

THE EFFECTS OF BLAST MEDIA ON PRODUCTION AND COATING PERFORMANCE

NSRP SPC Panel Meeting
September 2024



Approved for public release; distribution is unlimited.
Category B Data – Government Purpose Rights.



Background

- There has been a long-standing debate on whether one abrasive blast media provides additional benefits over other.
- Manufacturers of various blast media differentiate their products by claiming benefits in areas such as cleanliness, production rate, coating performance, and many others.
- The team will work with NSRP and Navy technical advisors test the use of many abrasive blast materials used at shipyards, on Navy bases, and in industry to generate data and compare abrasive media benefits.

Anticipated Benefits

- This testing will generate data comparing the production rate of common abrasive media.
- It will also test the long-term performance of coatings over substrates blasted with each of the tested media.
- This data will be used to help reduce costs by providing shipyards insight and guidance the abrasive media selection that results in the most efficient work and longest coating life.

Scope of Work

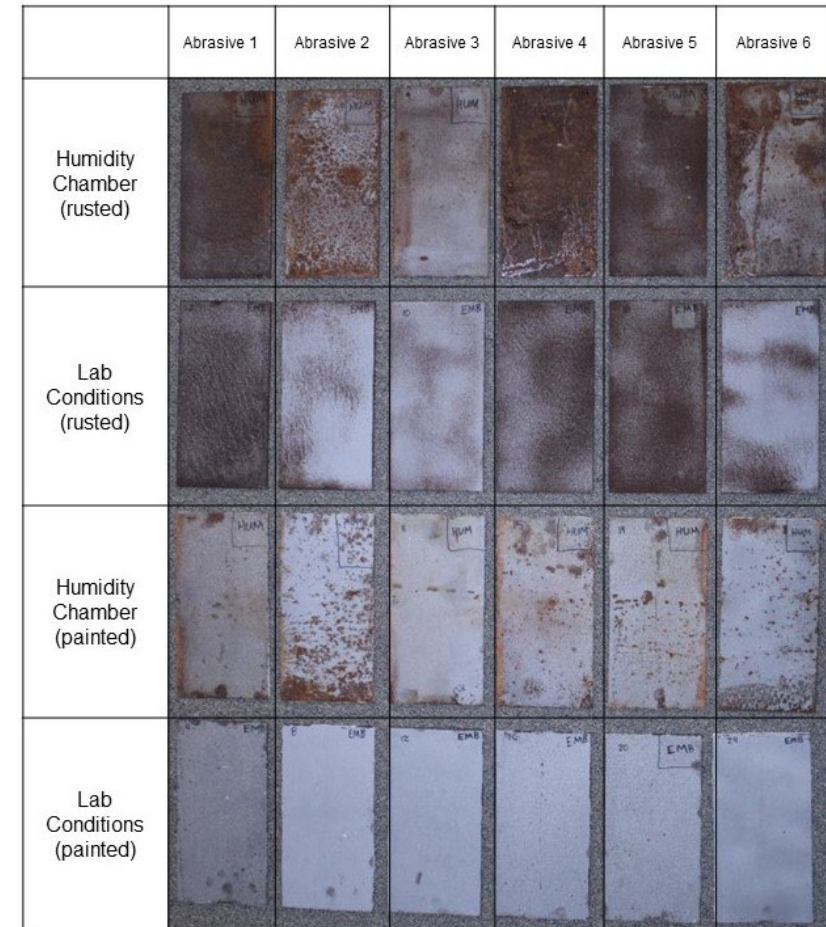
- This project will evaluate the production rate of common blast media and resulting coating performance.
- Goals/Objectives
 - Determine commonly used blast media and blast parameters of shipyards.
 - Generate production rate data for tested blast media
 - Test coating performance of samples blasted with the test blast media.
 - Provide recommendations for shipyard and navy consideration.

Tasks

- Task 1 – Identify Different Abrasives, Applications, Requirements, and Constraints
 - Poll and interface with shipyards to gain a consensus on abrasive materials currently being used, areas of applications, different requirements associated with abrasives, and identify any constraints when using a certain abrasive over another.
- Task 2 – Finalize Test Plan and begin Laboratory Testing
 - Define testing parameters based on information received from shipyards.
 - Measure abrasive production rates for removing navy coatings, mill scale, and rust.
 - Apply coatings over blasted surfaces and test long term performance differences via cathodic disbondment, cyclic corrosion, and outdoor corrosion testing.
- Task 3 – Shipyard Demonstration
 - Demonstrate the three to four best performing abrasives at a NSRP shipyard on a large test platform to collect production, material usage, and other metrics in a shipyard environment.
- Task 4 – Final Report

Task 1 – Literature Review

- L. Huntington, "Abrasives Testing Report Draft," NAVSEA, Washington, DC, 2024
 - 6 abrasive blast media were used to clean rusted and coated samples at two blast conditions.
 - Testing was performed to analyze resulting production rate, flash rust, abrasive embedment, and produced hazardous dust.
 - Testing found little difference in production rate and resulting flash rust. Certain blast media resulted in significantly higher embedment and higher resulting hazardous dust creation.
 - Testing found that higher blast pressure (100+ psi) resulted in higher production rates than lower (90 psi) for all media.



