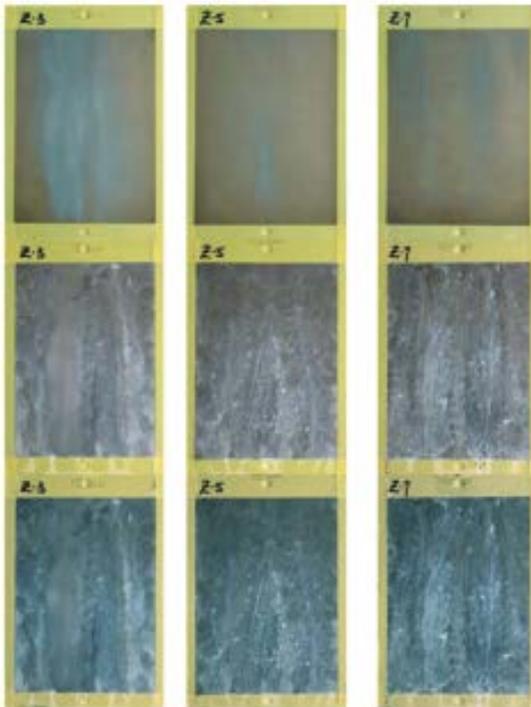
- MIL-STD for LHE
ZnNi
Electrodeposition to
be sent out to DOD
offices for review,
comment and
approval





Questions?

LHE ZnNi



ASTM
B117
4000
hours

LHE Cd

