

Maintaining Corrosion Protection by Anticipating Increased Environment, Safety and Health Requirements

Patrick J. Taylor, P.E.
Hughes Associates, Inc.
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Three Questions

1. What do **Environment, Safety and Health (ESH)** requirements have to do with **Corrosion Prevention and Control (CPC)**?
2. How are ESH requirements increasing?
3. How is **RDECOM** responding?



ESH vs. CPC

- Often competing requirements
- Many CPC processes subject to Executive Orders, EPA/OSHA Regulations, DoD/Army policies, etc.
 - Plating, Finishing, Sealing, etc.
 - Painting, Depainting, Cleaning, etc.
- Many ingredients in CPC materials are ESH bad actors
 - Heavy metals, e.g., hex chrome, cadmium, cobalt
 - HAP/VOC solvents, e.g., methylene chloride (MeCl), trichlorethylene (TCE)
- RDECOM needs to offer suitable alternatives to ESH offenders before they are regulated out

DoD Policy: Minimizing the Use of Hexavalent Chromium

- USD(AT&L) memo 08 Apr 09 directing DoD to:
 - Invest in RDT&E for alternatives
 - Approve alternatives that meet requirements
 - Update technical documents to implement alternatives
 - Document system-specific risks in the PESHE
 - Require PEO and Service Corrosion Executive to certify that no acceptable alternatives exist for new systems
- Applies to all new program starts, new program increments and infrastructure-related procurements
 - Applies to legacy systems only when system mods and procedure updates allow for insertion of alternatives

DFARS Clause: Prohibition on Use of Hexavalent Chromium

- Policy to be implemented in Defense Federal Acquisition Regulation Supplement (DFARS)
 - Future defense contracts will prohibit hex chrome unless specifically approved by the government
- Draft rule distributed for review Aug 09
 - Unless otherwise exempt, clause must be included in all DoD solicitations and contracts for materials, parts, equipment, systems, subsystems and components
- As of 15 Jan 10, DFARS case still open

DLSME NESHAP

- EPA planning to propose National Emission Standards for Hazardous Air Pollutants (NESHAP) for surface coating of Defense Land Systems and Miscellaneous Equipment (DLSME)
 - Will apply to all DoD facilities and some OEMs (munitions)
- DoD provided data supporting the following limits
 - Numerical HAP limits on MILSPEC coatings
 - HAP-free solvents for substrate cleaning and paint thinning unless otherwise authorized by technical documents
 - HAP-free solvents or work practices for paint gun cleanup
 - Work practices, usage caps for MeCl depainting

DLSME NESHAP

Highest Use Coating Specs

Spec Number	Title
MMM-A-121	Adhesive, Bonding Vulcanized Synthetic Rubber to Steel
A-A-1936	Adhesives, Contact, Neoprene Rubber
MIL-C-81904	Coating Compound, Thermal-Insulation, Ablative
MIL-C-46168	Coating, Aliphatic Polyurethane, Chemical Agent Resistant
MIL-DTL-53039	Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant
MIL-PRF-22750	Coating, Epoxy, High-Solids
MIL-PRF-85285	Coating, Polyurethane, Aircraft and Support Equipment
MIL-DTL-64159	Coating, Water Dispersible Aliphatic Polyurethane, Chemical Agent Resistant
MIL-DTL-11195	Enamel, Lusterless, Fast Dry, VOC Compliant (for Use on Ammunition and Other Metals)
MIL-E-52891	Enamel, Lusterless, Zinc Phosphate, Styrenated Alkyd Type
TT-E-516	Enamel, Lustreless, Quick-Drying Styrenated Alkyd Type
A-A-208	Ink, Marking, Stencil, Opaque (Porous and Non-Porous Surfaces)
MIL-P-14105	Paint, Heat-Resisting (for Steel Surfaces)
TT-P-2756	Polyurethane Coating, Self-Priming Topcoat, Low VOC Content
TT-P-1757	Primer Coating, Alkyd Base, One Component
MIL-PRF-23377	Primer Coating, Epoxy, High Solids
MIL-P-53030	Primer Coating, Epoxy, Water Reducible, Lead and Chromate Free
MIL-P-53022	Primer, Epoxy Coating, Corrosion Inhibiting, Lead and Chromate Free

Aerospace NESHAP

Residual Risk Assessment

- Promulgated 1995, effective 1998
- DoD has already spent \$ millions demonstrating compliance with standards that do not eliminate pollution
 - “Specialty coatings” with no requirements
 - “Parts normally removed” with unlimited use of MeCl
 - “Composite vapor pressure” limits on solvents
 - Most HAP solvents are low in vapor pressure
 - Xylene, ethylbenzene, MIBK, toluene all compliant
 - MEK/acetone mixture also compliant but actually has higher vapor pressure than pure MEK
- 10-year review currently underway
 - Aerospace NESHAP not expected to meet recent court rulings
 - Too many instances of “no control” MACT floors

Executive Order 13423 & Army Goals for Toxic Chemical Reduction

- EO 13423 required Federal agencies to set goals for reducing use of toxic chemicals
- DoD implemented by requiring Services to:
 - Identify three or more chemicals for reduction
 - Establish usage baselines
 - Set future reduction goals
- Army issued goals in Nov 09 to reduce the use of three chemicals by 2013
 - Hexavalent chromium
 - TCE
 - MeCl

