THE EFFECTS OF BLAST MEDIA ON PRODUCTON AND COATING PERFORMANCE

NSRP All Panel Meeting

February 2025

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 - COMPLETE
  - 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 (COMPLETE) and Laboratory Testing (IN PROGESS)
  - 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 – Limiting time and funding constraints~~
  - ~~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 2– Finalize Test Plan (COMPLETE) and Laboratory Testing (IN PROGRESS)

- Program Process
  - Blast mill scale test panels
  - Coat and age/rust blasted panels
  - Re-blast and re-coat aged panels
  - Perform coating performance testing
- Abrasive Blasting Schedule
  - Mill scale panels blasted 10/1/2024
  - Aged for 1 month outdoor with daily salt spray
  - Aged panels blasted 11/5/2024
  - Final coating application 11/7/2024
- Blasting Data Collected
  - Production Rate
  - Material Usage
  - Surface Profile (SPG Gage, Profile Tape, and Profilometer)
  - Surface Conductivity

Task 2– Finalize Test Plan (COMPLETE) and Laboratory Testing (IN PROGRESS)

- Blast Media and Blasting Parameters
- No. 8 Venturi Nozzle with 12 – 18-inch standoff used for all blast media per feedback from Shipyards
- 2 in diameter air hose with blast pot meter set to 3

Media Grit Sizes and Blast Pressures

Media	Grit Size	Pressure
Steel Grit	25/40	90 psi
Steel Shot	280/390	90 psi
Garnet	30/70	100 psi
10X	20/70	100 psi
Aluminum Oxide	36/60	90 psi
Coal Slag	Medium	100 psi

Task 2– Finalize Test Plan (COMPLETE) and Laboratory Testing (IN PROGRESS)

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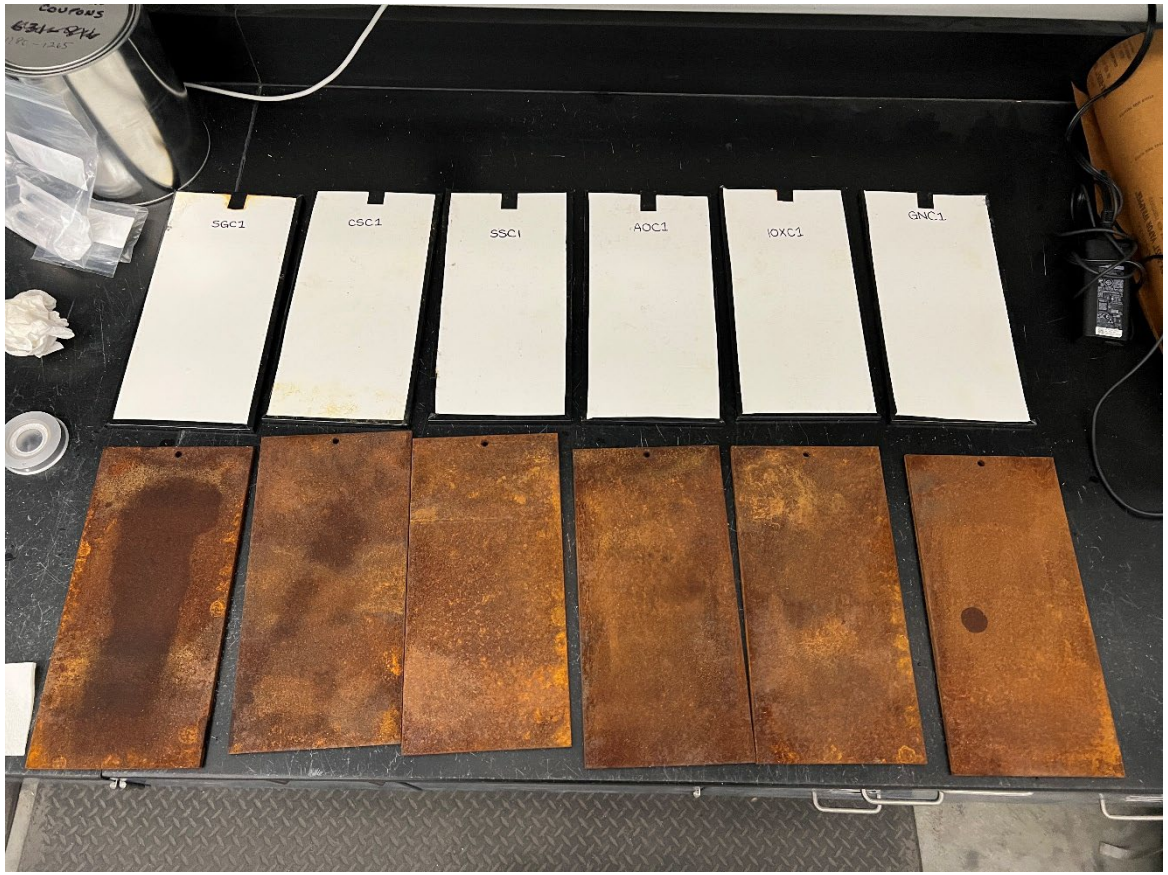

