FY25 NSRP Panel Project Solicitation Pitch Meeting

Conlan Hsu, Panel Chair

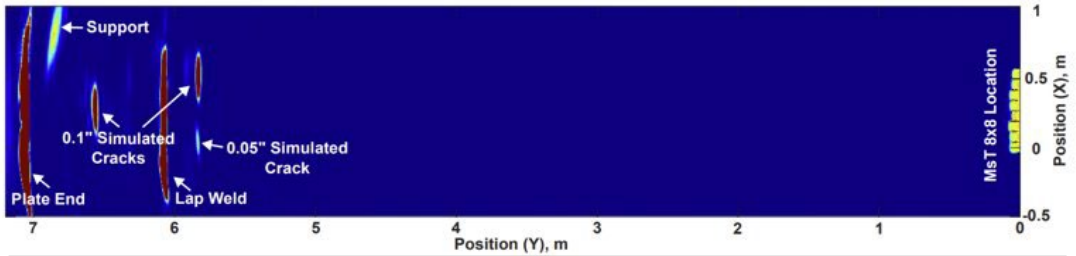
May 21, 2024 – San Diego, CA

NSRP
NATIONAL SHIPBUILDING RESEARCH PROGRAM™
Taking Shipbuilding and Repair to the Next Level

Agenda

Title	Presenter
Detecting Corrosion Under Paint at a Distance	Jack Ramsey, SWRI
Robotic Ballast Tank Inspection	Jack Ramsey, SWRI
Reducing Surface Preparation Noise Levels	Chris McNamara, Rapid Prep
Reducing the Cost/Schedule Impact of Certifying Blasters & Applicators	Jennifer Merck, AMPP
High Heat Coatings for Ship Application	Eric Shoyer, Elzly
Reducing Rework in Heat Affected Zones	Eric Shoyer, Elzly
Extended Recoat Windows for Non-Critical Zones	Eric Shoyer, Elzly
Reduction of Welding Using Adhesives	Eric Shoyer, Elzly
Enhancement of Cold Spray Systems with EMF-Assisted Nozzle Technology for He-free Corrosion-Resistant Coatings	Bryer Sousa, Triton Systems

Detecting Corrosion Under Paint at a Distance

PROJECT IMAGE	OBJECTIVE
 Example image generated using guided wave sensor array showing detection and localization of damage at ranges up to 6.5 meters in a steel plate.	This project will evaluate guided wave sensing to determine how effective it is as a screening tool to detecting corrosion under paint from a distance in large metal plates. TIP Item(s): 7.2.2.1.2, 7.2.2.6.5.b, 7.3.2.5.1, 7.3.2.6.1
BENEFITS/ROI	**PROJECT INFORMATION/FINANCIAL**
• Assess prototype guided wave sensors for use in screening for corrosion under paint on large steel panels • Optimize speed and accuracy of inspection • Summarize cost/benefits and recommendations for immediate use	**Project Lead**/Team Members: **Southwest Research Institute,** HII-NNS Duration: 12 Months Program Funds: $200K Cost Share: $0 Public Sector: $0

Detecting Corrosion Under Paint at a Distance

- Detecting corrosion under paint is extremely challenging but crucial for maintenance. Guided wave sensors can detect corrosion under paint from a distance, allowing paint to remain in place during inspection.
- This project will:
  - Evaluate sensing method in common shipyard cases to determine viability as a screening tool.
  - Quantify the sensors' ability to detect anomalies to prove their reliability.
- This project will increase the efficiency of inspecting large steel plate structures by screening for anomalies to guide the inspection process.

