

## POLLUTION PREVENTION OPPORTUNITY DATA SHEET

### PLASTIC MEDIA BLASTING

**Revision:** 4/95  
**Process / Product:** Mechanical Paint Stripping  
**Process Code:** ID-01-99  
**Substitute for:** Chemical Paint Stripping/Sand Blasting  
**Waste-Stream:** Aircraft Chemical Paint Stripping Wastes  
**Applicable EPA Hazardous Waste Codes:** D006, D007, D035  
**Applicable EPCRA Targeted Constituents:** Toluene, Xylene, Methyl Ethyl Ketone, Acetone, n-Butyl Alcohol, Lead, Chromium, Zinc Compounds, Phenols, Chloroacetic Acids, and Methylene Chloride

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**Introduction:** Plastic Media Blasting (PMB) is a dry abrasive blasting process designed to replace chemical paint stripping operations and conventional sand blasting. Chemical paint stripping is primarily used on aircraft by applying chemical gels to the painted surfaces or by dipping the component into a tank of unquelled stripper. The paint and solvent mixture are scraped and washed off with water. The process generates large quantities of paint/solvent sludges which may contain chromium, other toxic metals, and toxic organic substances (e.g., phenols, chloroacetic acids, and methylene chloride) from the stripping solvents.

Conventional industrial sand blasting uses silica sand suspended in a high pressure air stream to remove paint from surfaces. Fugitive dust composed of both paint and sand particles is created and requires management during the abrasive process. The used silica sand is not typically recycled; the waste stream mixture of sand and paint chips is disposed as hazardous waste depending on the paint constituents.

**Description:** PMB is performed in a ventilated enclosure such as a small cabinet (glove box), a walk-in booth, a large room, or airplane hanger. PMB is similar to conventional sand blasting except that soft, angular plastic particles are used as the blasting medium. The PMB process propels the plastic media at a much lower pressure (less than 40 psi) than conventional blasting. PMB is well suited for stripping paints, since the low pressure and relatively soft plastic medium have minimal effect on the surfaces under the paint.

After blasting, the media is passed through a reclamation system that consists of a cyclone centrifuge, a dual adjustable air wash, multiple vibrating classifier screen decks, and a magnetic separator. In addition, some manufacturers provide dense particle separators as a reclamation system. The denser particles, such as paint chips, are separated from the reusable blast media, and the reusable material is returned to the

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blast pot. Typically, media can be recycled ten to twelve times before it becomes too small to effectively remove paint. Waste material consists of blasting media, floor particles, and paint chips. Plastic waste may be classified as RCRA hazardous waste because of the presence of metal contaminants. Disposal options include solidification and landfill disposal of the plastic dust and paint chips, incineration of the waste, or use of the waste as a fuel additive in authorized cement kilns. An alternative solution to handling a potential hazardous waste is to locate a vendor that would 'lease' the blast media to the base and then recycle the media to recapture the metals.

Plastic media are manufactured in a variety of types, sizes, and harnesses. A military specification (MIL-P-85891) has been developed for plastic media. The specification provides general information on the types and characteristics of plastic media.

Operators must wear continuous flow airline respirators in accordance with OSHA with OSHA 29 CFR 1910.94 when blasting operations are in progress.

PMB is being used at Puget Sound, Charleston, and Portsmouth Naval Shipyards; Naval Aviation Depots (NADEPs) Norfolk and Cherry Point; and Naval Surface Warfare Center (NSWC) Indian Head, as well as other Navy activities and throughout the Air Force. Plastic media glove boxes and enclosed blasting booths have been installed at aircraft maintenance activities to remove paint from support equipment and components. A blast media lease and recycle program is in place at NADEP Cherry Point. A more detailed list of organizations within the DOD depot maintenance community that have implemented PMP operations is provided in Appendix III of Joint Paint Removal Study: Final Report Plastic Media Blast, Joint Depot Maintenance Analysis Group, Technology Assessment Division, June 1994.

### **Materials Compatibility:**

Storage and handling of plastic media and blast waste associated with this process pose no compatibility problems. Prior to using plastic media for repainting operations, personnel should check any applicable military specifications and operations manuals for the systems. Plastic media cannot be used with a system designed for other types of media. Some military specifications do not allow PMB for repainting certain types of materials (i.e., fiberglass, certain composites, honeycomb sandwich structures, and some applications with thin-skinned aircraft components). In certain cases, PMB can inhibit crack detection on some of the softer alloys used for aircraft components (i.e., magnesium).