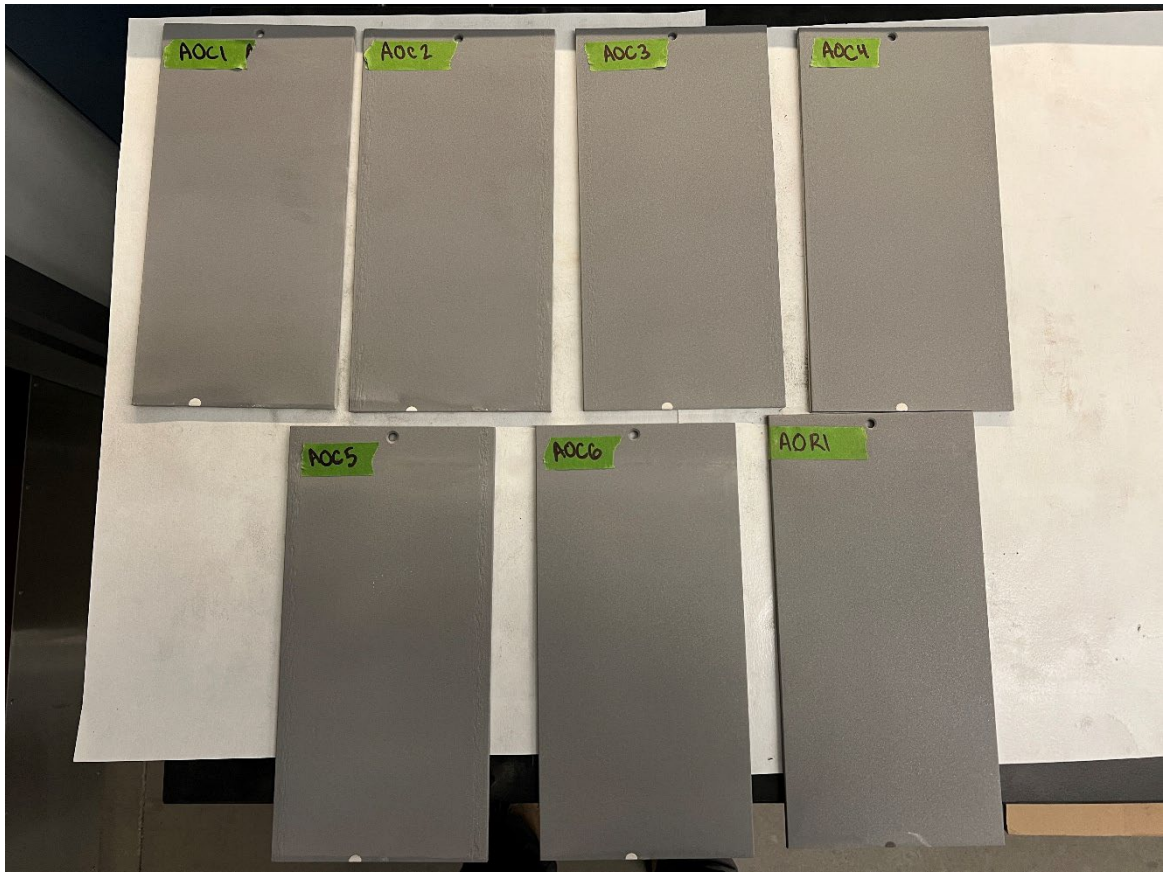

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Coating Performance Testing Panel Matrix

