

HCAT Program Overall Objective

Conduct demonstration/validation or research/development on advanced surface engineering technologies that will eliminate or mitigate environmental problems while improving materials performance that will lead to reduced life-cycle costs in military weapons systems

- *HVOF thermal spray to replace hard chrome plating on external surfaces (five projects) (ESTCP w/ JG-PP or PEWG)*
- *Plasma spraying using miniature guns for hard chrome plating replacement on internal surfaces (SERDP)*
- *Electrospark deposition for localized repair of coatings or f coatings or non-coated components (ESTCP with PEWG)*

amorphous Co-P alloy plating for hard chrome plating replacement on internal surfaces (ESTCP CP)

electrolytic plasma processing for surface cleaning

Program on Qualification of HVOF Coatings as Hard Chrome Replacement

OBJECTIVE: *Demonstrate and validate high-velocity oxygen-fuel (HVOF) thermal spray coatings as an environmentally acceptable and cost-effective alternative to electrolytic hard chromium (EHC) in most maintenance operations at Navy, Air Force, and Army aircraft depots and in manufacturing operations at Defense Department OEMs*

- *Establish superior performance of thermal spray coatings to hard chrome, leading to increased time intervals between required maintenance*
- *Demonstrate reduced turnaround times for repair of components using thermal spray, enhancing weapons systems readiness*

Five projects related to replacement of chrome plating with HVOF coatings

HVOF Projects

Landing Gear:

- *ESTCP funding ended in March 2003*
- *Final Report published as archival NRL Report in March 2004 (available on HCAT web site)*
- *Project received ESTCP Project-of-the-Year Award at Annual Symposium in December 2003*

Propeller Hub Components:

- *ESTCP funding ended in March 2003*
- *Final Report published as archival NRL Report in March 2004 (available on HCAT web site)*

HVOF Projects

Gas Turbine Engines:

- *ESTCP funding ended in March 2004*
- *Draft final report submitted to ESTCP in September 2004*
- *Final Report to be issued in April 2005*

Hydraulic Actuators:

- *ESTCP funding ended in FY2004; tasks still being completed*
- *Materials Joint Test Protocol being executed; fatigue testing complete*
- *Extensive actuator qualification testing being conducted by Air Force*
- *Functional rod/seal testing and some actuator qualification testing being conducted by NAVAIR*

HVOF Projects

Helicopter Dynamic Components:

- *ESTCP funding through March 2006*
- *Stakeholders meeting held in March 2004 in Baltimore*
- *Draft Joint Test Protocol completed*
- *Component testing at OEMs to be conducted in 2005*

Proposed New Hexavalent Chrome Permissible Exposure Limit (PEL)

- *OSHA under court order to issue new hex-Cr PEL under expedited rulemaking schedule*

Current	Proposed
<p>OSHA 8 hr time weighted average (TWA) PEL: Cr(VI) 52 $\mu\text{g}/\text{m}^3$ CrO₃ 1 mg/10m³</p>	<p>OSHA 8 hr TWA PEL: Cr(VI) 1.0 $\mu\text{g}/\text{m}^3$</p>
<p>ACGIH Threshold limit Value (TLV)-TWA: Water insoluble Cr(VI) 10 $\mu\text{g}/\text{m}^3$ Water soluble Cr(VI) 50 $\mu\text{g}/\text{m}^3$</p>	<p>OSHA Action Level 8 hr. TWA PEL: Cr(VI) 0.5 $\mu\text{g}/\text{m}^3$</p>
<p>Expected lung cancer deaths per 1000 workers at current PEL: 20 yr exposure: 43-198 45 yr exposure: 101-351</p>	<p>Expected lung cancer deaths per 1000 workers at proposed PEL: 20 yr exposure: 0.85-4.4 45 yr exposure: 2.1-9.1</p>

Hexavalent Chromium PEL

- *Publication of proposed new rule in Federal Register on 8 October 2004*
- *Comments on proposed rule were due to OSHA on 3 January 2005*
- *Public hearings held in early February 2005*
- *Publication of final rule in January 2006*

- *Proposed new rule covers general industry, construction and shipyards*
- *OSHA estimates that, across all industries, approximately one million workers are exposed to hexavalent chromium on a regular basis*

Hexavalent Chromium PEL

Following processes would be affected by new PEL:

- *Hard and decorative chrome plating*
- *Chromate conversion coatings on all materials*
- *Stainless steel passivation*
- *Plating on plastics*
- *Chromic acid anodizing*
- *Welding*
- *Electropolishing*

At action level of 0.5 µg/m³, new requirements for facilities:

- *Exposure assessments*
- *Respiratory protection*
- *Protective clothing and equipment*
- *“Clean” change rooms and showers*
- *Medical monitoring*
- *Recordkeeping*

Estimated Compliance Costs in General Industry Associated with the Revised Standard

Cost Category	10	5	1
Engineering Controls	\$10,652,864	\$14,475,735	\$26,474,262
Initial Exposure Assessment	\$15,250,335	\$15,250,335	\$15,250,335
Periodic Monitoring	\$24,605,517	\$30,034,467	\$60,305,070
Respirators	\$29,448,797	\$29,448,798	\$35,361,768
Medical Surveillance	\$21,211,591	\$13,230,302	\$67,359,536
Communication of Hazards	\$21,211,591	\$21,193,263	\$21,881,436

Small Business Administration Response

SBA Small Business Advocacy Review Panel stated:

- *“Small Entity Representatives told Panel that OSHA was underestimating impact of the rule*
- *“OSHA’s economic analysis does not address the problem of business failures and businesses which will forego use of substances containing hex-Cr”*
- *“The Panel questioned whether OSHA has correctly interpreted the data from several scientific studies, and whether the data itself is representative of modern exposure levels”*
- *Advocacy’s report on regulatory alternatives recommended that OSHA set the PEL at 23 $\mu\text{g}/\text{m}^3$, while continuing to study the effect of hex-Cr exposures at lower levels”*

Proposed Hex-Cr PEL

- *Surface Finishing Industry Council claims that proposed PEL “will devastate metal finishing industry”*
- *Estimates that annual cost to “average” small chrome plating shop is \$300,000 (OSHA estimate is \$15,000)*
- *Comments by Shipbuilders Council of America to OSHA included statement that at proposed level, ship welders would have to wear PPE air fed respirators; recommends PEL be set at 10 $\mu\text{g}/\text{m}^3$*

HCAT

Program description, reports, meeting presentations, test data all available at www.hcat.org

Final reports on completed projects available without need to enter username and password

Next HCAT Meeting

*Proposed for
Late January 2006
in
Southern California*