How Two Very Different Techniques Tackle the Challenge of SURFACE PREP

By Jack Innis and Tony Anni

Most people in the coatings industry will agree that surface preparation is the foundation of a successful coatings job. Just how important is it? "Good surface prep can make a poor coating perform well, and poor surface prep can cause an excellent coating to fail," notes an industry expert. With so much riding on this critical, time-consuming step — and such a myriad of abrasive-blasting techniques now available on the market — it might be tempting to stick with a "tried and true" method that has traditionally worked well on a particular substrate.

But why not investigate the full range of methods at your disposal? From steel slag to polyurethane sponge, from walnut shells to corn cobs, from high-pressure water to liquid nitrogen, abrasive media can have widely varying prices, surface profiles, and environmental impacts. What works for one substrate or one environment may not suit another. And another important factor to consider is the old adage, "Time is money." One blast medium may appear to be cheaper "on the surface," but may prove to be far more expensive in labor-hours, or when a coatings job subsequently fails. Surface prep is one area where it pays to have a working knowledge of your options.

Walk through any coatings industry trade show and you'll be barraged by the choice of abrasives, all making similar claims in their brochures, videos, and live demonstrations. Many are relative newcomers to the market. Do they really accomplish what they purport to do? Common sense tells us there are downsides to everything, and that every claim warrants thorough investigation. If you want to ensure success in the coatings business, there's simply no substitute for doing your surface prep homework.

Intrigued by the growing choices of abrasive media, *CoatingsPro* decided to take a closer look at two very different techniques and see how they performed in actual recent applications. Ever heard of using liquid nitrogen to remove stubborn coatings? NASA recently put it to the test in our space mission. And how can something as soft as sponge effectively tackle the surface prep of a rusted ship? Check out these case studies and the chart that follows — a thumbnail comparison of some abrasive methods on the market today.

Tale of Two Ships: Blasting Gives Needle-Gunning a Run for the Money

Sponge Media

The turbulent waters of the Hudson River and Long Island Sound are filled with traffic, rocks, reefs, shoals, and narrow channels that can wreak havoc on cargo ships and ferries traveling to New York and New Jersey. With $12 billion in annual economic activity at stake, navigating the harbor's close quarters is best left to the experts. That's why large vessels rely on pilot ships to assure them safe passage to their anchorage. One of the premier pilot-ship companies, Sandy Hook Pilots (SHP) of Staten Island, New York, safely guides more than 12,000 of these ships and ferries each year.

SHP's pilot superintendent John Oldmixon and marine superintendent Ken Peterson are continuously searching for new ways to keep their fleet safely operating on the water and avoid costly maintenance in shipyards. "Whether you're guiding these huge vessels to safe anchorage or to pier-side, the last thing we need to worry about is the reliability of our service," he says. "That's precisely why we conduct continuous maintenance on our fleet. An interruption to our service

Guiding cargo ships and ferries through New York's turbulent harbor can wreak havoc on a pilot ship, making constant maintenance a necessary chore. Sponge blasting accelerated the process of removing contaminants from the hull of this Sandy Hook pilot ship, returning the ship to service without having to undergo costly shipyard maintenance.

JOB at a GLANCE: LIQUID NITROGEN

PROJECT:
Remove coating from exterior surfaces of NASA space shuttle booster rockets using high-pressure liquid nitrogen. Specialized 4"-5" thick coating is NASA's secret formulation designed for permanent installation to withstand 12 to 14 g-forces and temperatures in excess of 3,000° F.

COATINGS CONTRACTOR:
NitroCision
2582 Heyrend Way
Idaho Falls, ID 83402
(208) 552-2706
www.nitrocision.com

SIZE OF CONTRACTOR:
16 full-time employees;
Two three-man teams for this project

PRIME CLIENT:
NASA
Kennedy Space Center
Brevard County, Florida

SIZE:
More than 300 cubic feet of coatings on 56 different rocket sub-assemblies. Coating is 4-5" thick in some areas.

DURATION:
90 days (although future projects may be warranted)

UNUSUAL FACTORS:
In main house of pier-side pilot boat, blasting and painting process had to be tightly contained. Ballast tanks were extremely small and remote, with many corners, pipes, and weld seams.

SUBSTRATE CONDITION:
Metal alloy in near-perfect condition

UNUSUAL FACTORS:
Job requires removal of coating, leaving primer intact. Sensitive equipment inside rocket boosters requires coating removal without contact from any residue or particles, including water, sand, or chemicals.

MATERIALS/PROCESS:
- Set up truck near Launch Vehicle Assembly Building
- Unload the system with a forklift
- Take system to a work area called the high bay
- Erect vacuum shrouds to contain airborne particles
- Pressurize liquid nitrogen system to 45,000 PSI, set nozzle temperature to -245°F
- Work nozzle back and forth, approximately 2.5" away from coating (3" thick area takes about 6 passes to get down to primer)

SAFETY CONSIDERATIONS:
When blasting with liquid nitrogen, safety gear includes gloves, apron, outer footwear, and goggles.

