DEGREASING AND PAINT STRIPPING USING SPONGE BLASTING

Revision Date: 8/99

Process Code: Navy and Marine Corps: ID-01-03; Air Force: ST01; Army: DPT

Usage: Navy: Low; Marine Corps: Low; Army: Low; Air Force: Low

Compliance Impact: Medium

Alternative For: Sand Blasting and Chemical Paint Stripping

Applicable EPCRA Targeted Constituents: Toluene (CAS: 108-88-3), Xylenes (CAS: 1330-20-7), Methyl Ethyl Ketone (CAS: 78-93-3), Acetone (67-64-1), n-Butyl Alcohol (CAS: 71-36-3), Lead (CAS: 7439-92-1), Chromium (CAS: 7440-47-3), Zinc Compounds, Methylene Chloride (CAS: 75-09-2), Phenols (CAS: 108-95-2), and Chloroacetic Acids (CAS: 79-11-8)

Overview:

Sponge blasting systems incorporate various grades of water-based urethane-foam cleaning media in order to clean and prepare surfaces. Non-abrasive media grades are used to clean more delicate substrates. Abrasive media grades, consisting of grit-impregnated foam, are used to remove surface contaminants, paints, protective coatings, and rust from a variety of surfaces. In addition, the abrasive grades can be used to roughen concrete and metallic surfaces, if desired. The abrasive media may contain a variety of grit including aluminum oxide, steel, plastic, and garnet, depending upon the application.

The foam cleaning media is absorptive and can be used either dry or wetted with various cleaning agents and surfactants to capture, absorb, and remove a variety of surface contaminants such as oils, greases, lead compounds, chemicals, and radionuclides. The capability of using the foam cleaning media wetted also provides for dust control without excess damping of the surface being cleaned. The equipment consists of three transportable modules, which include the feed unit, the classifier unit, and the wash unit.

The feed unit is pneumatically powered for propelling the foam cleaning media. The unit is portable and is produced in several sizes (depending on the capacity required). A hopper, mounted at the top of the unit, holds the foam media. The media is fed into a metering chamber that mixes the foam cleaning media with compressed air. By varying the feed unit air pressure and type of cleaning media used, sponge blasting can remove a range of coatings from soot on wallpaper to high-performance protective coatings on steel and concrete surfaces.

The classifier unit is used to remove large debris and powdery residues from the foam media after each use. The used media is collected and placed into an electrically powered sifter. The vibrating sifter classifies the used media with a stack of progressively finer screens. Large contaminants, such as paint flakes, rust particles, etc., are collected on the coarsest screens. The reusable foam media are collected on the corresponding screen size. The dust and finer particles fall through the sifter and are collected for disposal. After classifying, the reclaimed foam media can be reused immediately in the feed unit. The abrasive media can be recycled approximately six times and the non-abrasive media can be recycled approximately 12 times.

During degreasing applications, the foam media must be washed every three to five cycles. The washing of the foam media takes place in the wash unit, which is a portable centrifuge, closed-cycle device. The contaminated wash water is collected, filtered, and reused within the wash unit.

This system removes paint, surface coatings, and surface contaminants from a variety of surfaces. Waste streams produced from this system include blast process contaminants, such as paint flakes, rust particles; dust and finer particles, and the concentrated residue from the bottom of the wash unit.

The effect that this technology has on pollution prevention is that the stripping media can be recycled (10-15 events) and the quantity of wastewater that is typically generated using conventional methods (chemical stripping) is greatly reduced.

Compliance Benefit: Use of sponge blasting paint stripping as a replacement for chemical paint strippers results in the following compliance benefits:

- Elimination of volatile organic compounds (VOCs) used as strippers that are associated with the formation of smog typically regulated by federal and state agencies as well as local air pollution control districts.
- Elimination of hazardous air pollutants (HAPs) in strippers that are regulated by federal, state, and local regulations including the National Emissions Standards for Hazardous Air Pollutants (NESHAPs) **(40 CFR 63)**.
- Decreased SARA Title III reporting **(40 CFR 355, 370, and 372; and EO 13148)**.
- Reduced volumes of organic wastes, which must be managed as hazardous waste under **40 CFR 260 and related sections**.
- Reduced potential for release of hazardous substances in reportable quantities **(40 CFR 110 and 302)**.
- Reduced occupational exposures, which are regulated by **29 CFR 1910**.
- Decreased water use as required under **EO 13123**. In addition, since no wastewater is generated the potential for a facility to need a wastewater pretreatment permit from a local treatment operator is decreased.

Compliance benefits include: 1) elimination of recordkeeping and reporting requirements under the Clean Air Act Title V Operating Permit Program, NESHAPs, and SARA programs, 2) reduce administrative burden associated with hazardous waste (i.e., tracking, plans, reports, training), and 3) reduced administrative burden associated with OSHA (i.e., training and recordkeeping).

