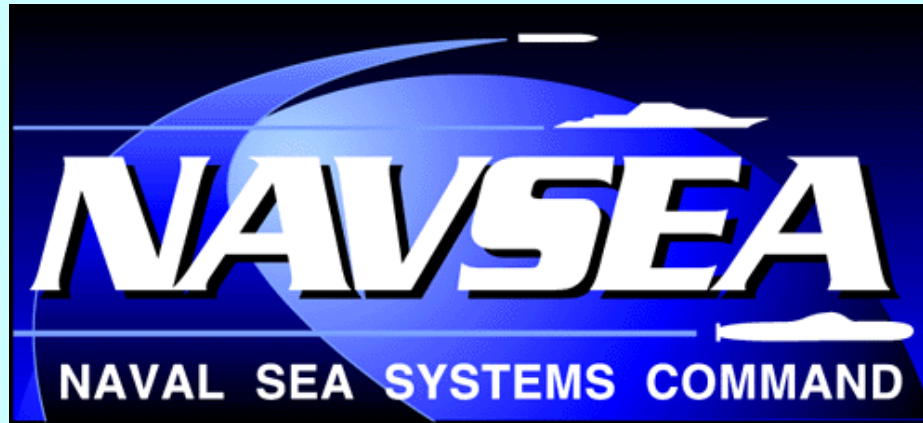


# NAVAL SEA SYSTEMS COMMAND RECENT DEVELOPMENTS IN COATINGS



**National Shipbuilding Research Program – SP-3 Panel**

**Oct. 2010**

**Mr. Mark Ingle, P.E.**

**SEA 05P23**

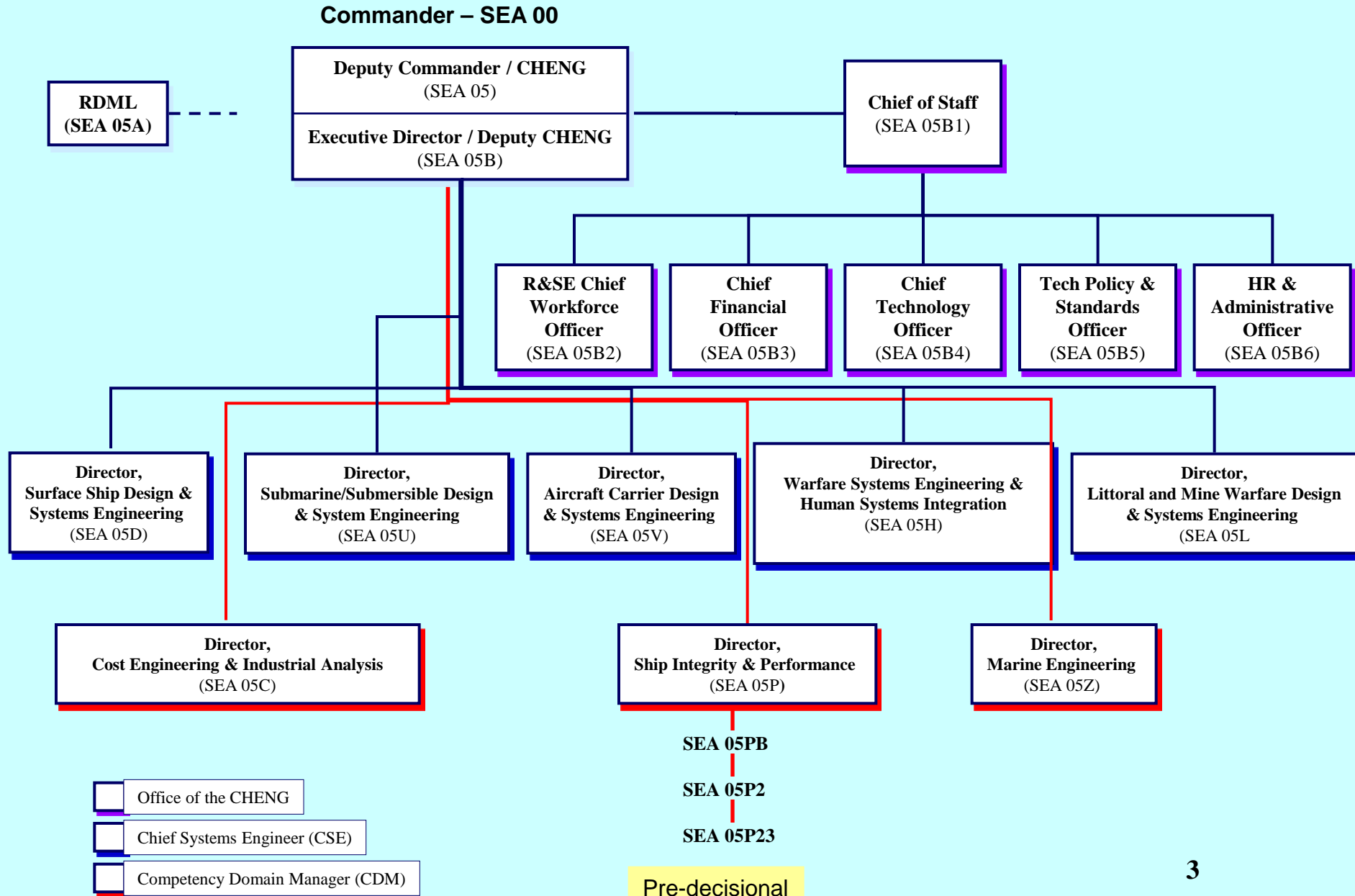
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# OBJECTIVES