Care must be taken not to contact stream of liquid nitrogen or to touch any materials that might have been in contact with the liquid nitrogen. NASA requires a second man at the nozzle with a kill switch.

Although nitrogen is not toxic, it displaces air. This work was performed in an open air environment; however, in a closed environment care must be taken to ensure the oxygen level stays at 19.5%, as per OSHA. Operational and safety orientation mandatory before working with liquid nitrogen.

Although not required on this project, all crew members are trained and prepared to wear respirators.

JOB at a GLANCE: SPONGE MEDIA

PROJECT:
Prepare surface and recoat the pilot boats *New York* (main house) and *New Jersey* (#4 port and starboard ballast tanks) Staten Island, New York.

COATINGS CONTRACTORS:
Maintenance Department
Sandy Hook Pilots
201 Edgewater Street
Staten Island, NY 10305
(718) 448-3900

SUBSTRATE:
Steel in both the main house and ballast tanks

SIZE:
2,000 square feet of main house
1,600 square feet of ballast tanks

DURATION:
4 weeks for the main house;
3 weeks for the ballast tanks

UNUSUAL FACTORS:
In main house of pier-side pilot boat, blasting and painting process had to be tightly contained. Ballast tanks were extremely small and remote, with many corners, pipes, and weld seams.

PROCESS:
- Sponge-blasting and needle-gunning to remove rust, scale, and failed coating
- Apply thinner to blasted areas
- Apply inorganic zinc-rich primer
- Apply two-part marine epoxy
- Apply topcoat (main house only)

MATERIALS:
- Sponge-Jet, Inc.'s Silver Sponge Media for abrasive blasting surface
- Ingersoll-Rand's needle gun for peening the surface
- Ameron's T-10 thinner, Dimetcoate 302H zinc-rich primer, Amercoat 235 intermediate coating, PSX 100 topcoat (main house only) to coat the surface

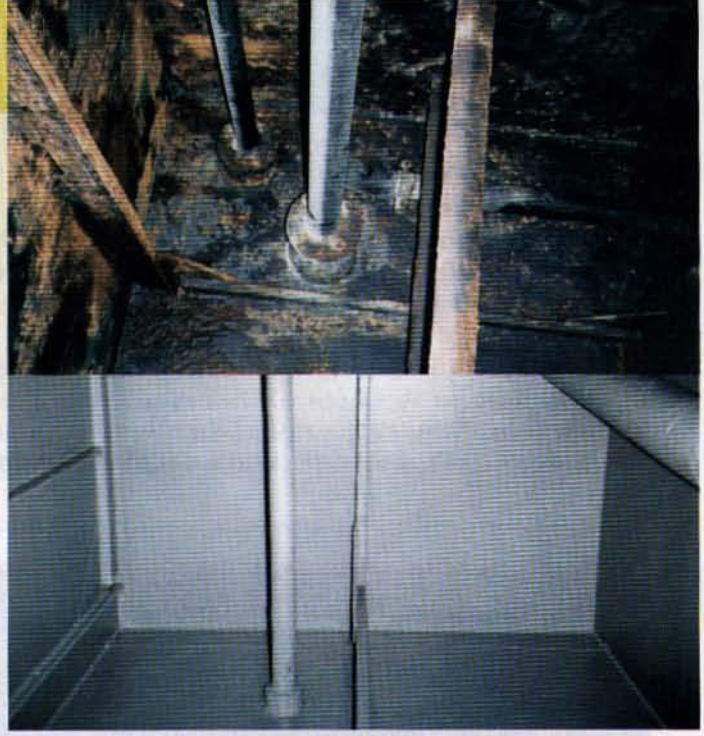
SAFETY CONSIDERATIONS:
Tyvek suits, organic-cartridge respirators, and canvas gloves worn during abrasive blasting process in blasting tanks (a confined space).

out there could jeopardize lives, the environment, and valuable cargo."

This past year, Peterson made huge strides in limiting expensive shipyard maintenance and downtime by accelerating SHP's painting and blasting operations. "We were looking to blast and repaint the main house of the 182-foot *New York* pilot boat, without pulling it from the water or sending it away," he explains. Its problems included rust, scale, and failing sections of a two-part marine epoxy coating, averaging ¼"-thick. The surface prep specification called for an SSPC SP-10/NACE No 2 Near-White Metal Blast finish and a 1-½- to 2-½-mil anchor profile, which would be recoated with Ameron's Dimetcoate 302H inorganic zinc-rich primer, Amercoat 235 two-part marine epoxy (intermediate coating) and PSX 100 single-pack, acrylic polysiloxane topcoat.