Task 1 – Literature Review

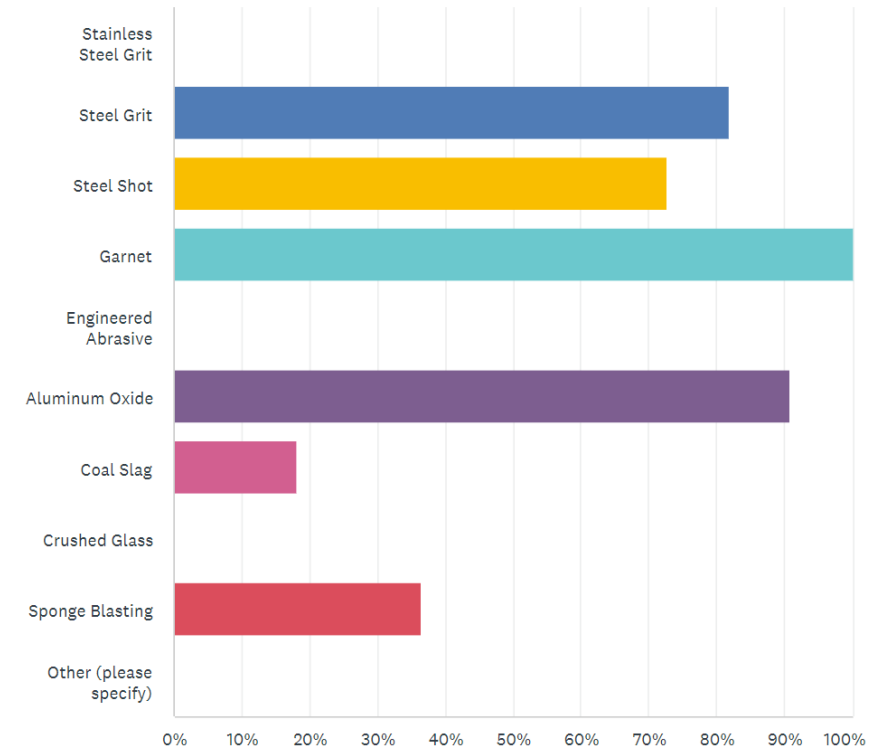
- D. Ward, "An Investigation into the Effect of Surface Profile on the Performance of Coatings in Accelerated Corrosion Tests," NACE International, Houston, TX, 2007
 - Four different tests performed - NACE TM0404, ISO 20340 Annex A and B, ASTM B117 and ASTM D5894.
 - Performance was measured via the resulting corrosion creep.
 - The greatest performance differentials were noted on panels exposed to ISO 20340 Annex A and B.
 - These tests consists of cycles of UV/condensation, salt spray, and a dry cycle either at ambient temperatures (Annex A) or -20C (Annex B). Compared with the other tests, coating performance was easier to determine given the corrosion creep measured for each of the coating systems exposed to the testing regime.
 - This test was able to demonstrate a difference between the steel shot and steel grit blasted samples but did not result in a significant difference between the different media sizes of the two types.
- H. Tsaprailis and S. Rao, "The Effects of Different Blast Abrasives on the Performance of Liquid-Applies Epoxy Pipeline Coatings," AMPP, San Antonio, TX, 2022.
 - These surfaces contained 10 different blast media and some media at different sizes.
 - The surfaces were then characterized via replica tape, stylus profilometer, and 3D replica tape while the coating performance was characterized via various adhesion tests and cathodic disbondment testing.
 - Drastic results seen in delamination and disbondment after 28 days of cathodic disbondment testing or 28 days of hot water immersion

Task 1 (Completed) – Identify Different Abrasives, Applications, Requirements, and Constraints

- Poll sent out to shipyard representatives to gauge abrasive use and blasting practices.
- 11 responses received by 7/18/2024
- Highlights:
 - 30-60 grit size range is typical
 - 60% of responses blast at pressures between 90 and 105 psi
 - 10% 90-95 psi
 - 30% 95-100 psi
 - 20% 100-105 psi
 - #8 and #10 Venturi blast nozzles are most used

What are your most commonly used abrasives? (Select all that apply)

Answered: 11 Skipped: 0



Task 2 (In Progress) – Finalize Test Plan and begin Laboratory Testing

- Testing to be performed
 - Production rate for removal of navy coatings, mill scale, and rust
 - Resulting surface profile and surface cleanliness (Profilometer, profile tape, point profile measurements, Conductivity)
 - Post blast coating application with MIL-PRF-23236 will be tested for performance
 - Cathodic disbondment, cyclic accelerated corrosion, outdoor exposure, Hot water Adhesion
- **Materials** (Steel Grit, Garnet, Engineered Abrasive, Aluminum Oxide, Coal Slag)
- **Blast parameters**
 - Based on responses from all Partner Yards – Blast Pressures will be set to 100 +/- 10 psi. A #8 venturi nozzle will be used as well based on its reference in 70% of responses.

Task 2 (In Progress) – Finalize Test Plan and begin Laboratory Testing

Abrasive	Cathodic Disbondment 6x12		D5894 Cyclic 4x6		Hot Water Adhesion 6x12		Electro-chemical Testing 6x12	Outdoor Exposure 6x12	
	Coated before Blasting	Rusted Before Blasting	Coated before Blasting	Rusted Before Blasting	Coated before Blasting	Rusted Before Blasting	Rusted Before Blasting	Coated before Blasting	Rusted Before Blasting
Steel Grit	2	2	2	2	2	2	1	2	2
Steel Shot	2	2	2	2	2	2	1	2	2
Garnet	2	2	2	2	2	2	1	2	2
10X	2	2	2	2	2	2	1	2	2
Aluminum Oxide	2	2	2	2	2	2	1	2	2
Coal Slag	2	2	2	2	2	2	1	2	2
		6x12	13 per media		78 total				
		4x6	4 per media		24 total				

Task 3 (Future Work) – Shipyard Demonstration

- After lab testing, 2 or 3 of the best performing materials will be selected for a shipyard demonstration
- Shipyard test platform is to be determined
- Shipyard demonstration timeline not yet decided

Path Forward

- Order blast media and test samples – Tentative End of Month
- Prepare test samples and perform production rate testing
- Perform long-term coating performance testing
- Analyze and present test data
- Finalize report for distribution

Questions?

