Sponge Blasting

Under previous efforts, the NDCEE and NSWC-CD tested alternatives at the NDCEE Demonstration Facility, including sponge blasting, to current coatings removal and etching methods. The NDCEE utilized these efforts to help identify potential alternatives to chemical or mechanical coatings removal processes for use on delicate substrates, many of which are also dimensionally critical parts.

Technology Description

The sponge blasting technology cleans, etches, and removes coatings from various types of substrates. It uses an air-propelled open cell, water-based polyurethane foam cleaning media (also known as sponge media). The foam material can be impregnated with abrasive grit to enhance the performance of the media. The abrasive media may contain a variety of grit including aluminum oxide, steel, and plastic. The ability to use different media types gives the system flexibility by providing different characteristics and blasting capabilities. The foam cleaning media are absorptive and, when wetted with a cleaner or surfactant, can be used to remove a variety of surface contaminants and control dust without excess wastewater.

A feed unit is used to deliver sponge media to the surface. A media classifier is required to handle recycling chores. This classifier operates by collecting the sponge blast media and running the media through an electrically powered sifter, which separates the sponge media into four categories: oversized debris, reusable debris, reusable media, and fines (consisting of spent media and dust). Typically, 85–90% of the sponge media is reusable after each blast cycle. Using a classifier, the media can be recycled approximately 5–7 times for low dust applications. The amount of times that the media can be recycled depends on the type of surface and the contaminants that are removed from the surface. Some applications have shown up to 18 uses before the media are no longer productive.

ESOH Need

Coatings removal techniques

Typically, the waste that is generated with sponge media blasting is minimal because the media are recyclable. The disposal method depends on the type of coating or substance that was removed from the surface. Generally, if the substance that is being removed is classified as nonhazardous waste, then the spent media and the material that were removed are placed into a drum and sent to a landfill. If the substance that is being removed is classified as a hazardous waste, such as a radioactive material or a lead-based paint, then it must be placed in an approved container (55-gallon drum) and sent to an approved disposal facility.

Sponge media feed unit

Technology Benefits and Advantages

- Decreases solid waste generated from non-recyclable blasting media (e.g., garnet and black beauty) and use of chemical strippers
- Reduces labor and operating costs as a result of decreased preremoval preparation and postremoval cleanup
- Improves safety and worker health conditions due to the elimination of airborne emissions of heavy metals and other contaminants when used with vacuum recovery
- Involves reusable media
- Helps facilities to comply with Executive Order 13148, which requires the DoD to decrease the amount of waste that is generated at federal facilities, as well as environmental regulations regarding airborne particulate emissions

Technology Limitations

- Not as aggressive on metallic substrates as some abrasive media; however, unlike the sponge medium, these more abrasive media do not have the capability to be used on delicate substrates.

NDCEE FY04 Accomplishments

The NDCEE produced a Final Report on Task N.301 accomplishments. Included in this report was a discussion on NDCEE field demonstration activities at NAB Little Creek and on behalf of Fort Eustis on four coatings removal processes. Sponge, fiber, water, and wet sodium bicarbonate blasting were evaluated on their ability to meet the facilities' production requirements and waste reduction needs. In addition, they were tested on aluminum and fiberglass HMMWV parts to determine if these delicate substrates would be damaged during a coatings removal process. They also were tested on steel Modular Causeway Systems and a 2 1/2-ton truck component.

Sponge blasting was effective for removing coatings from all the substrates presented at the demonstration; however, implementation of the technology may require minor maintenance or upgrades to the current blast facilities to ensure effective collection and particulate separation during recycling. Recycling blast media is expected to increase production and reduce procurement and disposal costs.

Economic Analysis

Equipment costs are approximately $50,000. Using the baseline removal rate that was received from Fort Eustis on its dry sodium bicarbonate blasting process for aluminum and fiberglass components, a comparison was made with the sponge alternative technology. Test results show that the sponge technology offers a comparable strip time to the baseline of 4–5 hours, causes no damage to delicate materials, and emits little to no dust. Because of the comparable strip rates, associated labor costs should be the same as the baseline method. Reduced procurement and disposal costs are anticipated because the sponge media are recyclable. Procurement savings are dependent on the price of the raw materials. Prior to technology implementation, a complete cost analysis should be performed.

Suggested Implementation Applications

Applicable weapon system components include fiberglass hoods on HMMWVs and other delicate substrates.

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Applicable NDCEE Task

Sustainable Green Manufacturing (Task N.301, Subtask R3-10)