- Summarize evolving Naval Sea Systems Command (NAVSEA) organization and coating requirements:
  - Headquarters NAVSEA organization & Objectives.
- Summarize recent **accomplishments** in NAVSEA coatings and maintenance cost reduction strategies:
  - FY-12 Updates to Standard Item 009-32.
  - Reduction of conformance test requirements in coating specifications.
- Summarize FY-10 **initiatives** in NAVSEA coatings and maintenance cost reduction strategies:
  - Status of single-coat paint initiatives.
  - Implementation of enhanced performance topside coatings.
- Discuss Cooperative NAVSEA/NSRP Projects.
  - Comment on “Fall FY-10” proposed NSRP SP-3 Panel projects.

# NAVSEA & Naval Systems Engineering Directorate (SEA 05)



# Coatings & Corrosion Control Technical Pyramid

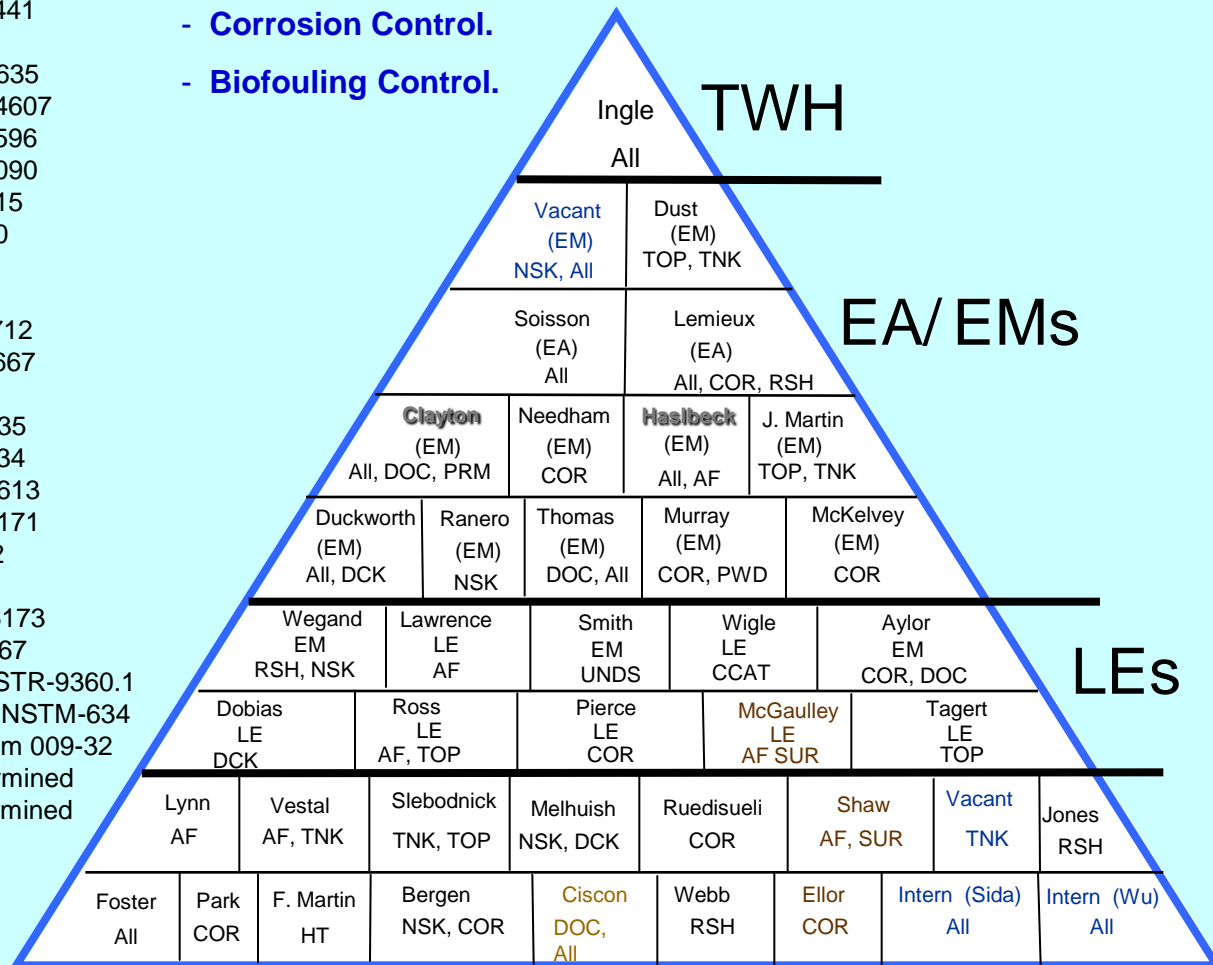
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**Code - Product - Related Specifications**

- All - All Technical Products, Managerial - All
- AF - Antifouling Coating System - MIL-PRF-24647
- TNK - Tank Coatings, Epoxy Primers - MIL-PRF-23236  
MIL-DTL-24441