The compliance benefits listed here are only meant to be used as a general guideline and are not meant to be strictly interpreted. Actual compliance benefits will vary depending on the factors involved, e.g., the amount of workload involved.

Materials Compatibility: Sponge blasting systems are compatible in most situations where other types of blasting media have been used.

Safety and Health: As with any blasting operations, airborne dust is a major safety and health concern. Proper precautions should be taken to avoid inhalation of dust/particulate matter. 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 solvent vapor 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 this technology.

Benefits:

- Safer for operators compared to other blasting media and chemical stripper systems
- Easily transportable
- Waste minimization is achieved by recycling the sponge media (an average of ten to fifteen times)
- Absorbs and removes contaminants
- Reduces dust generation

Disadvantages:

- Foam media costs are more expensive than sand blasting media
- Reasonably large capital investment cost
- The Sponge Blasting paint removal or degreasing process has not received any engineering evaluation by the Air Force. Any new paint removal technology for application on aerospace equipment must meet extensive material characterization testing for compatibility. The responsibility for determining test and evaluation requirements now belongs to the Coatings Technology Integration Office at AFRL.

Economic Analysis: The cost elements of a Sponge-Jet™ stripping system are compared to chemical stripping.

Assumptions:

- 20,000 square feet of paint to be removed per year
- Paint stripping rate of the sponge blasting system: 180 ft2/hr
- Paint stripping rate of chemical stripping: 25 ft2/hr
- Labor rate: $30/hr
- Foam media cost: $65/50 lbs
- Foam media used: 18,000 lbs
- Feed unit cost: $15,500
- Classifier unit cost: $8,550
- Washer unit cost: $23,700
- Chemical cost: $11.40/gal
- Chemicals used: 416 gal
- Water usage cost: $1.94/1000 gal
- Water treatment: $8.24/1000 gal
- Volume water treated: 1,600,000 gal
- Paint and solvent sludge disposal cost: $2000/ton
- Sludge generated: 4 ton
- Dry paint waste residue (after recycling foam media): 240 lbs
- Paint disposal cost: $2/lb

Sponge Jet and Chemical Stripping

	Sponge-Jet™	Chemical Stripping
Operational Costs:		

Labor:	$5,080	$24,000
Chemical:	$0	$4,760
Foam Media:	$23,400	$0
Hazardous Waste Disposal:	$480	$8,000
Water Purchase	$0	$3,200
Water Treatment:	$0	$13,200
Total Operational Costs:	$28,960	$53,160
Total Recovered Income:	$0	$0
Net Annual Cost/Benefit:	-$28,960	-$53,160

Economic Analysis Summary:

Annual Savings for Sponge-Jet™:	$24,200
Capital Cost for Diversion Equipment/Process:	$47,750
Payback Period for Investment in Equipment/Process:	< 2 Years

Click Here to View an Active Spreadsheet for this Economic Analysis and Enter Your Own Values. To return from the Active Spreadsheet, click the ***reverse arrow*** in the Tool Bar.

Approving Authority: Appropriate authority for making process changes should always be sought and obtained prior to procuring or implementing any of the technologies identified herein.

For Air Force applications, degreasing and paint stripping using sponge blasting must not be used on any aircraft or weapon systems without the knowledge and approval of the appropriate system manager, office(s) having engineering authority on the specific airframe(s) and the Air Force Corrosion Prevention and Control Office. This process requires significant engineering evaluation and must be approved by the engineering authority of the specific Weapon system Manager or Equipment Item Manager within the Air Force.

NSN/MSDS:

Product	NSN	Unit Size	Cost
Sponge-Jet Feed unit	4940-01-395-6212	ea.	Requested JR
Sponge-Jet Sifter	4940-01-396-6868	ea.	Requested JR
Sponge-Jet Sifter	4940-01-400-1220	ea.	$6,000

Points of Contact:

Navy:
Mr. Scott Mauro
Naval Facilities Engineering Service Center, ESC 423
1100 23rd Avenue
Port Hueneme, CA 93043-4370
Phone: (805) 982-4889, DSN: 551-4889
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Air Force:
Air Force Corrosion Prevention and Control Office
AFRL/MLS-OLR (Bldg. 165)
325 2nd Street
Robins AFB, GA 31098-1640
Phone: (912) 926-3284
DSN: 468-3284

Vendors:

This is not meant to be a complete list, as there are other manufacturers of this type of equipment.

Sponge-Jet™
235 Heritage Avenue Suite 2
Portsmouth, NH 03801
Phone: (603)-431-6435
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URL: http://www.spongejet.com/index.html

Sources:

Sponge-Jet™, May 1996.

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