Off With the Old Using Something New

Prior to surface preparation, Peterson had been to the Workboat trade show and had learned of a dry abrasive that would contain potential airborne emissions at the source and greatly reduce the rebound commonly associated with



Before new coating could be applied, *(top)* this corroded ballast tank needed to be sponge-blasted to an SSPC SP-10/NACE No. 2 near-white metal blast finish and a 1.5 to 2.5 anchor profile. The final topcoat lends a shiny white finish, *(above)* making the ballast look like new.

conventional abrasive blasting. He was intrigued by the concept of a blasting process that would allow for quick set-up, clean-up, and minimal waste disposal. "It is increasingly difficult to dispose of large volumes of conventional abrasives, and presents much more of a headache in dealing with the EPA," he says. Disposing of large volumes of spent abrasives that have been used to remove marine paints presents a significant challenge, and it can be rather unpredictable how the waste will be classified for disposal, he adds.

"As soon as I saw the Sponge-Jet abrasive and understood how it worked, I knew we wanted to try it," says Peterson. A composite of sponge and aluminum oxide abrasive, Sponge-Jet particles flatten on impact. They suppress the release of loosened surface contaminants while exposing the abrasive with little fracturing, says Stu Goldberg, mid-Atlantic regional sales manager of Sponge-Jet. "Contaminants are removed selectively or, if desired, the coating system is completely stripped and the substrate profiled," he explains. "Once the media leave the surface, they constrict, pulling and entrapping most of what normally would have become airborne contaminants."

Peterson rented a sponge-blasting system to prepare the surface of the *New York*'s 2,000-square-foot main house. The system was delivered by an air-driven feed unit equipped with a pneumatic control panel that precisely adjusts blast pressure and media feed rate. The blasted media was then collected and processed through a pneumatically powered classifier that separated the composite media abrasives into three categories: oversized debris, reusable media, and fines, which consist of spent media and dust. SHP was able to reuse up to 90% of the abrasives after each blast cycle.

"Composite media abrasives helped in saving us time and money that would have gone to a shipyard," Peterson confirms. He recycled the abrasive many times, thus reducing media volume used on the project and lowering waste disposal to a small percentage compared to conventional abrasives. By using – and reusing – composite media abrasives, SHP was able to blast more square feet and had much less volume of spent abrasive to dispose of than with conventional abrasives.

"In some cases, you can reclassify the media to further separate potentially hazardous substances without rendering the entire waste stream as hazardous, and therefore dispose of a very small amount of hazardous waste," he notes.

Putting Sponge to the Test

Peterson chose to try the sponge-blasting system again in the ballast tanks of the *New Jersey*, but also wanted to

compare it directly to hand-tooling, which he had been using regularly. The 145-foot boat – whose two tanks' 800 square-feet of surface contained ¼-inch of heavily rusted steel and multiple layers of failing marine epoxy coating – provided a perfect venue to compare the two methods. Wearing Tyvek suits, organic-cartridge respirators, and canvas gloves for protection, crews blasted Bays 1 and 2 of the Number 4 port ballast tank with Silver Sponge Media abrasives. The specification called for an SSPC SP-10/NACE No. 2 Near-White Metal Blast finish and a 1-½- to 2-½-mil anchor profile before recoating with an inorganic zinc primer and a two-part marine epoxy topcoat. A Tornado blower with an eight-inch-diameter air hose was placed in each tank along with an evacuating pipe, assuring the swift exit of potentially harmful airborne particulates.

Simultaneously, Bays 1 and 2 of the Number 4 starboard-side ballast tank were needle-gunned by five operators, each using Ingersoll-Rand air-needle guns. Two weeks were required to prepare the tank. "Needle-gunning can be good for flat surfaces, but it doesn't work as effectively where there are angles and crannies, such as in corners, frame joints, and under the many fixed pipes," says Peterson. "I try

Composite media blasting offered a low-dust, low-rebound method of removing paint, rust, scale, and failed sections of a two-part marine epoxy coating inside the ballast tank. Normally, disposing of large volumes of spent abrasives would have presented a significant challenge.

Sponge/abrasive composite particles made quick work of preparing the ship's main house, located just feet from the waterside. Sandy Hook Pilots maintenance crews reduced surface preparation labor by 72% and dramatically reduced waste disposal costs by using composite media.

to use hand tools on very small, spot areas generally not exceeding a few square feet, and on projects where minimal staging is required."

The tank blasted with composite media abrasive went much more quickly, requiring only one week's work by a two-man crew to completely prepare the surface. The sponge/abrasive composite particles easily removed the rust and multilayered coatings and produced the profile as specified, with a significant reduction in total labor. Additionally, the recyclable nature of the composite media abrasive dramatically lowered waste disposal costs, compared to conventional abrasive blasting. "The operation using Sponge-Jet was much faster and more thorough, and able to more completely impart the specified profile on every surface, in every corner, and under every frame joint and pipe," Peterson says. "Overall, the use of composite media abrasive reduced our surface preparation labor by 72%. It also allowed us to dramatically reduce time required for blasting and painting."

Renewed by thorough surface preparation and a fresh coating of primer and topcoat, the *New York* and *New Jersey* have now returned to service, guiding their clients through winter storms and fog into one of the East Coast's busiest – and also most hazardous – ports. CP

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