- PRM - Primers, Single Component - TT-P-645
- TOP - Topside Coatings, Alkyd Colors - MIL-PRF-24635
- INT - Interior Coatings (SEA 08) - DOD-DTL-24607  
MIL-PRF-24596  
MIL-DTL-15090  
MIL-DTL-1115  
MIL-DTL-700  
TT-P-28
- HT - High Temp. Coatings, Metallic Corrosion Control Coatings
- PWD - Powder, Interior, Cosmetic - MIL-PRF-24712
- NSK - Non-Skid, High Temperature, Non-traditional - MIL-PRF-24667
- DCK - Deck Coverings - MIL-PRF-3135  
MIL-PRF-3134  
MIL-PRF-24613  
MIL-PRF-32171  
MIL-A-22262
- SUR - Abrasive blasting, surface preparation, pretreatments
- SEL - Sealants and Preservatives - MIL-PRF-16173
- COR - Corrosion Policy and Design - DODI-5000.67  
NAVSEAINSTR-9360.1
- DOC - Policy Documents - NSTM-631, NSTM-634  
Standard Item 009-32
- RSH - Research, Corrosion, Coatings - To Be Determined
- UNDS - Regulations, Underwater-hull, Flight-deck Cleaners, Cooling Water Fouling Control - To Be Determined

**Technical Warrant Holder (TWH) for Coatings & Corrosion Control responsible for:**

- Coating Environmental Compliance.
- Corrosion Control.
- Biofouling Control.



