

REVISIONS			
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SCOPE: This process specification establishes the requirements and procedures for stripping paint from metallic and nonmetallic substrates using the xenon/CO₂ process.

CHANGES:

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QA	<i>C. Johnson</i>	<i>4-22-96</i>	TITLE PAINT REMOVAL USING THE XENON/CO ₂ PROCESS				
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1. SCOPE

1.1 Scope. This process specification establishes the requirements and procedures for stripping paint from metallic and nonmetallic substrates using the xenon/CO₂ process.

1.2 Supplemental data. This process simultaneously uses pulsed-light energy from a xenon lamp, a dry-ice (CO₂) particle stream, and an effluent collection system to pyrolyze the organic coating, remove the paint particles, and trap any harmful effluents in disposable filters.

2. APPLICABLE DOCUMENTS

2.1 Government documents. The following documents, of the issue in effect on the date of invitation for bid or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

Military

MIL-S-13165

Shot Peening of Metal Parts

2.1.1 Copies of specifications, standards, drawings, and other publications required by suppliers in connection with specified procurement functions should be obtained from the procuring activity or as directed by the contracting officer.

2.2 Nongovernment documents. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of invitation for bid or request for proposal shall apply. In case of conflict between these documents and this specification, the requirements of this specification shall prevail.

SPECIFICATIONS

McDonnell Douglas Helicopter Systems

HMS 20-1267

Manufacturing Materials

HP 9-5

Chemical Cleaning Methods for
Metallic Parts

2.2.1 Unless otherwise specified by the contracting officer, McDonnell Douglas Helicopter Systems (MDHS) documents should be obtained from the MDHS Materials, Processes, and Standards (MP&S) Department.

McDonnell Douglas
Helicopter Systems

3. REQUIREMENTS

3.1 Equipment. The following equipment is required to perform the procedures and operations described in this specification:

a. A FLASHJET® robotics/coating removal system that is comprised of the following:

1. Stripping head. This unit consists of a module containing the flash lamp, a dry-ice delivery nozzle, a proximity/motion and color sensors, and a light containment/noise abatement/effluent capture shroud.

2. High-voltage power supply/controller. This unit consists of the power control module, charging capacitors, a control computer/remote control pendant interface, and the flash lamp water-cooling system.

3. Dry-ice pelletizer and delivery system. This system consists of an air compressor, a liquid CO₂ storage tank, a Model 65-200 Cold Jet pelletizer, an air dryer, and dry-ice particle delivery hoses.

4. Pump effluent collection system. This system consists of a vacuum, a line heater, a particulate trap, a high-efficiency particle air (HEPA) filter, and an active charcoal scrubber. The particulate trap and HEPA filters have an efficiency of 99.7 percent for particulates in excess of 0.3 microns (0.3 μm). The scrubber has an efficiency of 99 percent in removing organic compounds.

b. Ancillary equipment.

c. Fixtures.

d. Hearing protection.

e. Hoists.

f. Safety goggles, UV rated.

g. Temperature laser gun.

h. Tools.

3.2 Materials. Temperature indicator strips (HMS 20-1267/2118) are required to perform the procedures and operations described in this specification.

3.3 Facility. The facility used to perform paint stripping shall consist of an enclosed paint removal facility with a gantry to support the robotics/coating removal system.

3.4 Personnel training/certification requirements. Personnel using the robotics/coating removal system shall be trained and certified as specified in 4.4.

3.5 Personnel safety. The enforcement of and adherence to safety regulations and procedures is the responsibility of supervisory personnel. The Environmental, Health, and Safety (EH&S) Board shall monitor the facility in which paint removal procedures are being performed to ensure proper safety equipment is available, and to advise personnel and supervision on procedural compliance and safety practices.

3.6 Prestripping requirements. Proceed as follows:

a. No precleaning requirements are required.

b. Acrylic plastic material, cabin windows, cockpit windshields, lenses, rubber, and other items which could be affected by the paint removal process shall be masked to prevent CO₂ pellet or flash lamp damage.

3.6.1 Controls and sensors.

3.6.1.1 Control parameters. The predetermined control parameters shall be in agreement with those included in the individual setup parameter matrix. Predetermined control parameters have been optimized to provide the most effective paint stripping rates.

