Air Force Materiel Command

Developing, Fielding, and Sustaining America's Aerospace Force

Air Sampling Report DoD Portable Laser Coating Removal System

U.S. AIR FORCE

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Air Sampling Report - PLCRS

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- **Task: Perform Occupational Health Hazard Assessment of the Operation**
- **Prepare Industrial Hygiene Air Sampling Strategy and Methodology Plan**
- **Assess Hazards Associated with Three Lasers**
  - **CO_2, Nd:YAG, Diode**
- **Recommend Respiratory Protection and Personal Protective Equipment (PPE)**
- **By Products:**
  - **Acid Gases and Mists**
  - **Volatile and semi volatile organics**
  - **Particulates (Metals Screen)**
  - **Total, trivalent and hexavalent chromium**
  - **Ozone, carbon monoxide and carbon dioxide**

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- **Anteon, using Pacific Environmental Services (PES) as a subcontractor, evaluated exposures of both the laser operator and observers for ablation by-products, noise exposures and some system ergonomics**
- **Sampling conducted 9-11 Apr on CO_2 Laser and 19-23 Aug for Nd:YAG and possibly Diode Lasers**
- **Air sample results were compared with Air Force Occupational Exposure Limits (OELs), which are based on the more stringent limit of OSHA's Permissible Exposure Limits (PELs) or American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs).**

Air Sampling and Analytical Methods

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Table 1 Summary of Air Sampling Strategy CO_2 Laser: April 9 - 11, 2002 Sampling			
Ablation By-Products	**Number**	**Sample Media**	**Analytical Method**
Hydrogen Chloride	7	Silica Tube	Acid Gas Screen NIOSH 7903
Hydrogen Fluoride	7		
Hydrogen Bromide	7		
Sulfuric Acid	7		
Phosphoric Acid	7		
Nitric Acid	7		
Isocyanates	12	Treated GFF	OSHA 42
Hydrogen Cyanide	7	Soda Lime Tube	NIOSH 6010
Cadmium	6	MCEF Filter	Metals Screen NIOSH 7300
Lead	6		
Strontium	6		
Zinc	6		
Chromium (Total)	6		
Hexavalent Chromium (water insoluble)	6	PVC Filter	NIOSH 7600
Nitric Oxide	3	Detector Tube	Colormetric
Nitrogen Dioxide	3		
Carbon Monoxide	3		
Carbon Dioxide	3		
Ozone	3		
Sulfur Dioxide	3		
Lead Chromate	6	Not Applicable	Stochiometric Calculations Based on Results of Hexavalent Chromium and Attached Metals
Strontium Chromate	6		
Zinc Chromate	6		

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CO_2 Laser Assessment

- Total of 133 air samples from laser operator and observer vicinity. 102 TWA samples, 13 15-min samples, 18 detector tubes
- Operator and observer noise dosimetry
- Ventilation: Fumex Local Exhaust attachment
- PPE
- General Conditions

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CO_2 Laser Assessment Results

- All sampling results were below lab detection limits
- Operator noise: TWA of 104.5 dbA
- Observer noise: TWA of 94.9 dbA
- Both exceeded OSHA limit of TWA 90 dbA
- Ventilation: Fumex Local Exhaust attachment produced between 470-505 fpm capture velocity which essentially controlled all potential airborne exposures
- PPE: Reduced from Powered Air Purifying Respirator (PAPR) to half face respirator, laser approved glasses, hearing protection, and gloves
- General Conditions: Very warm thermal conditions have since been reduced with increased general ventilation

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- **CO_2 Laser Assessment Recommendations**
  - **Continued use of PPE and Fumex ventilation system**
  - **Identify hazardous noise areas**
  - **Baseline hearing exam and custom fitted earplugs for operator**
  - **Reduce room temperature conditions with general exhaust**
  - **Consider laser arm reconfigurations**
  - **Fumex filter change out and disposal**
- **Further assess ergonomic issues with 74 MDG and other resources**