Pre-decisional

**Key:** Navy employee, Navy Developmental Employee, Contractor Employee

# OBJECTIVE

## REDUCE TOTAL OWNERSHIP COST

- NAVSEA focused on reducing Total Ownership Cost (TOC):
  - Significant factor in performance evaluation.
  - Funding to support projects to reduce TOC.
- TOC proposals require use of a spreadsheet that includes:
  - Specific cost and service life data fields.
  - Discount rate of 4.2% per annum for future savings.
  - Five and ten year Return On Investment (ROI) review.
- Service life cannot be traded away for up-front cost savings.
- Performance risk needs to be managed by technical warrant holder.

Aug. 2010, HQ-NAVSEA SEA 05D & SEA 05P23, DDG-1000 Team Received NAVSEA Total Ownership Cost Award for Adjusting Edge Radius Requirements When Using High-solids Edge Retentive Paints.

New Requirement – Program Office must concur with reported savings.

# Universal Paints Requirement Document

- Navy historically applied coatings to ships in accordance with:
  - NSTM 631 – Ship, submarine & carrier maintenance painting & ship's force painting.
  - Standard Item 009-32 – Maintenance work on ships.
  - Submarine Maintenance Standard (SMS), 631-081-015 – Maintenance work on subs.
  - New construction contract, RCOH contract, other contracts.
- Each document has its own, similar, but not identical requirements.

**PROBLEM: Multiple requirements documents create training cost drivers & confusion.**

**SOLUTION: Reduce training, planning, & implementation costs by having one document.**

## Accomplishments:

1. SEA 00 letter directed use of Standard Item 009-32 as universal paints requirements document on 3 July 2008.
2. NSTM 631 updated to reference to Standard Item 009-32 on 1 Nov. 2008.
3. SMS updated to reflect use of Standard Item 009-32 on 1 June 2009.
4. FY-11 Standard Item 009-32 fully coordinated with SEA 08 and approved, via route sheet on 8 Dec. 2009. Issued by SSRAC in Dec. 2009 – in use today.
  - Requires single-coat paint in ballast tanks, voids, chain lockers.
  - Allows single coat as option in fuel tanks and well-deck overheads.
  - Allows retention of moderate level of flash rust on exterior, hull coatings.
  - Allows polysiloxane paints topside with option of single-coat polysiloxane on aluminum.
  - Eliminates requirement to paint CHT tanks at 50% relative humidity.

# Universal Paints Requirement Document

## FY-12 Proposal Summary

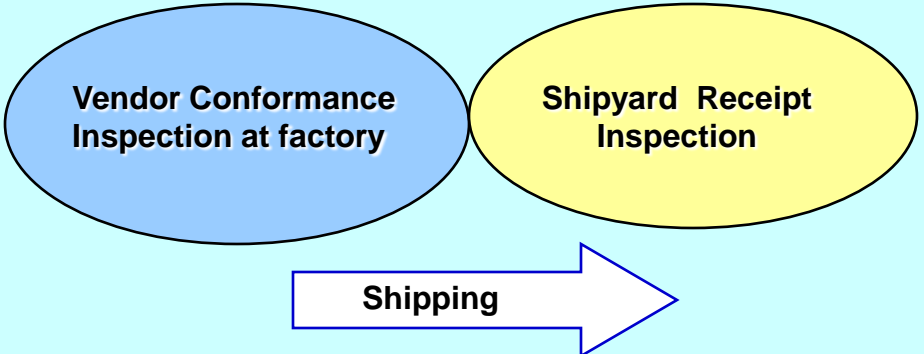
**Modified draft submitted in NAVSEA for comment to address receipt inspection testing.**

**3.8.1.1 FOR AIRCRAFT CARRIERS AND SUBMARINES, ACCOMPLISH ADDITIONAL RECEIPT INSPECTION OF COATINGS TO BE APPLIED IN CRITICAL COATED AREAS (EXCLUDING NONSKID AND UNDERWATER HULL PAINT) UPON RECEIPT FROM THE MANUFACTURER.**

