



Rust Never Sleeps

NAVY TURNS TO ADVANCED COATINGS,
TECHNOLOGY TO COMBAT CORROSION

BY PETER ONG

Aviation Boatswain's Mate (Handling) 3rd Class Caleb Claunch removes rust and old paint from the aircraft elevator onboard amphibious assault ship USS Makin Island (LHD 8), Jan. 22, 2023.

U.S. NAVY | MASS COMMUNICATION SPECIALIST SEAMAN DOMINIC DELAHUNT

It looks unpleasant; it looks soiled; the dirty brown streaks of various shades make the gray paint look downright spoiled. It's warship rust, and there's a never-ending (online and print) discussion of why U.S. Navy warships are streaked and caked with rust that makes them appear less than shipshape and not befitting a superpower Navy.

In the case of steel warships, rust is a combination of air, water and iron alloy that combined cause an electrochemical reaction of hydrogen and oxygen atoms to iron atoms to produce iron oxide, or corrosion, that over time bonds to the steel, weakening the metal structure and causing it to disintegrate.

Debate about getting rid of rust on Navy warships, especially when they are deployed, goes back and forth with reasons from online commentators such as not having enough paint coatings to be environmentally friendly; to lax U.S. Navy leadership; to ship captains not pushing their Sailors to scrape off rust; to the Navy just not caring anymore.

But is that the case? In May 2023 for a Naval News story on the topic of rust, the author asked Naval Sea Systems Command (NAVSEA) for its position on tackling the issue.

"NAVSEA has worked successfully for decades to improve the corrosion-control performance of coatings while

simultaneously reducing the adverse impact of coatings on the environment," NAVSEA responded. "In the 1990s, Navy tank coatings had a performance life of five to seven years, but emitted paint solvents when applied. NAVSEA worked with domestic and foreign commercial coating manufacturers to develop ultrahigh solids epoxy tank coatings that do not contain any paint solvent. Since these coatings were first applied in the early 2000s, many coated tanks have remained corrosion-free for 15 to 20 years. These coatings are required on all Navy ships and have contributed to extending the drydocking periodicities."

The response went on to say NAVSEA has transitioned the fleet from silicone alkyd topside coatings that require reapplication to new, high-performance and environmentally acceptable polysiloxane coatings that provide extended service life. They allow the use of water solvent kits to clean paint without emitting harmful chemicals. NAVSEA said it also adopted high-performance powder coatings for use on topside parts, as they are hard, durable, color stable and contain no paint solvents.

The Navy also participated in the National Shipbuilding Research Program that is investigating technologies such as drones and robots for coating applications.

For 2025, *Seapower* asked NAVSEA if there have been any changes to the maintenance approach and attitudes toward rusting U.S. Navy warships.

“The NAVSEA engineering directorate and warfare centers provide technical assistance and guidance to Sailors and industry partners on the application of naval coating systems that improve corrosion control. Underwater inspection robots are used as a standard practice to inspect tanks on ships for corrosion. NAVSEA also manages ongoing initiatives such as mission modules with corrosion control tools and pier-side technical assistance to help facilitate ship’s force in conducting effective corrosion control on their ships,” NAVSEA responded via email.

“These efforts have enabled NAVSEA to steadily improve the corrosion-control performance of coatings while simultaneously reducing the adverse impact of coatings on the environment.”

NAVSEA said in May 2023 that Navy warships are now painted in polysiloxane coatings.

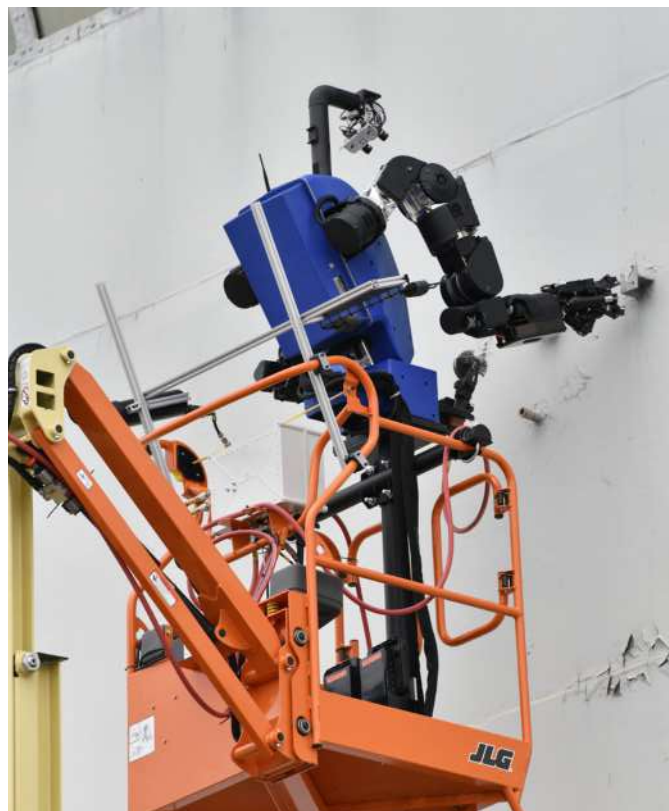
According to a website hosted by the Massachusetts-based company Dampney Engineered Coatings, “polysiloxane coatings are industrial protective and maintenance coatings that used in services characterized by abrasion, chemicals, extreme UV and high temperatures. The term polysiloxane refers to a polymer with a silicon-oxygen backbone. The silicon-oxygen backbone is much more resistant to the effects of UV radiation than the carbon-carbon backbone of organic polymers.”