Robotic Ballast Tank Inspection

PROJECT IMAGE	OBJECTIVE
 Example 3D map of underwater structure	This project will utilize underwater robots to generate 3D models of ship ballast tanks and identify corrosion and damage prior to docking. This reduces the duration of ship servicing through better accuracy in resource allocation and maintenance planning. TIP Item(s): 7.3.2.3.4, 7.3.2.5.1, 7.3.2.5.3, 7.3.2.7.2
BENEFITS/ROI	**PROJECT INFORMATION/FINANCIAL**
• Evaluate off-the-shelf robots and software for use • Recommend robot and mapping software for immediate shipyard adoption • Quantify costs and expected benefits of robotically inspecting ship ballast tanks prior to dry docking	**Project Lead**/Team Members: **Southwest Research Institute**, HII-NNS, BAE Jacksonville Ship Repair [tentative] Duration: 12 Months Program Funds: $200K Cost Share: $0 Public Sector: $0

Robotic Ballast Tank Inspection

- Ship ballast tanks must be properly maintained by repairing corrosion damage as it occurs.
  - It is challenging to inspect ballast tanks while filled, so the condition of the ballast tanks is usually not known until a ship is already dry docked.
  - This adds uncertainty to the maintenance schedule and can cause time delays and cost overruns.
- This project will reduce the cost and schedule impact of unexpected ballast tank repair by:
  - Evaluating underwater robots and 3D reconstruction algorithms to create 3D maps of filled ballast tanks.
  - Enabling accurate tank repair estimates prior to docking via the 3D maps.

Reducing Surface Preparation Noise Levels

PROJECT IMAGE	OBJECTIVE
	The objective of this project is to identify steps within the surface preparation process that exceed the required noise decibels level. Current decibels levels have been documented in excess of 100. Identify and test the current noise levels associated with Abrasive Blasting. Work to reduce noise to an acceptable OSHA level for the work environment. The current process for addressing noise levels is inadequate. TIP Item(s): 7.2.2.6
BENEFITS/ROI	**PROJECT INFORMATION/FINANCIAL**
Safety – Obtain the required hearing noise level, < 85 decibels. Reduce Craftworkers risk of hearing loss **Quality** – Ensure Craftworkers to go home in the same condition they came to work in, maybe a little dirty **Schedule** – Increase schedule adherence **Cost** – Reduce Workers Compensation cost	**Project Lead**/Team Members: **Rapid Prep LLC,** GD-NASSCO Duration: 12 Months Program Funds: $200K Cost Share: $0 Public Sector: $0

Reducing Surface Preparation Noise Levels

Testing with New Modifications

FREQUENCY (Hz)	Measurements taken in DBA					
	Position 1	Position 2	Position 3	Position 4	Position 5	Position 6
Total	84.5	84.5	85.0	85.1	86.5	86.5
31.5	51.6	51.6	51.6	51.6	51.6	51.6
63	53.0	56.5	53.8	55.4	60.9	56.5
125	74.9	70.7	75.6	65.5	65.7	65.5
250	73.3	76.4	73.9	77.5	75.6	76.5
500	75.4	77.3	77.3	77.5	79.3	79.3
1000	77.3	76.4	77.7	78.5	78.8	78.9
2000	78.1	78.7	78.8	79.5	80.4	79.8
4000	78.2	78.2	77.9	79.5	80.2	80.0
8000	73.0	70.0	71.0	73.5	75.1	75.0
16000	64.1	60.0	61.1	64.0	64.0	65.9

All Measurements were taken at 1m away and 1m high. The test was performed inside of a building with doors closed. The Background reading was 82.5 DBA. About 10' to 20' away and above the unit. The sound level was 84 - 83 DBA respectively. When factoring in the background noise *the vacuum is approximately 84.3 DBA* for the high. (See below.) The 2000 Htz and 4000 Htz levels were the dominate frequencies contributing an estimate of 25% of the noise level. A Quest Model 2900 (Serial # CE0090003 with calibration dates of 9/8/06-9/8/07) was used with a Quest OB-300 (Serial # HV0080043 with calibration dates of 9/8/06-9/8/07). A Quest QC-10 field calibrator (Serial # QI0100143 with calibration dates of 9/8/06-9/8/07) was used before and after the test.