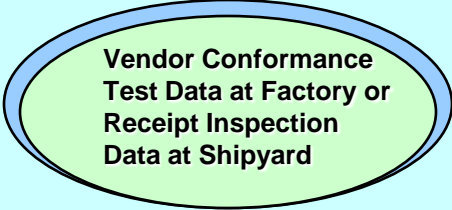
**Rationale:**

- 1. Current practice in fleet was to not conduct receipt inspection on antifouling and non-skid.**
- 2. Low risk based on Cumbersome Work Practices project to eliminate receipt inspection one failed coating from plant to work site, epoxy in Siberia.**
- 3. Eight required tests include density, fineness of grind, and condition in container for for Part A & Part B validate viscosity, dry hard time, sag resistance, appearance of dry film, and color of dry film for mixed paint.**

### TODAY



### TOMMORROW



**Goal Is to Have Complete Test Data Set on:**  
Density, Grind, Condition in Container,  
Viscosity, Dry time, Sag, Color  
Appearance dry film

# Universal Paints Requirement Document

## FY-12 Proposal Summary

### Acknowledge the “Definition” of Touch-up and Expand Allowable Areas.

Changed surface ship "touchup" that **was** less than 1% and no area more than 10 sq.ft., to **now be** less than 10% and no area more than 10 sq.ft.

Rationale:

1. Consistent with current submarine practice.
2. Consistent with CCAMMS policy for a “fair” coating (i.e., previous requirement for a “good” coating).
3. Avoids leaving exposed bare metal because budgets will not support full re-preservation.

### Allowed Steel Added to Ship’s Uncompensated Fuel Tanks to Remain Unpainted.

Changed Note (65) to allow “new” steel to be uncoated; but **required** “new” steel with pre-construction primer (PCP) to be over-coated with one coat of MIL-PRF-23236, Type VI, Class 5, at 4-6 mils.

Rationale:

1. Consistent requirement for new and existing steel in the tank.
2. Fuel & Engine Technical Warrants will not accept large areas of uncoated PCP due to potential zinc release into fuel.
3. Costs still low, do not have to blast in tank.

### Clarified that Only Uptake Spaces on Steel Ships (e.g., DDG-51) are Critical Coated Areas.

Modified which Uptake spaces are on critical list: **only critical uptakes are:**

"Gas turbine exhaust uptake spaces and trunks (steel surfaces only)."

Rationale:

1. Aluminum uptakes not subject to severe corrosion.
2. Fleet does not want to pay for added documentation for FFG, CG, LCS.
3. Aluminum uptakes still preserved.

# Universal Paints Requirement Document

## FY-12 Proposal Summary

### Reduce Environmental Requirements for Touch-up.

For individual areas 2 sq.ft. or less totaling less than 0.03 percent of the total surface area, **relax** 50% RH requirement for PW/FW tanks to be 85% RH to match what we allow for all other locations.

#### Rationale:

1. Small area equates to small risk.
2. High cost to dehumidify tank for such small repairs.
3. Speeds touch-up and tank close out,

### Allow Spray Applied Capastic Shield.

**Allow** use of either Sherwin Williams Novaplate or International's Interline 624 coatings for spray applied capastic shield.

#### Rationale:

1. Performance of two systems documented, novalac chemistry can resist cathodic current/potential.
2. Different products apply differently (**potential NSRP input**).
3. Plan to develop specification requirement for such products and investigate single-coat.

### Expanded Allowable Profile Range for Non-skid.

**Allow** profile readings of 3 - 6 mils, as compared with current requirement of 3 - 4.5 mil, with no individual reading over 7 mils (i.e., was 5 mils).

#### Rationale:

1. Non-skid can cover high profile.
2. Many decks have high profile already.
3. Still need some control pressure and grit size.  
Plan to evaluate applying coating over any profile revealed by ultrahigh pressure waterjet blast (**potential NSRP input**).

# Universal Paints Requirement Document

## FY-12 Proposal Summary

### Prohibit Painting in High Winds.

**Added** requirement from NSTM 631 that painting shall not be performed when sustained winds exceed 15 mph, without an enclosure.

#### Rationale:

1. Painting in high winds wastes paint.
2. Overspray is greater problem in high winds.
3. Substrate contamination is greater in high winds.