Draft Toxicological Review of Trichloroethylene

- Findings expected to impact Halogenated Organic Solvent Cleaning NESHAP already in force
- History of TCE carcinogenicity data
 - 1995, International Agency for Research on Cancer: “probably carcinogenic to humans”
 - 2000, National Toxicology Program: “reasonably anticipated to be a human carcinogen”
 - 2001, Environmental Protection Agency: “highly likely” to be carcinogenic in humans
 - 2006, National Research Council: “potential human carcinogen”
 - 2009, Environmental Protection Agency:

“TCE is characterized as ‘Carcinogenic to Humans’ by all routes of exposure”

Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

- Candidate List updated Dec 09 with 15 new substances of very high concern, including:
 - Anthracene oils
 - Diisobutyl phthalate
 - Lead chromate compounds
 - tris(2-chloroethyl)phosphate
- Candidate List already included sodium dichromate among other CPC ingredients
- Substances on Candidate List may become subject to authorisation by decision of the European Commission
- REACH impacts on industry will filter down to DoD

Army Response to Increasing ESH Requirements

- Allocate funding to eliminate pollution while maintaining or improving corrosion protection
 - Base Army RDT&E
 - Leveraged OSD Corrosion Program
 - Leveraged SERDP, ESTCP, etc.
- Do not allocate funding to:
 - Hunt for loopholes
 - Justify inaction or non-compliance
 - Comply with bare minimum regulatory requirements
- Work with EPA/OSHA, not against them
 - DoD/Army get achievable standards at lower cost
 - EPA/OSHA get greater emission reductions

Army RDT&E Efforts Addressing ESH/CPC Requirements

- Sustainable Painting Operations for the Total Army program to eliminate HAPs in coatings
 - Materials developed and tested on lab-scale '03-'07
 - Materials demonstrated in real environments '08-'11
 - Materials approved and implemented throughout
 - Baseline HAP-containing materials phased out after implementation
- Toxic Metals Reduction program to reduce hex chrome and cadmium in surface finishing
 - Select efforts begun in '08
 - Full-scale program proposed in FY12-17 budget

Examples of ESH Technologies with Improved CPC Performance

- MIL-DTL-53039 Chemical Agent Resistant Coating
 - Two major changes made in Rev B (2005)
 - ESH: HAPs eliminated and VOCs reduced
 - CPC: Polymeric beads added to improve weathering resistance
 - Additional changes anticipated in 2010
 - ESH: Cobalt-based pigments being eliminated
 - CPC: New pigment being added to improve UV resistance
- MIL-DTL-53022 and -53030 Epoxy Primers
 - Two major changes anticipated in 2010
 - ESH: HAPs being eliminated and VOCs reduced
 - CPC: Improved performance in salt spray and cyclic tests

Select Products Already Implemented

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- HAP-free, water-dispersible CARC topcoat, all types
 - MIL-DTL-64159 specification adopted 2002
 - Type III touch-up kits added 2007
- HAP-free, single component CARC topcoat, type II
 - MIL-DTL-53039 specification revised 2005
 - Type VIII touch-up kits added 2009
- HAP-free enamel for munitions, type II
 - MIL-DTL-11195 specification revised 2003
 - Supersession of TT-E-516 pending
- HAP-free degreasing solvent
 - MIL-PRF-680 specification revised 2006
- HAP-free anti-tamper sealant
 - Demonstrated 2008, NSNs assigned 2009
- Non-chromate epoxy primers, MIL-PRF-23377 class N and MIL-PRF-85582 class N
 - Developed by NAVAIR, approved by AMCOM 2008

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Select Products to Look for 2010-11

- HAP-free CARC primers
 - MIL-P-53030 and MIL-P-53022 drafts in coordination
- CARC powder primers
 - New specification in coordination
- Cobalt-free CARC topcoats, all types
 - Green 383 pigment to be replaced by Green 808
 - All specs to be revised
- HAP-free cleaners for wipe, flush and immersion
 - Demonstrations complete, joint specification in development
- HAP-free immersion paint remover to replace MeCl
 - Two applications already demonstrated, others to follow
- HAP-free thinners for paints and adhesives
 - To be incorporated into existing specifications and SOPs
- Non-chromate trivalent chromium pretreatment (TCP)
 - Developed by NAVAIR, approval by AMCOM pending

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Select Products to Look for 2012-13

- HAP-free system to replace TCE vapor degreasers
 - Demonstrations underway for two applications
- CARC powder topcoats
 - New specification to be developed
- HAP-free, non-skid coatings
 - To replace MIL-PRF-24667 and similar products
- HAP-free, high temperature coatings
 - To replace MIL-P-14105 and similar products
- HAP-free, general purpose adhesives
 - To replace MMM-A-121 and similar products
- Non-chromate wash primer
 - To replace DOD-P-15328 and similar products
- HAP-free munitions coatings
 - Numerous different specifications and applications

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- Patrick J. Taylor, P.E.
Hughes Associates, Inc.
ptaylor@haifire.com
p.taylor@us.army.mil
410-737-8677 (office)