Calculated noise produced by vacuum machine at each position (using the General Method)

Position 1	Position 2	Position 3	Position 4	Position 5	Position 6
80.17	80.17	81.4	81.6	84.3	84.3

Factoring Out Estimated Background Level

$$SPL_f = 10 \text{ LOG } \{S10^{SPL/10}\}$$

Reducing the Cost/Schedule Impact of Certifying Blasters & Applicators

PROJECT IMAGE	OBJECTIVE
	The objective is to improve the quality and proficiency of the abrasive blasting and spray application workforce, in NSRP and Government, as well as private shipyards. This project will create an abbreviated path to required certifications by owners and contractors. This project will also aid various initiatives: Submarine Industrial Base (SIB), Talent Pipeline and Build Submarines-ATDM initiatives. The Aircraft Carrier Programs will also benefit from the development and increased number of a skilled craftsmen, in support of the Construction, Maintenance, and Overhaul. TIP Item(s):7.2.2.5.1, 7.2.2.5.2, 7.2.2.6.3, 7.3.2.1.3, 7.3.2.2.2, 7.3.2.2.3
BENEFITS/ROI	**PROJECT INFORMATION/FINANCIAL**
• Upon completion of the 40-hour course, the certification pathway for C7, C12 is reduced from 800 hours to 400 hours of work experience. • Provide standardized training, including safety and quality, for Abrasive Blasters and Applicators (1 wk./40 hrs.) in four to five cities near NSRP/Government and private shipyards. • Create a qualified workforce to serve the increased demand in U.S, by reducing the pre-work experience hours needed prior to applying for the certification exam by 50%.	**Project Lead**/Team Members: **The Association for Materials Protection and Performance (AMPP)**, Fincantieri Marine Repair, GD-NASSCO, HII-NNS, BAE Duration: 12 Months Program Funds: $200K Cost Share: $0 Public Sector: $0

Reducing the Cost/Schedule Impact of Certifying Blasters & Applicators

- Naval Vessels are required to have Blasters and Applicators certified to perform their process as written in NAVSEA Standard item 009.32.
- This program, once completed, has been approved to offset 400 hours of work experience for the Abrasive Blaster for C7 Certification as well as 400 hours of work experience for the Coating Applicator for C12 Certification. A similar initiative for C14 may be forthcoming as the program constantly evolves to meet industry needs.
- This one-week training program will:
  - Serve as an entry point into the Coating Industry, and increase the current skill level of those already in the Industry
  - Contribute to the need for an increase in a qualified workforce in a reduced amount of time
  - Increase the proficiency of Blasters and Applicators on Navy vessels
  - Be made available as a 1 week/ 40-hour AMPP public course offering, or Shipyards/contractors can purchase a license and provide the training in-house to fit their internal schedules. It does not require an AMPP instructor. AMPP will oversee the student completions for each module to verify accurate training and produce the proper documents to receive the credit for 400 hours of Blaster and Applicator experience.

Abrasive Blasting Training – 20 hours				Coating Applicator Training – 20 hours			
Classroom Lessons	Surface Prep Fundamentals	Examining the Substrate	Precleaning	**Classroom Lessons**	Reasons for Coating	Coating Fundamentals	Curing Mechanisms
	Ambient Conditions	Hand & Power Tools	Dry Abrasive Blasting		Receiving & Storage	Mixing & Thinning	Application Considerations
	The Blasting Process	Abrasive Media	Safety		Application Equipment	Measurement & Monitoring	
Hands-on Labs	Condition Assessment & Precleaning	Measuring Ambient Conditions	Hand & Power Tool Cleaning	**Hands-on Labs**	PDS & SDS	Mixing	Measurement & Monitoring
	Abrasive Blast Cleaning						