### Eliminated Requirement to Apply Antifouling Inside of Stern Tubes.

**Eliminated** requirement that interior surfaces of stern tubes and coupling covers get antifouling topcoat.

#### Rationale:

1. Low flow and low light areas do not foul.
2. Touch tacky requirement for antifouling primer leads to problems with workers in tight spaces.

Added High Durability Deck Paint (MIL-PRF-32171) as option to some areas.

Replaced call outs for "Spongejet" media with new, SSPC AB-4 for "Recyclable Encapsulated Abrasive Media."

Added crushed glass as option for surface preparation.

Inaccessible areas will be as agreed upon with the supervisor and masking on noble-metal pipe defined.

Added polysiloxanes as option for wet space topcoat.

Added powder coating as only option for DDG louvers, and as alternative option for all other removable louvers.

Waived paint storage requirement when MIL-PRF-23236 Type VII coatings are applied using a plural component spray pump with recirculation and preheating.

# Universal Paints Requirement Document

## FY-12 Proposal Summary

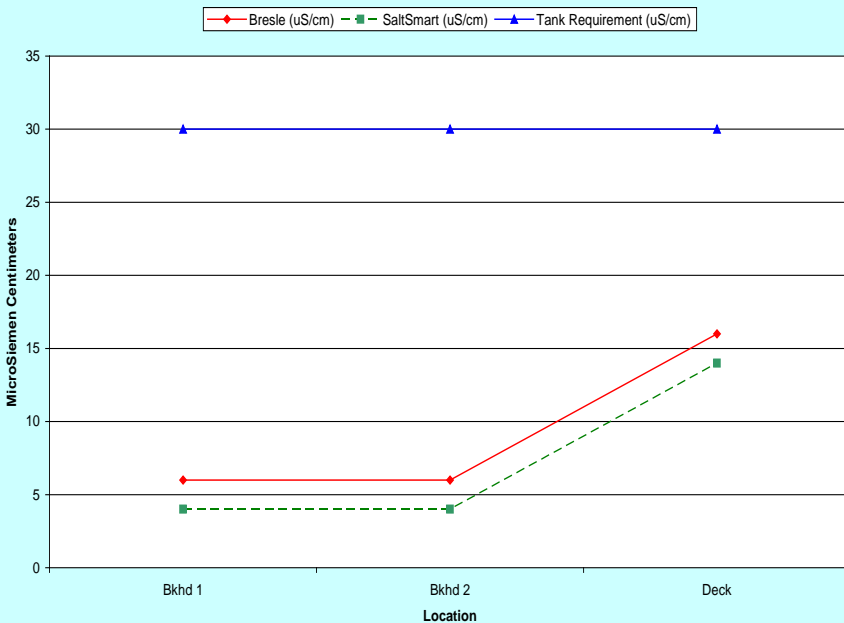
### Allowed Use of SaltSmart Technology to Measure Surface Conductivity.

**Allowed** use of SaltSmart: Conductivity samples shall be collected using a product that meets the requirements of NACE SP0508-2008, "Methods of Validating Equivalence to ISO 8502-9 on Measurement of the Levels of Soluble Salts."