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**Safety and Health:** As with any blasting operations, airborne dust is a major safety and health concern. Proper precautions should be taken to ensure inhalation of dust/particulate matter is avoided. Additional protective measures should be taken when stripping lead chromate- or zinc chromate-based paints, as these compounds may be hazardous. Inhalation of lead and zinc compounds can irritate the respiratory tract, and some compounds are known to be carcinogenic. Inhalation of paint solvents can irritate the lungs and mucous membranes. Prolonged exposure can affect respiration and the central nervous system. Proper personal protective equipment should be used.

Consult your local Industrial Health specialist, your local health and safety personnel, and the appropriate MSDS prior to implementing any of these technologies.

**Benefits:** There is approximately a 50 percent reduction in hazardous chemical paint stripper waste. In addition, PMB benefits the environment because the media can be recycled for use a number of times. Technologies are being developed which recycle the media on site and further reduce the amount of hazardous waste generated.

**Economic Analysis:** Since the media used in this abrasive blasting process is generally not compatible with existing equipment that is designed for blasting with sand or chemical paint stripping, a capital equipment investment is required. Incompatibilities between media are due to the differing cone angles in the blast pots. Wastewater disposal costs (typical in chemical paint stripping operations) are virtually eliminated with PMB; however, the solids generated from this process have to be disposed. Actual solids disposal costs can vary greatly depending on the quantity, proximity, and disposal facility, and also any state and local fees. Disposal costs also depend upon the material removed from the aircraft; materials determined to be hazardous will have significantly greater disposal costs than nonhazardous materials. This problem can be solved by locating a vendor that leases the media. The vendor supplies the media to the user and collects the spent media and blast waste. Therefore, the user does not spend time and resources disposing of the potentially hazardous waste.

The following information on investment costs and costs/payback for PMB systems at DOD facilities was provided in Joint Paint Removal Study: Final Report: Plastic Media Blast, Joint Depot Maintenance Analysis Group, Technology Assessment Division, June 1994.

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### San Antonio ALC, Kelly AFB, Texas

San Antonio ALC installed a PMB facility in July 1992 designed to strip coatings from B-52 and C-5 aircraft. Payback on this facility is expected by 1995. At the May 1993 DOD/Industry Advanced Coatings Removal Conference, SA-ALC reported stripping seven C-5, one B-52, three F-16, and one T-37 aircraft in the facility. The ALC has scheduled one C-5 aircraft for stripping every week for the next 2 years. Stripping costs are:

Electrical	\$24,000	
Labor	102,000	
Media	10,000	
Hazardous waste	5,000	
Consumable	<u>10,000</u>	
<b>Total</b>	\$151,000	Cost per C-5 aircraft

The savings over chemical stripping with type V media per C-5 aircraft is 2,000 man-hours. The process will save \$4,800,000 a year and eliminate 72,000 gallons a year of methylene chloride stripper. The only areas not PMB processed are fiberglass, which means that 90 percent of the C-5 is dry stripped. The fiberglass areas are scuffed and painted.

### Hill AFB, Utah

In 1987, Hill AFB gathered data during the stripping of F-4 aircraft using chemical stripping and PMB. The comparison shows that using PMB instead of chemical stripping saves \$12,582 per aircraft. For a capital investment of \$1,400,000 and a workload of 150 aircraft per year, the payback period for converting to PMB stripping is approximately 9 months for this application. The evaluation factors and costs (per F-4 aircraft) are:

For chemical stripping at Hill AFB (1987):

- Labor = 346 hours at \$45.00/hr (\$16,380)
- Chemical use = 468 gallons at \$11.40/gal (\$5,335)
- Water treatment/disposal = 200,000 gallons at \$8.24/1000 gal (\$1,648)
- Heating, ventilating and air conditioning (HVAC) = \$1,347
- Maintenance = \$667 (note that chemical strippers can corrode concrete)
- Electricity = \$333 for ventilation fans
- Hazardous waste = 1024 pounds of paint and solvent sludge at a disposal cost of \$200/ton (\$102)

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- Water use = 200,000 gallons at \$0.43/1000 gal (\$86)
- TOTAL = \$25,89S/aircraft

For PMB stripping at Hill AFB (1987):

- Labor = 183 hours at \$45.00/hr (\$8,235)
  - Plastic media = 1,500 pounds at \$1.76/lb (2,640)
  - Maintenance = \$1,333 for PMB facilities and mechanical equipment
  - Non-PMB costs = \$667 to strip components that cannot be done using PMB
  - Hazardous waste = 1,700 pounds at \$260/ton (\$221)
  - Electricity = \$173 for ventilation fans and air compressors
  - HVAC = \$47
- TOTAL = \$13,316/aircraft

### Puget Sound Naval Shipyard (PSNSY), Bremerton, Washington

The PSNSY investment cost for a 10'x10' x 15' blast enclosure and associated equipment was \$150,000 in April 1990. The system included two blast pots with a 6-cubic-ft capacity and media classification equipment (cyclone separator, magnetic particle separator, and vibratory deck). Media is recovered by vacuuming through hoses connected to vacuum ports in the side of the booth. The system was installed to accommodate small parts that normally would be stripped in a 2,000-gallon methylene chloride paint strip tank.