Abrasive	Cathodic Disbondment 6x12		D5894 Cyclic 4x6		Hot Water Adhesion 6x12		Outdoor Exposure 6x12	
	Coated before Blasting	Rusted before Blasting	Coated before Blasting	Rusted before Blasting	Coated before Blasting	Rusted before Blasting	Coated before Blasting	Rusted before Blasting
Steel Grit	2	2	2	2	2	2	2	2
Steel Shot	2	2	2	2	2	2	2	2
Garnet	2	2	2	2	2	2	2	2
10X	2	2	2	2	2	2	2	2
Aluminum Oxide	2	2	2	2	2	2	2	2
Coal Slag	2	2	2	2	2	2	2	2
		6x12		12 per media	72 total			
		4x6		4 per media	24 total			

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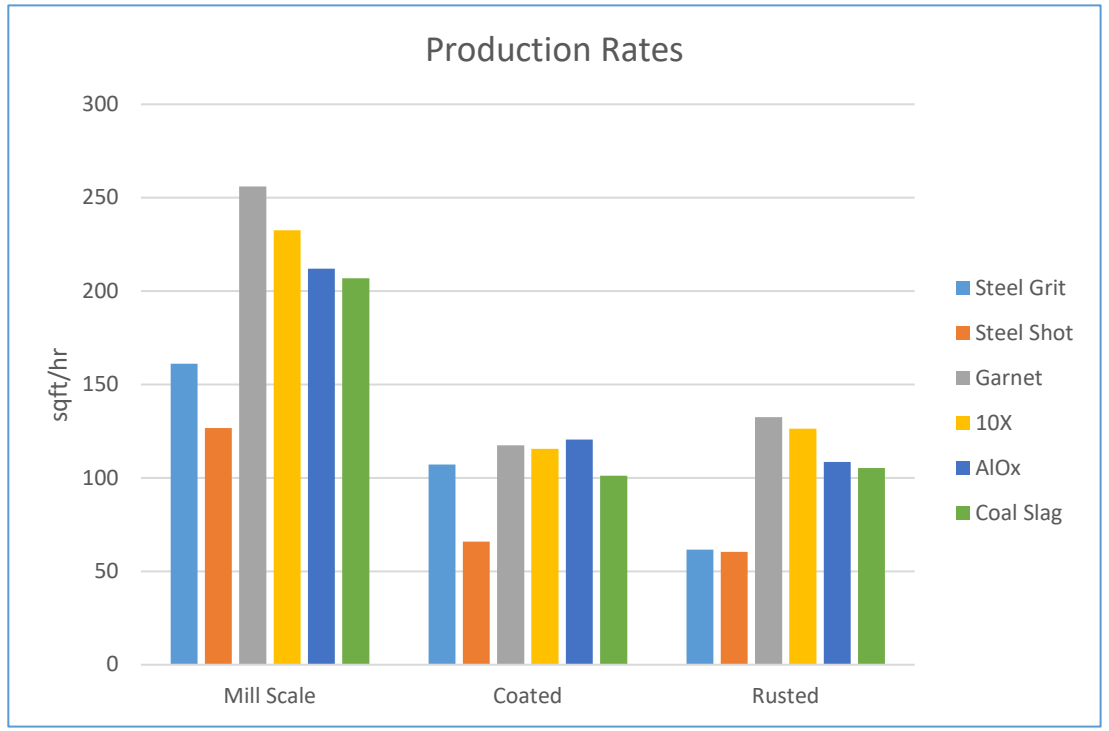
- Blasting material usage and production rate data

Material Usage

Blast Media	Round	Weight Used (lbs)	Volume Used (ft3)
Steel Grit	1	148.3	0.57
Steel Shot	1	196.2	0.85
Garnet	1	87.45	0.58
10X	1	94.1	0.94
Aluminum Oxide	1	96.6	0.86
Coal Slag	1	70.6	0.81
Steel Grit	2	270.3	1.04
Steel Shot	2	374.8	1.63
Garnet	2	163.15	1.09
10X	2	144.1	1.44
Aluminum Oxide	2	152.7	1.36
Coal Slag	2	127.8	1.46