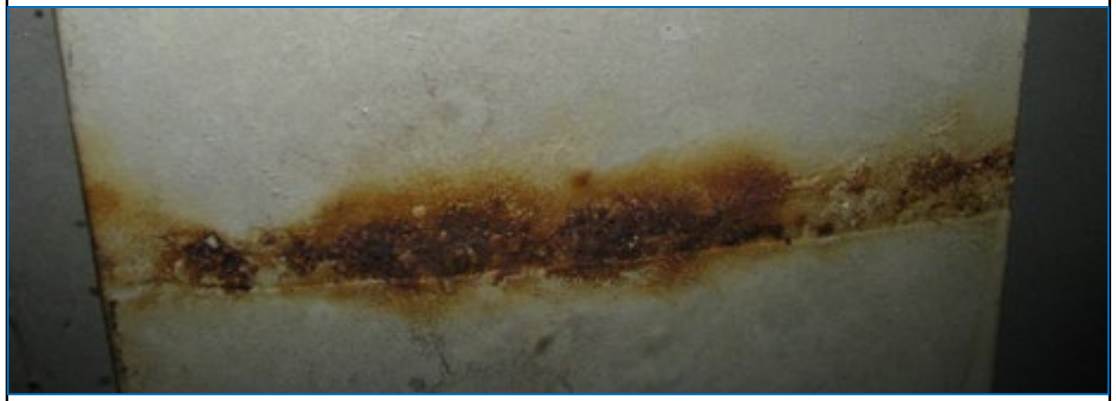
High Heat Coatings for Ship Application

PROJECT IMAGE	OBJECTIVE
	Evaluate heat resistance of currently used coatings within ship building. Recent inspections have found coatings in areas prone to high temperatures have complete delamination. This project helps to provide guidance for different heat prone areas, not only for coatings that can withstand varying heating levels, but also provide adequate corrosion resistance. Testing will be performed in communication with NAVSEA on heat requirements to allow for optimizing best coating systems. TIP Item(s): 7.2.2.1.4, 7.2.2.6.3, 7.2.2.6.4, 7.3.2.6.3
BENEFITS/ROI	**PROJECT INFORMATION/FINANCIAL**
• Improve overall aesthetics of heat affected zones due to improved color and gloss retention. • Provide list of coatings/systems that could be used in heat prone zones that also provide corrosion resistance. • Reduce recoating in areas affected by heat.	**Project Lead**/Team Members: **Elzly Technology**, HII-NNS, HII-Ingalls, NSWCCD Duration: 12 Months Program Funds: $200K Cost Share: $0 Public Sector: $0

High Heat Coatings for Ship Application

- This project will:
  - Generate data to understand the relative performance of coatings commonly used in the Navy in high heat areas.
  - Develop a comprehensive list of available coating systems that resist varying temperature levels and provide corrosion resistance.
    - Evaluate testing criteria in heat ranges from 200-600 degrees.
  - Provide test data and recommendations for shipyard and Navy consideration.

Reducing Rework in Heat Affected Zones

PROJECT IMAGE	OBJECTIVE
	Identify and implement methods to reduce the cost and schedule impact of coating rework. Identify temperatures on back sides of coated areas that will lead to rework and deficiencies in coating performance. From data captured in this program, NSRP will be able to improve planning and increased awareness by other trades of how to not increase rework. Understand in what scenarios coating rework is necessary, and reduce the amount of rework by knowing coatings limits. TIP Item(s): 7.2.2.1.4, 7.2.2.2.4, 7.2.2.5.1, 7.3.2.7.3
BENEFITS/ROI	**PROJECT INFORMATION/FINANCIAL**
• Report the effects varying heat affected zones have on coating systems in terms of adhesion and overall performance. • Report costs of rework inefficiencies with recommended methods to decrease rework costs and make improvements. • Determine what percentage of rework may be reduced in the overall coating costs in new construction.	**Project Lead**/Team Members: **Elzly Technology**, HII-NNS, GD-BIW, Fincantieri Marine Repair, GD-NASSCO Duration: 12 Months Program Funds: $200K Cost Share: $0 Public Sector: $0

Reducing Rework in Heat Affected Zones

- Coating rework is a significant cost driver in Navy shipbuilding due to ship complexity and the extent of late-stage outfitting
- This project will:
  - Determine max temps on the backside of painted spaces
  - Determine adhesion and performance effects of high temperatures on the backside of painted areas
  - ID and share best practices among shipyard coating experts
- This project will provide:
  - Develop a guide/training materials to facilitate knowledge across shipyards
  - Develop training materials to educate non-paint trades on the impacts of their activities on coating rework
  - Provide a final report with data on findings

