Cadmium Alternatives High Strength Steel JTP

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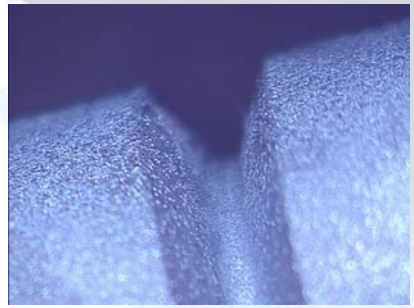

Objective:

Demonstrate and validate the performance of cadmium alternatives on high-strength steel components on DoD platforms

- Write JTP for High-Strength Steel Components – *complete*
- Write JTP Execution Plan – *complete*
- Execute the JTP – *in progress*

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Demonstration Locations:

- JTP coordinated and assembled by Boeing Phantom Works, funded by the AF and Navy/ESTCP
- Execution Plan coordinated and assembled by CTC Johnstown, funded by the AF and Navy/ESTCP
- Numerous DoD/contractor sites involved with coating and testing

- NAVAIR
- ARL
- CTC
- Boeing
- Hill AFB
- Alumiplate
- Finishing Services, Inc.
- Marshall Labs

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Alternative Coatings Selected by JCAT:

- Primary
  - LHE Cadmium (control)
  - Zinc-Nickel, acid
  - Tin-Zinc
  - IVD Aluminum (control)
  - Aluminum-Manganese
  - Electroplated Aluminum
  - Sputtered Aluminum
- Repair
  - brush LHE Cadmium (control)
  - brush Sermetel 249/273
  - brush Zinc-Nickel, alkaline
  - brush Tin-Zinc

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Demonstration Tests Selected by JCAT:

- Phase I
  - Hydrogen Embrittlement
  - Hydrogen Re-Embrittlement (NRB immersion, exposed C-ring (Army))
  - Bend Adhesion (Q/A)

- Phase II
  - Appearance
  - Throwing Power
  - Composition Uniformity
  - Strippability
  - Galvanic Potential
  - Bend Adhesion
  - Paint Adhesion
  - Unscribed Neutral Salt Spray
  - Scribed Neutral Salt Spray
  - Galvanic Corrosion Resistance
  - Fluid Corrosion Resistance
  - Scribed w/primer/topcoat NSS
  - SO2 Salt Spray (Navy)
  - Run-on/Break-away Torque
  - Torque-Tension
  - Reparability (appearance, adhesion, corrosion)
  - Hydrogen Embrittlement (Q/A)

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Demonstration Tests Selected by JCAT:

- Phase III
  - Rotating Beam Fatigue Smooth Bar (primary and repair coatings)
  - Rotating Beam Fatigue Notched Bar (primary coatings only)
  - Bend Adhesion (Q/A)
  - Hydrogen Embrittlement (Q/A)

- Navy Added Tests
  - Corrosion Fatigue
  - Stress Corrosion Cracking
  - Run-on/Break-away Torque – additional corrosion step
  - Rotating Beam Fatigue – may require 2nd geometry at additional axial fatigues

- Air Force Added Test
  - Torque Tension – adjusted acceptance criterion

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Schedule/Milestones

- AF first draft *completed 12/02*
- Joint Community working meeting/JTP kick off at Hill AFB *completed 03/03*
- Multi-service JTP draft *completed 4/03*
- Service input *completed 7/03*
- JTP Execution Plan *completed 2/04*
- Contracts delays continue for over 12 months
- Contract signed for Phase II & III work *completed 12/05*
- NAVAIR executing Phase I tests *in progress*
- SOWs submitted for Phase II & III work *in progress*

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Schedule/Milestones

- Execution of JTP expected to continue through FY07
  - Phase I Test Report *planned spring 2005*
  - Phase II Test Report *planned late CY 2006*
  - Final Test Report *planned mid CY 2007*

- Field demonstrations
  - Deploy coatings on non-flight critical components *spring 2006 thru 2008*
  - Deploy coatings on flight critical components *spring 2007 thru 2008*
  - Interim field test report *planned spring 2007*
  - Final field test report *planned spring 2008*

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Phase I Test Results

Hydrogen Embrittlement, ASTM F 519 Sustained Load Test in Air, Type 1a.1 Notched Round Bars

Coating	Replicate	FRACTURE STRENGTH (%)	TIME TO FAILURE (HRS)	PASS/FAIL
LHE Cd	1	89.5%	202	pass
	2	92.1%	203	pass
	3	93.7%	203	pass
	4	91.9%	203	pass
IVD Al	1	92.9%	203	pass
	2	94.6%	203	pass
	3	94.2%	203	pass
	4	97.4%	204	pass
Alumiplate	1	91.6%	203	pass
	2	95.2%	203	pass
	3	96.0%	204	pass
	4	98.2%	204	pass

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Questions?