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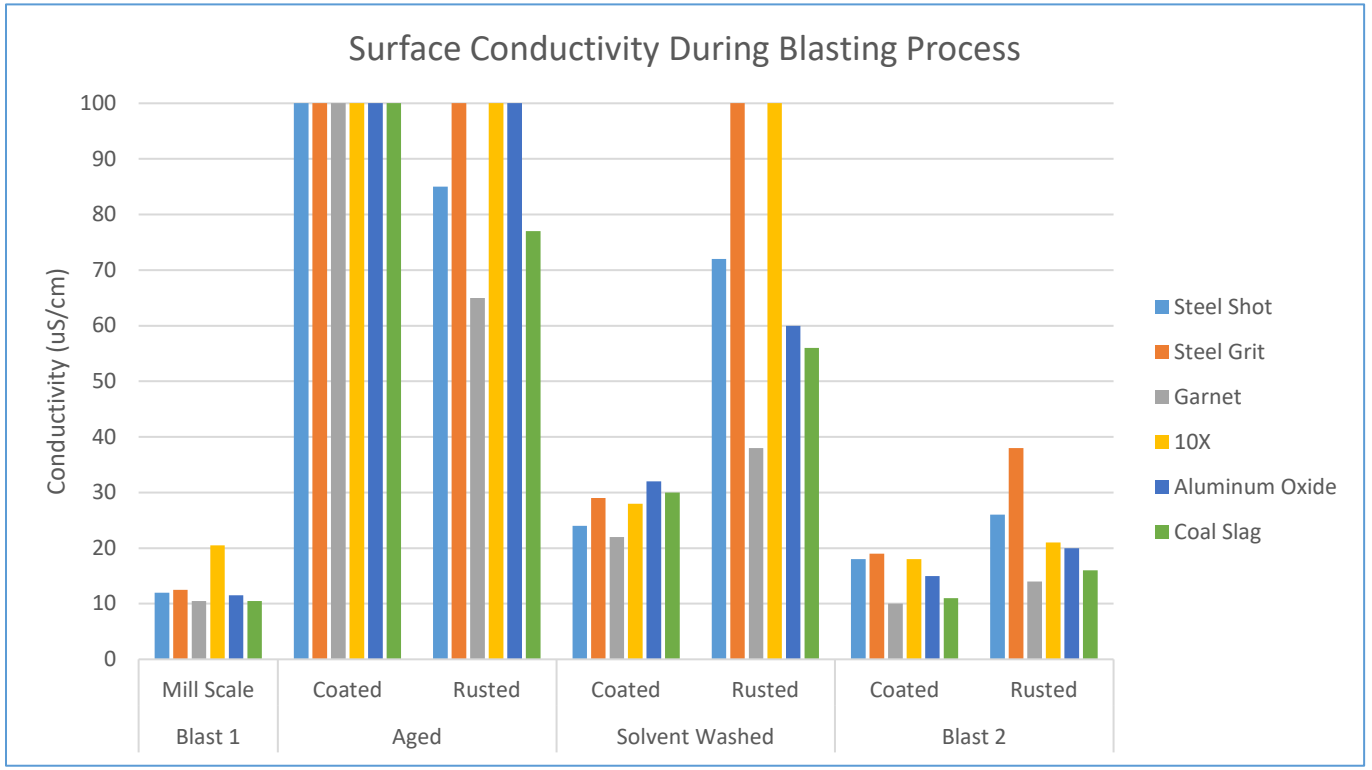
- Blasting conductivity data
  - Significant surface salt on coated aged coated and rusted panels (>10x scale of figure)
  - Solvent wash significantly reduces surface conductivity
  - Only rusted panels blasted with Steel Grit remained above the 30 µS/cm limit for immersed/ critical coated surfaces