3.6.1.2 Dry-ice particle stream nozzle. The angle of the dry-ice particle stream nozzle shall be set at approximately 29 degrees.

3.6.2 Performance requirements.

3.6.2.1 Mechanical stress damage. Regardless of the number of stripping passes, stripping parameters selected shall not induce mechanical stress damage in parts as evidenced by less than 0.001 Almen strip deflection when tested in accordance with MIL-S-13165, Test Strip N.

3.6.2.2 Substrate temperature. Stripping parameters selected shall control substrate temperatures to less than or equal to 180 °F (82 °C) as evidenced by visual temperature indicator strips applied to the backside of the substrate being stripped or by use of a temperature laser gun directed on the stripped side of the substrate immediately after being exposed to the paint stripping head.

3.6.3 Stripped surface requirements.

3.6.3.1 Metallic surfaces. Metallic surfaces shall normally be stripped so that some degree of primer remains intact. It is not necessary to remove the coating to the bare substrate as the adhesion between existing primer and new topcoat is excellent.

Some stripped surfaces may show blends of remaining primer and topcoat which is acceptable. A remaining paint film precludes the requirement to treat a base metal surface prior to repaint which requires several steps including use of chromate conversion coating. With a remaining paint film, subsequent repaint only requires a tie-coat application of primer followed by a normal application of topcoat.

3.6.3.2 Composite surfaces. Composite surfaces shall normally be stripped to the primer. The appearance will differ from that of the stripped metal surfaces in that the resultant stripped surface will show blends of base surface, primer, and topcoat. This is acceptable as specified in 4.6.1.

3.7 Poststripping requirements. Proceed as follows:

a. There are no postcleaning requirements associated with this process.

b. Chemical conversion coatings are not affected by this process.

c. Primer and paint adhesion to freshly stripped surfaces is excellent; however surfaces that are subsequently soiled shall be cleaned in accordance with HP 9-5.

3.8 Required procedures and operations.

3.8.1 Setup. Proceed as follows:

a. Select the predetermined operating parameters for the specific coating, type and color, and substrate type.

b. Automatic operating parameters shall consist of the following:

1. Set high-voltage supply/controller using appropriate controls on the robotics/coating removal system.

2. Set lamp control settings using appropriate controls on the robotics/coating removal system.

3. Set dry-ice particle stream. This includes input pressure and flow rate which are set by controls on the Model 65-200 Cold Jet pelletizer.

4. Set stripping head standoff distance. This is controlled by laser stand-off sensors.

3.9 Paint removal. Proceed as follows:

a. Select the individual stripping program to perform and complete the actual paint removal operation. In the robotic mode, the paint removal process is automatic and will continue until the selected stripping program is complete, however, the process requires operator intervention to run and direct the program..

b. Monitor sensor feedback and indicators on the cell controller during the paint removal process. The paint removal system contains a series of interconnected sensing devices and interlocks which ensure personnel safety, and prevent damage to the system and to the substrates being stripped.

c. The following conditions may occur when operating the robotics/coating removal system:

1. If the dry-ice particle stream flow is interrupted, the flash lamp control will automatically be placed in a standby mode.

2. If the pulsed light energy is disrupted, the dry-ice delivery system will be placed in a standby mode.

3. If the effluent collection system vacuum is disrupted, both flash lamp and dry-ice delivery systems will be placed in a standby mode to prevent exposure of personnel to harmful effluents.

4. If the stripping head is not moving within the pre-determined rates, the flash lamp will not be allowed to operate, thus prevent substrate damage.

5. If the correct color is not sensed, the on-line color sensor monitoring system will determine if the flash lamp will fire on or off until the correct color is sensed.

6. If all interlocks are not satisfied, the high-voltage power supply/controller will not allow the system to operate. The power supply will not operate if there is any disruption of cooling-water flow to the flash lamp, if there is a low-water indication in the flash lamp cooling-water reservoir, or if there is any airflow blockage or a disruption of any component cooling system, or if there is any open or unlatched door. The internal capacitors are automatically discharged upon system shutdown.

7. In the event of several over-pressure conditions, the dry-ice pelletizer liquid injection system will automatically shut down.