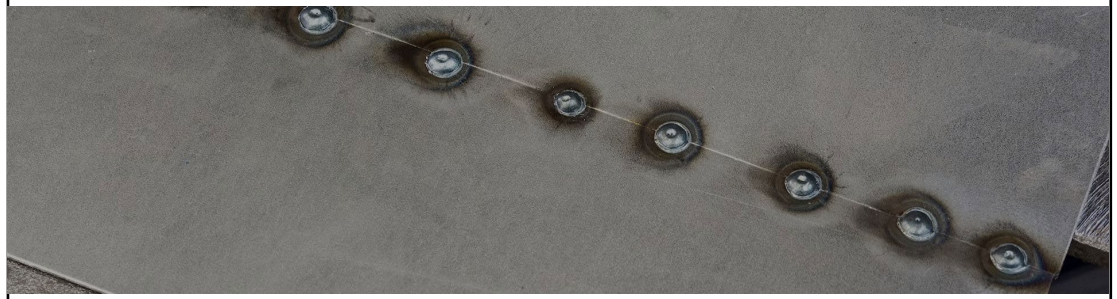
Extended Recoat Windows for Non-Critical Zones

PROJECT IMAGE	OBJECTIVE
	This project will evaluate the effects that different surface preparation methods have on non-critical areas over varying timeframes of the construction process. TIP Item(s): 7.2.2.1.4, 7.2.2.6.3, 7.3.2.6.3
BENEFITS/ROI	**PROJECT INFORMATION/FINANCIAL**
• Reduce cost of surface preparation by extending the recoating window in non-critical areas • Optimize most efficient surface preparation methods outside of recoating windows to ensure proper coating performance • Final reports for NSRP and public shipyards	**Project Lead**/Team Members: **Elzly Technology**, HII-NNS Duration: 12 Months Program Funds: $200K Cost Share: $0 Public Sector: $0

Extended Recoat Windows for Non-Critical Zones

- Extending recoat windows in non-critical zones can greatly help decrease additional costs of surface preparation prior to topcoat
- Recent studies have shown minimal, if any, benefits from surface preparation on non-critical areas outside of coating windows prior to topcoating
- This project will provide the following benefits to the SPC Naval Community:
  - Identify and share performance of varying extended coating windows
  - Evaluate several secondary surface preparation methods on expired recoat windows
  - Compare coating performance
  - Provide a final report with data on findings