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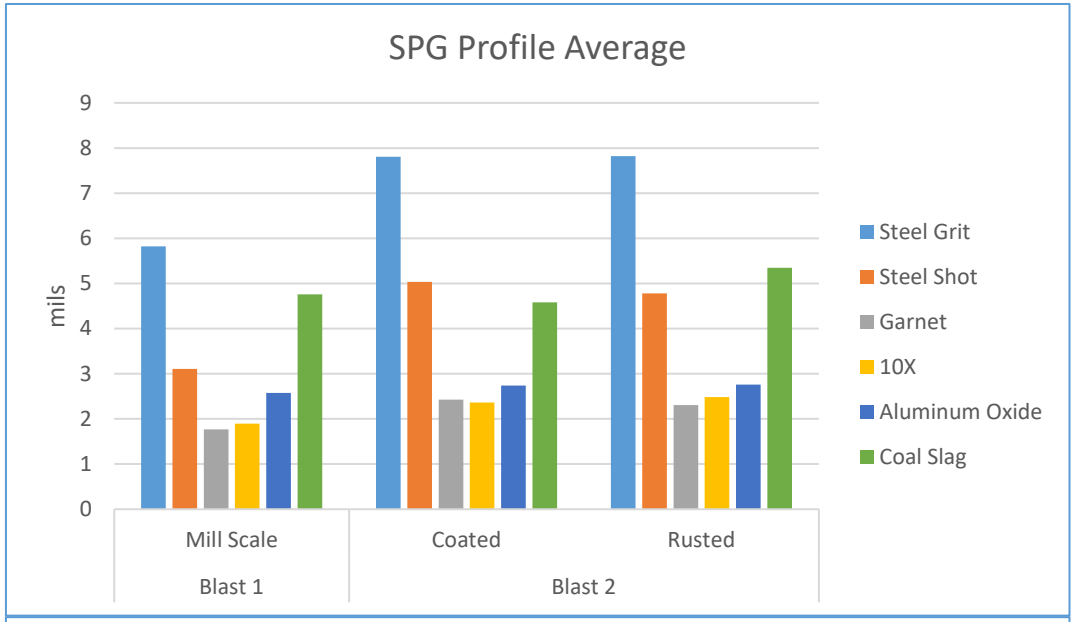
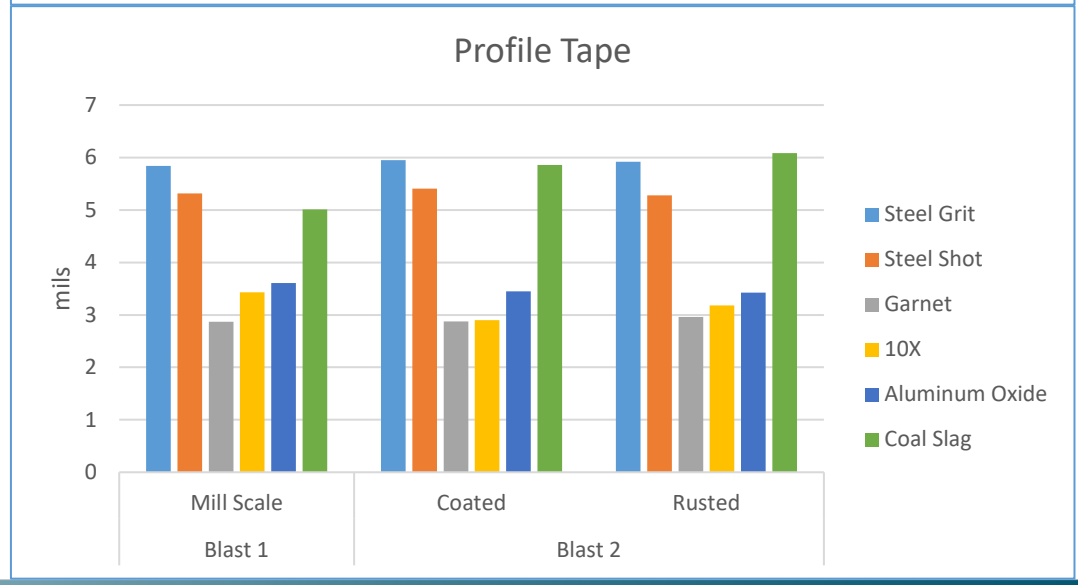
- Blasting Profile Data
  - 2-4 mil profile not consistently met with manufacturer recommended blast parameters
    - Steel Grit was the worst offender
  - Trends between SPG and Profile Tape measurements align despite slightly different values
  - Two profile groupings are apparent
    - Group 1: Steel Grit, Steel Shot, and Coal Slag
    - Group 2: Garnet, 10X, and Aluminum Oxide