8. The effluent capture filter outlet (sniffer) will trigger an alarm when the activated charcoal scrubber becomes saturated, indicating decreased filter efficiency. The alarm will continue until the scrubber is serviced.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.

4.1.1 Suppliers. Unless otherwise specified in the contract or work order, suppliers shall be responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, suppliers may use their own facilities or any commercial laboratory acceptable to MDHS. MDHS reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure that materials and services conform to prescribed requirements.

4.1.2 In-house. MDHS Quality Assurance (QA) shall be responsible for determining the organization/department that will perform the inspection process(es) specified herein. MDHS QA will perform audits, as necessary, to ensure compliance with requirements of this specification when QA is not performing the inspection process(es).

4.2 Monitoring procedures for equipment. Proceed as follows:

a. Equipment shall be operated only by certified personnel as specified in 3.6 through 3.9. Failure of the robotics/coating removal system to operate in accordance with these procedures shall be brought to the immediate attention of supervision.

b. After setup and operational testing, equipment shall demonstrate initial acceptability to requirements for mechanical stress damage specified in 3.6.2.1.

4.3 Monitoring procedures for materials. Not applicable.

4.4 Personnel training/certification procedures. Stripping of coatings using the robotics/coating removal system shall be performed only by certified personnel. Requirements are as follows:

a. No prerequisites are required.

b. Course length is 40 hours, and shall consist of:

1. Classroom training (16 hours). This will be conducted by using training materials to provide a thorough understanding of the theory of operation, and to become familiar with individual system components, system setup parameters, and process operations. Scheduled inspection and maintenance procedures necessary to ensure peak system performance will also be included in this training.

2. Hands-on training (24 hours). This will be conducted at the paint stripping facility to allow personnel to perform system setups and to operate the system to perform actual process operations. Operator certification tests will be conducted to ensure personnel have a complete understanding of the system and its operation.

4.5 Process control. Periodic surveillance of the robotics/coating removal system shall be accomplished to assure conformance to the requirements of this specification regarding personnel pre-strip masking, system parameter selection, and quality of system performance.

4.6 Test methods.

4.6.1 Visual inspection. Surfaces that are stripped of paint shall be visually inspected to determine the following:

a. The stripped surfaces shall conform to the requirements specified in 3.6.3. Any metallic surfaces stripped to bare metal shall be refinished in accordance with the engineering drawing, as applicable.

b. The stripped surfaces shall have a clean, and uniform surface condition.

c. Aircraft components that have been masked shall show no damage after masking is removed.

d. On nonmetallic surfaces, there shall be no signs of distortion, warpage, or other defects such as broken, damaged, or exposed fibers. Nonmetallic surfaces having broken, damaged, or exposed fibers shall be brought to the immediate attention of the MDHS Quality Assurance Department.

5. PREPARATION FOR DELIVERY

Not applicable.

6. NOTES

6.1 Glossary of terms.

a. Ablation. Thermal degradation and decomposition of a substance.

b. Color sensor. Indicates that the coating color to be removed is present, as directed by operator input from the customer setup matrix.

c. Effluent. The flowing, decomposed coating material.

d. Flash lamp. A quartz tube filled with xenon gas.

e. Motion sensor. Indicates that the predetermined stripping-head rate of travel, as directed by operator input.

f. Pelletizer. A machine that makes CO₂ pellets.

g. Proximity sensor. Indicates that proper focal stand-off has been achieved and the effluent collection shroud is in its proper position.

- h. Qualification or certification. The process of determining whether a person is capable of performing an identified task at a skill level which is acceptable to MDHS.
- i. Qualified personnel. A person who has demonstrated by passing written and/or performance evaluation tests that the person has the skills and job knowledge to perform in accordance with MDHS standards.
- j. Scrubber. An activated charcoal filter to trap hazardous vapors.
- k. Sniffer. A detector used to determine when scrubber filters are full and need to be changed.
- l. Substrate. Underlying layer of material.
- m. Trained personnel. A person who has successfully completed a course of classroom and on-the-job training in a specific task or operation.
- n. Xenon gas. A colorless gas that radiates heat when electrically energized.

7. APPROVED SUPPLIERS

Not applicable.