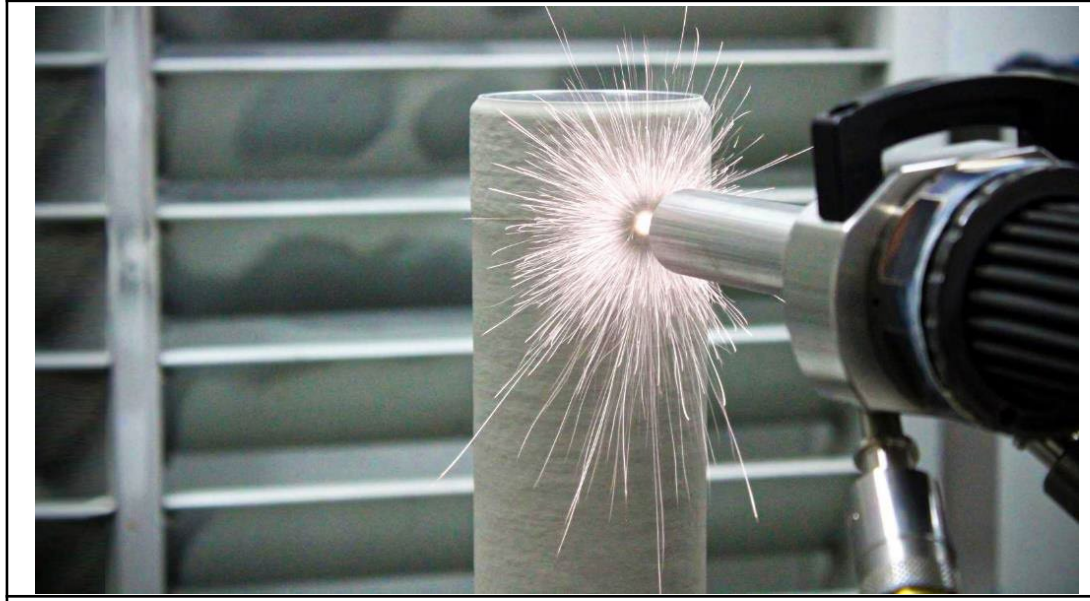
Reduction of Welding Using Adhesives

PROJECT IMAGE	OBJECTIVE
	Identify and analyze the use of adhesives or other bonding materials that can be used in lieu of tack welding where coating repair is not feasible. TIP Items: 7.2.2.1.4, 7.2.2.2.4, 7.2.2.5.1, 7.3.2.7.3
BENEFITS/ROI	**PROJECT INFORMATION/FINANCIAL**
• Reduce the cost of coating removal prior to hot work by finding an adhesive that can replace a tack weld. • Eliminate inaccessible bare metal areas in lap joints that may result in corrosion during the ships life. • Final reports for NSRP and public yards showing adhesive strength results.	**Project Lead**/Team Members: **Elzly Technology**, HII-NNS Duration: 12 Months Program Funds: $200K Cost Share: $0 Public Sector: $0

Reduction of Welding Using Adhesives

- Replacing a tack weld with adhesive would eliminate the need for the 4" OSHA strip back rule prior to hot work. Since there will be no coating removal, there is minimal risk for corrosion in the lap joint area.
- This project will provide the following benefits:
  - Identify and share performance of various adhesives compared to tack welds for impact of stress/vibration, fire/smoke/toxicity, and corrosion protection on adhesive bonded bulkheads vs tack welded bulkheads.
  - Compare adhesive performance.
  - Provide a final report with data on findings.

Enhancement of Cold Spray Systems with EMF-Assisted Nozzle Technology for He-free Corrosion-Resistant Coatings

PROJECT IMAGE	OBJECTIVE
	The main goal of this project is to improve the effectiveness and cost efficiency of surface coating deposition and repair in naval applications by incorporating EMF-assisted cold spray nozzle augmentation technology. This integration significantly reduces operational costs by eliminating the need for He as a carrier gas. The project shall demonstrate the practical application of EMF-assisted cold spray technology on current Navy-used systems and evaluate the resulting coatings' corrosion resistance and mechanical as well as microstructural properties. The initiative aims to enhance the quality and durability of corrosion control measures in shipbuilding and maintenance while promoting more cost-effective and efficient surface preparation and coating processes. TIP Item(s): 7.2.2.6, 7.2.2.2, 7.2.2.10, 7.2.2.1
BENEFITS/ROI	**PROJECT INFORMATION/FINANCIAL**
Cost Savings: Eliminates He use, reducing operational costs. **Improved Durability:** Superior corrosion resistance extends vessel lifespan. **Higher Quality:** Enhanced coatings with better mechanical properties. **Efficiency Gains:** Streamlines processes, saving time and boosting productivity. **Versatility:** Adapts easily to various naval applications as well as cold spray systems utilized or under consideration by the Navy **ROI:** Long-term savings on materials, maintenance, and operations.	**Project Lead**/Team Members: **Triton Systems** Duration: 9 Months Program Funds: $200K Cost Share: $0 Public Sector: $0

Enhancement of Cold Spray Systems with EMF-Assisted Nozzle Technology for He-free Corrosion-Resistant Coatings

- This project aims to improve the Navy's current high-pressure cold spray systems at depots and on shipboards for the deposition and repair of corrosion-resistant coatings.
- Triton Systems, Inc. proposes to enhance existing systems by integrating our emerging Electromagnetic Field-assisted (EMF-assisted) cold spray nozzle augmentation technology, enabling helium-free applications. This integration aims to achieve more economical cold spraying of corrosion control materials by allowing the deposition of materials that traditionally require helium to achieve critical impact velocities. This will be achieved by using nitrogen or compressed air as the carrier/processing gas species alongside the EMF-assisted cold spray nozzle augmentation solution developed by Triton Systems.
- The primary objectives of this project include:
  - Demonstrating implementation of the EMF Assisted Cold Spray hardware solution on existing Navy cold spray systems.
  - Evaluating and comparing the corrosion resistance and mechanical/microstructural properties of materials deposited using the EMF Assisted Cold Spray method versus those deposited using conventional high-pressure cold spray hardware alone.
  - Validating the cost-effectiveness and operational efficiency of the He-free cold spray process in shipbuilding and repair applications.
- By achieving these objectives, we aim to reduce costs, enhance the quality of surface coatings, and improve corrosion control in shipbuilding and repair operations.