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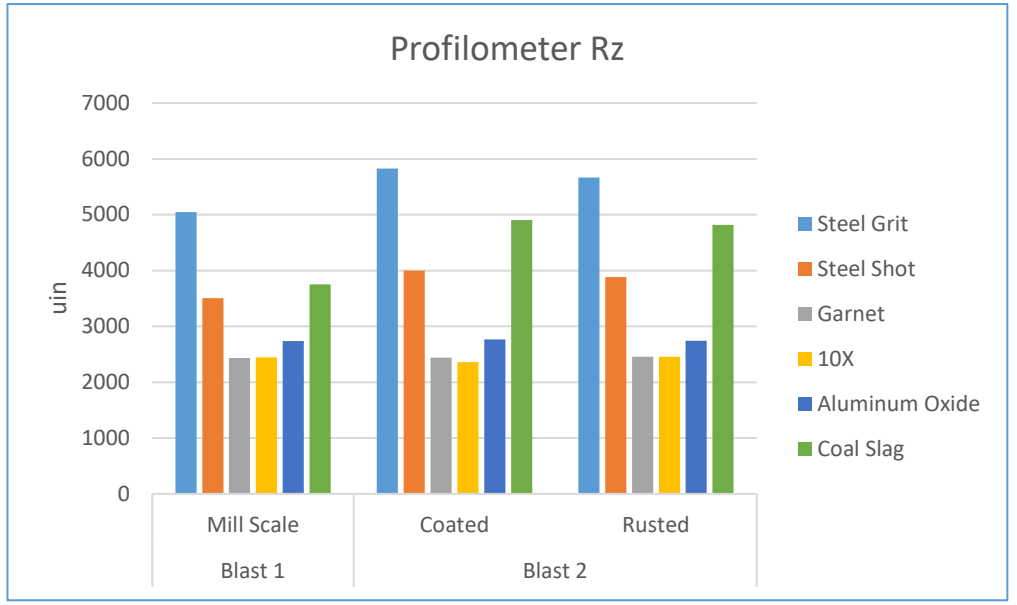
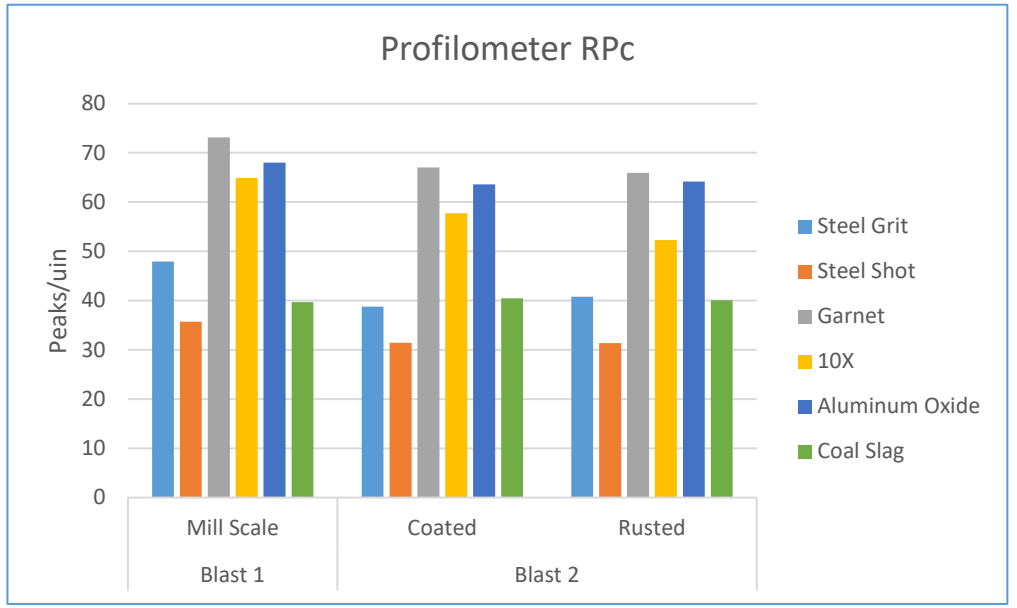
- Blasting Profilometer Data
  - Parameters measured: Ra, Rq, Rz, Rp, Rv, Rsk, RPc, RSm, Rdq, and Rt
  - Parameters in Figures (1000 µin = 1 mil)
    - Rz = average max profile height
      - Similar to SPG average
    - RPc = peak count
  - Same two groupings present
  - Group 1: Steel Grit, Steel Shot, and Coal Slag
    - Higher profile, lower peak count
  - Group 2: Garnet, 10X, and Aluminum Oxide
    - Lower profile, higher peak count





