



Toxic Metal Reduction

Environmental Quality Technology Pollution Prevention Program

Purpose: Reduce carcinogenic hexavalent chromium (Cr(VI)) and cadmium used in surface finishing on nearly all types of weapon systems across multiple PEOs/PMs by demonstrating more environmentally sustainable processes at Army depots, installations and DOLs.

Requirement: The Army requires the capability to protect its materiel from corrosion, wear, fatigue, and other harsh environments, while at the same time assuring its facilities remain sustainable. To accomplish its goals, the Army needs affordable inorganic coatings/processes that meet or exceed performance requirements while reducing or eliminating the environment, safety, occupational health (ESOH) and energy impacts of Army surface finishing operations. The Army must comply with Office of the Secretary of Defense policy to minimize the use of Cr(VI). New technologies will eliminate costly OSHA compliance bills and clean-up costs for continued use of Cr(VI).



Cold Spray process can eliminate Cr(VI) used to deposit gun barrel liners and extend barrel life

Technical Approach:

- Targeting 100% elimination of Cr(VI) used in pretreatments by:
 - Assessing commercially available technologies on multiple substrates, including mixed metal assemblies, for aviation and ground support equipment
 - Validating Cr(VI)-free chemical strippers for removing anodizing and hard chrome that meet technical, environmental and performance requirements
 - Demonstrating novel anodizing process as an alternative to traditional chromic acid anodizing
- Targeting 75% reduction in Cr(VI) used in electroplating by:
 - Demonstrating hard chrome plating process for wear surfaces that does not require or generate Cr(VI)
 - Developing cold spray technology for direct deposition on large caliber gun barrels and for portable repair of hard chrome wear surfaces
- Eliminate other toxic materials used in surface finishing by demonstrating:
 - Cyanide-free electroplating of copper and silver
 - Alternative processes to cadmium electroplating



Cr(VI)-free aluminum anodizing can be used for Army aircraft, such as the UH-60

Benefit to the Warfighter:

- Reduce or eliminate Warfighter and worker exposure to known carcinogens used in surface finishing by developing and transitioning alternatives to Cr(VI), cadmium and associated toxic metals
- Prevent Army installations from incurring costly OSHA compliance bills for Cr(VI) exposures. The Navy is currently paying \$1M per year to keep break rooms and other non-production areas free of Cr(VI) dust at a single depot
- Reduce 100K lbs of Cr(VI) used on thousands of weapons systems at over 10 Army depots/plants/arsenals
- Lead DoD and industry in advancing the state-of-the-art beyond Cr(VI)-based electroplating for depositing hard wear surfaces, including establishing first domestic production-scale Cr(VI)-free hard chrome plating capability
- Ensure continued availability of qualified corrosion preventive finishes for Army and Foreign Military Sales assets in light of global regulatory pressures to phase out Cr(VI) and cadmium
- Approve Cr(VI)-free wash primers to fulfill technology gap of qualified mixed metal pretreatments caused by pending cancellation of Cr(VI)-containing DOD-P-15328 wash primers