Polysiloxanes have “excellent” aesthetic weathering attributes, including retaining their gloss, are abrasion and corrosion resistant and are formulated with low volatile organic compounds, meaning chemicals in the paint that can be released into the air as it dries.

Potential Solutions

Sailors on a warship under way just can’t paint over the rust with new paint. Seapower reached out to the RAND Corp. for their analysis on how to combat warship rust.

“Painting over rust results not in eventual but near immediate bubbling of rust through the applied paint. To remove the underlying corrosion source does require removing the old paint, sanding away the corrosion, applying primer and then paint,” responded Dr. Bradley Martin, a retired U.S. Navy captain and senior policy researcher at RAND. Thus, deployed warships exhibiting external rust don’t have an easy fix if the temporary solution is to paint over the rust streaks that



U.S. NAVY | DANA RENE WHITE

Sarcos Technology and Robotics Corp.’s Guardian DX Teleoperated Dexterous Robot prepares for an upcoming scenario on the forecandle of the Self Defense Test Ship in 2022 as part of the Repair Technology Exercise, or REPTX. The robot, with attachments added to its “hands,” can use laser technology to scrape off or remove surface paint that is peeling or exhibiting corrosion.

ostensibly Sailors often can’t reach from a skiff bobbing at the waterline, even with the proverbial 10-foot pole (attached to a roller).

“There certainly should be priority on finding and correcting corrosion that presents a safety hazard, threatens watertight integrity or the ability to combat battle damage,” Martin said in an email. “Concern about appearance, while understandable, can be an invitation to ignore the more fundamental issues. The concern with cosmetic appearance could be counterproductive if crews paint over rust for the sake of short-term appearance.

“The problem is fundamentally time and opportunity, and also failure to design ships without rust-making pockets and to apply paints (which can be eco-friendly) in availability periods that are resistant to rust or easy to clean in the event of running rust,” Martin said.

Some commentators believe in constructing new



A laser ablation rust removal system aboard a World War II battleship. Laser systems are being used by the U.S. Navy in dry dock and under way. This system is being used at Pearl Harbor Naval Shipyard as of January 2025.

destroyer tenders or using mission module shipping containers with painting supplies, tools and perhaps robotics to help with rust control. The last destroyer tender, the USS Shenandoah (AD 44) was decommissioned in 1996, but an expeditionary sea base or a large uncrewed surface vessel with paint workshop Mission Modules could work.

“These [ships with paint Mission Modules] could be very helpful in assisting with preservation of deployed forces. However, there would still be the issue of finding sufficient time to properly do the work,” Martin said.

As for using robots to assist in rust removal and painting, Martin said, “robots can be very helpful in preserving spaces like tanks and voids, which are difficult for people to reach. It’s not clear these would be particularly helpful with topside corrosion where the answers are likely matters of better paint that both protect and allow easy cleaning of running rust, elimination of rust markers on ship’s sides, and simple allowance of time for ships to perform preservation.”

Removing Rust with Lasers?

According to the Florida-based company Laser Photonics, the financial impact of corrosion on military assets has been large, reported by the Department of Defense at \$20.6 billion in 2016.

“For just the Navy alone, which includes ships, submarines and aircraft, the figure was at \$8.6 billion,” says a company blog entry written by David Thierer, a marketing specialist at the company, and titled “Laser Cleaning: The U.S. Navy’s Secret Weapon in the Battle on Rust.”

“Now, the Navy has a new, modern tool in its arsenal in the battle to maintain its fleet. Laser cleaning technology from Laser Photonics can blast the rust off ships, even when they are at sea,” he wrote.

“The prescribed method to remove rust is to first remove the rust deposits and then coat the surface with primer and rust-resistant paint. This often requires the current paint to be removed to expose the corrosion beneath. The Navy goes through roughly 25 to 30 million gallons of paint per year to maintain its fleet,” Thierer wrote.

In an email, the company wrote that “laser ablation systems are currently being used in multiple areas fleet wide. There are also multiple studies and tests being conducted to further expand the areas where our technology could be implemented. Laser systems can be used in both public and private ship repair facilities during pier side and drydock availabilities, as well as onboard under way naval vessels.”

Regarding the challenges of laser rust removal, Laser Photonics said, “lack of understanding and training are the traditional challenges encountered today. At Fonon Technologies [the company’s Florida-based defense partner], we provide proper training on the safe and effective use of laser cleaning systems to shipyard personnel. It is then the responsibility of the Navy to implement laser safety officer certification and qualify their personnel for laser system operation.”

According to a June article from NAVSEA, “Using lasers to remove coatings and corrosion from U.S. naval vessels may soon become a reality based on recent testing conducted by Shop 71, Painters, Blasters, Tilesetters, at Puget Sound Naval Shipyard & Intermediate Maintenance Facility.

“Laser ablation, which is widely used in the commercial automotive and aerospace industries, is proving to be easy to perform, while being cleaner, quieter and reducing the amount of vibration mechanics are exposed to versus legacy methods.”

NAVSEA said Shop 71 first performed laser ablation on USS Carl Vinson (CVN 70) in 2019, with follow-on testing occurring on USS Ronald Reagan (CVN 76) a couple of years later with good results and has since purchased several laser ablation systems for further evaluation. ■

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