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- Coating Performance Testing
  - 2 coats MIL-PRF-23236 Type VI Primer at 12.6 mils average DFT
- Accelerated Cyclic Corrosion Testing (Modified ASTM D5894)
  - Five 2-week cycles – Ending March 12th
    - UV/Condensation – 6 days
    - Freeze – 1 day
    - Cyclic Salt Fog – 6 days
    - Freeze – 1 day
- Outdoor Exposure with Daily Salt Spray – Ending March 12th
- Hot Water Immersion Testing – Ending March 14th
  - 28 days hot water immersion before adhesion testing
- Cathodic Disbondment Testing – Ending March 17th

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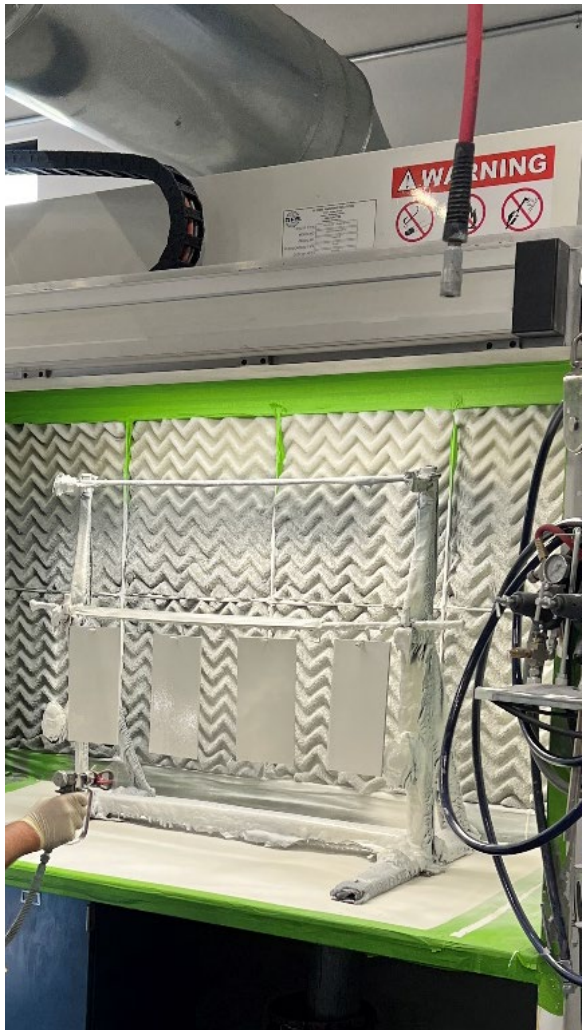