Estimating the cost of a PMB system as a replacement alternative for stripping heavy iron is more difficult. Most of the cost data have been developed for stripping large uniform surfaces rather than the variety of parts and sizes that must be handled at PSNSY. PSNSY, which has concluded that PMB effectively removes common shipyard coatings, has been unable to fully use PMB or adequately evaluate it against other paint removal processes. During the 2 1/2 years that their PMB booth operated, it was used a total of 722 hours. Of the 722 hours, the actual blast time (nozzle time) was 247 hours. As a result the following operating cost data were collected from April 1990 to October 1991:

#### 1. Factors:

- Total amount of media used = 13,000 lbs
- Total nozzle time (from hour meter) = 161.9 hrs
- Total booth operating time (from hour meter) = 457.4 hrs
- Booth operating time per S-hour shift = 6 hrs (75% of shift)
- Sandblaster labor rate = \$37.23 per hour

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- Media cost (Type II, Grade B) = \$1.50 per lb
- Hazardous waste disposal cost = \$4.09 per lb\*
- Maintenance labor rate = \$21.83/hr

\* This cost is an accounting figure used at PSNSY that includes all expenses (direct and indirect) related to hazardous waste management and disposal on a per pound (lb) basis.

2. Material cost per nozzle hour:  $(13,000 \text{ lbs}/161.9 \text{ hrs}) \times \$1.50/\text{lb} = \$120.45/\text{hr}$

3. Manpower cost per nozzle time:  $(75\% \times 161.9 \text{ hrs})/457.4 \text{ hrs} = 0.266$

$$\$37.23/\text{hr}/0.266 = \$139.96/\text{hr}$$

4. Disposal cost per nozzle hour:  $(\$4.09/\text{lb} \times 13,000 \text{ lbs})/161.9 \text{ hrs} = \$328.43/\text{hr}$

5. Maintenance cost per nozzle hour:

Maintenance costs were documented from October 1991 to August 1992. Thirty-two man hours and \$30 in materials were expended. During the same time period, 84.9 hrs of nozzle time was logged (actual blasting).

$$(32 \text{ hrs}/84.9 \text{ hrs}) \times \$21.83/\text{hr} = \$8.23/\text{hr}$$

6. Total cost per nozzle hour:

$$\$120.45 + \$139.96 + \$328.43 + \$8.23 = \$597.07/\text{hr}$$

**Major Assumptions:** N/A

**Points of Contact:** Charles Tittle  
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### **Vendors:**

The following is a list of PMB manufacturers. This is not meant to be

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a complete list, as there may be other manufacturers of this type of equipment.

BSMI  
P.O. Box 322  
Seahurst, WA 98062  
Phone: (206) 433-6947

Pauli & Griffin  
907 Cotting Lane  
Vacaville, CA 95688  
Phone: (800) 666- 1115

Schlick-America Inc.  
P.O. Box 374  
Randallstown, MD 21133  
Phone: (410) 655-0770

### Leasing Services:

Composition Materials  
1375 Kings Highway East  
Fairfield, CT 06430  
Phone: (800) 262-7763

L.S. Solutions, Incorporated  
P.O. Box 309  
Deer Park, TX 77536  
(713) 478-6522

PPI Industries  
2860 Cordelia Road, Suite 120  
Fairfield, CA 94585  
(707) 421-8818

Composite Leasing Corporation  
P.O. Box 102  
Minocqua, WI 54548  
Mr. Bill Stromdahl  
Phone: (715) 358-2625, Fax: (715) 358-3100

U.S. Technologies  
220 7th Street Southeast  
Canton, OH 44702  
(800) 634-9185



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**Approving  
Authority:**

PMB is not authorized for use on aluminum and magnesium components that require a fluorescent penetrant inspection. NAVAIR has authorized PMB use on metal substrates under specific process control parameters at depot activities. NAVAIR has not authorized PMB for depainting composites, other non-metal substrates, or honeycomb sandwich structures.

**Note:**

This recommendation should be implemented only after engineering approval has been granted by cognizant authority.

Sources: Pro-Act Technical Inquiry 4396

**Vendors**

Joint Paint Removal Study, Final Report; Plastic Media Blast, Joint Depot Maintenance Analysis Group, Technology Assessment Division, Dayton, Ohio; June 1994; (513) 296-8296.