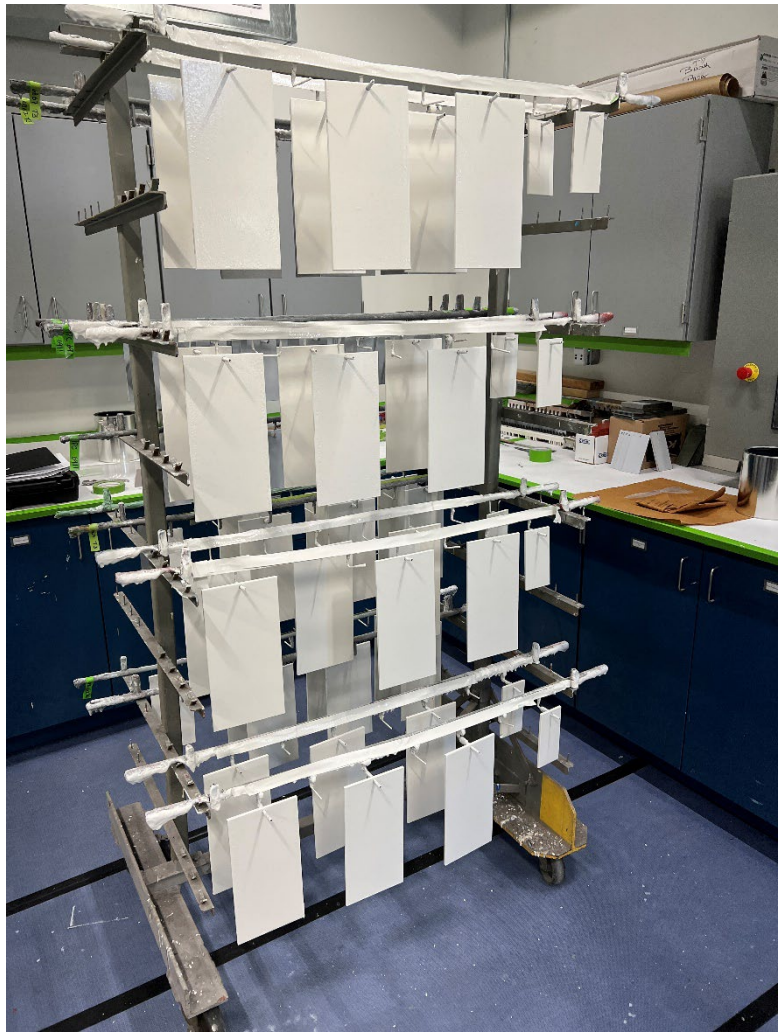

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Hot Water Immersion

Cathodic Disbondment

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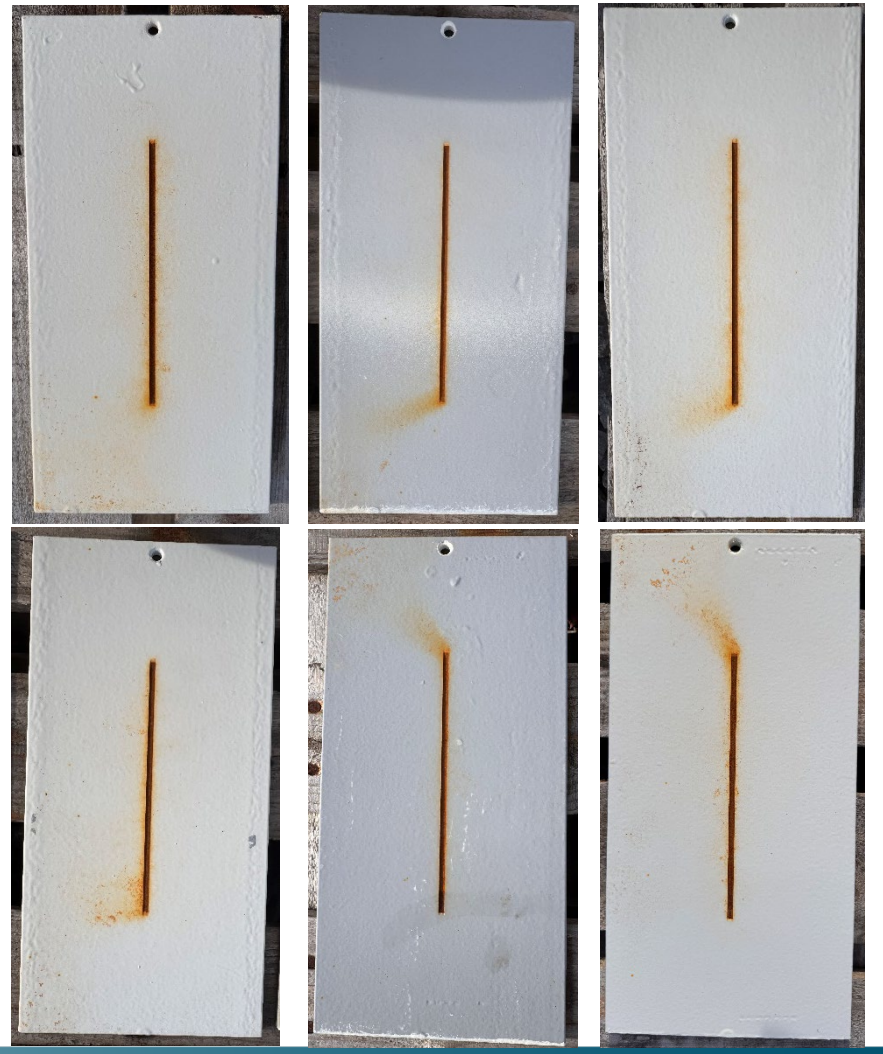
Accelerate Cyclic Corrosion

Steel Grit | Steel Shot | Garnet

10X | AlOx | Coal Slag

Outdoor Exposure



Path Forward

- Complete coating performance testing
- Analyze test data
- Finalize report for distribution

Questions?