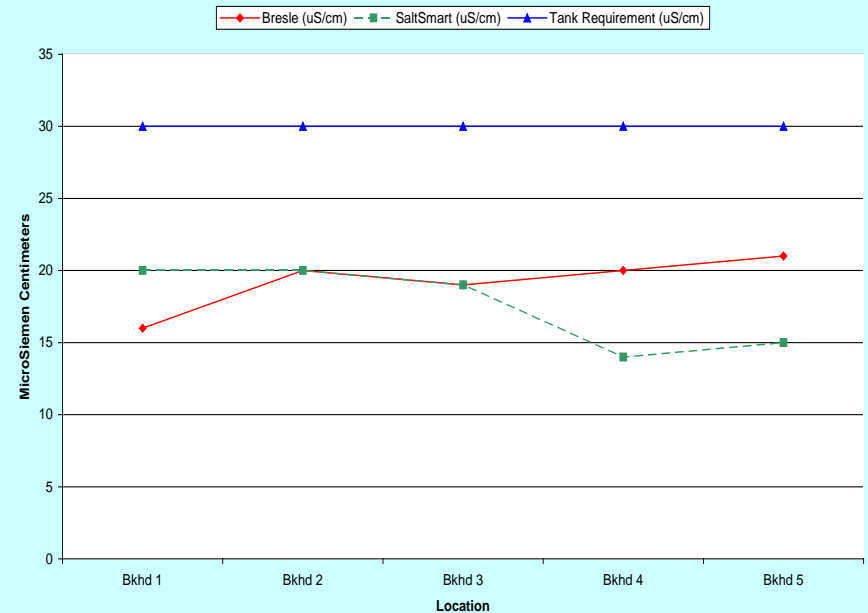
#### Rationale:

1. SaltSmart could reduce time and cost associated with conductivity measurement.
2. Strips passed NACE test at three salt levels, not just the one level normally required.
3. Field trials completed on USS FOR McHENRY (LSD-43).

SALT SMART DATA 30 June 2010

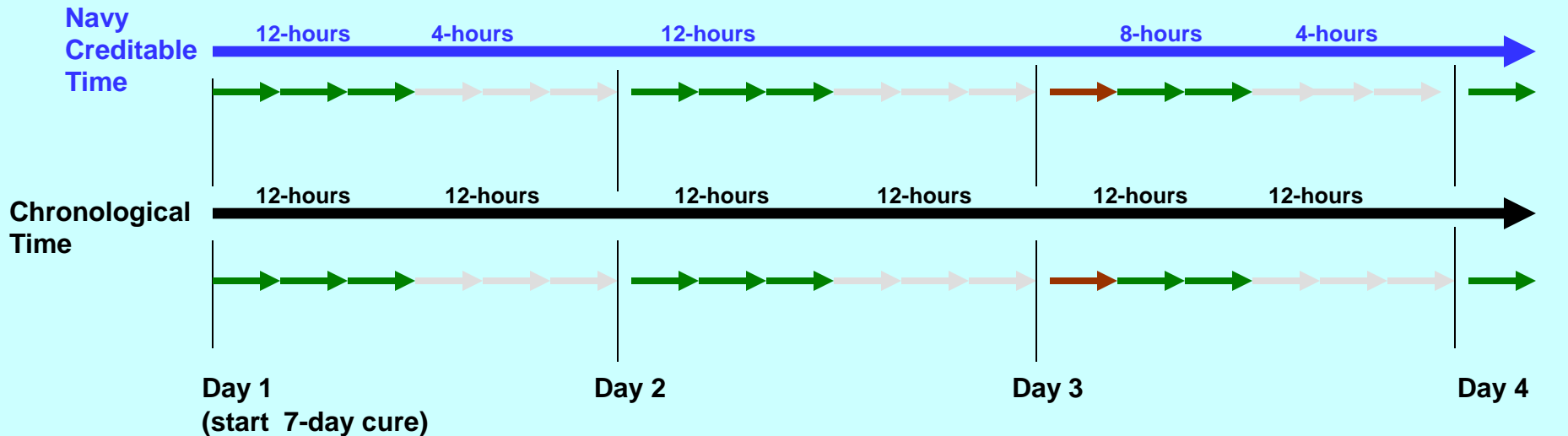


SALT SMART DATA 9 July 2010



# Universal Paints Requirement Document

- Navy shipyards requested “Creditable” hours concept be included to address limited ability to fund overtime.
  - Assume manual readings are being used for tank work and requirement is every 4-hours.
  - Time only applies to final cure, **does not apply to overcoat window.**
  - Must add up 168-hours of credible cure time for a seven-day cure. May be more chronological time.



Key: 4-hour readings (good): ➡      4-hour readings (bad): ➡      4-hour reading (no data): ➡

Example Above Shows 72-hrs of Actual Time Yields 40-hrs of Navy “Creditable” Cure Time

# Coating Specification Conformance Testing

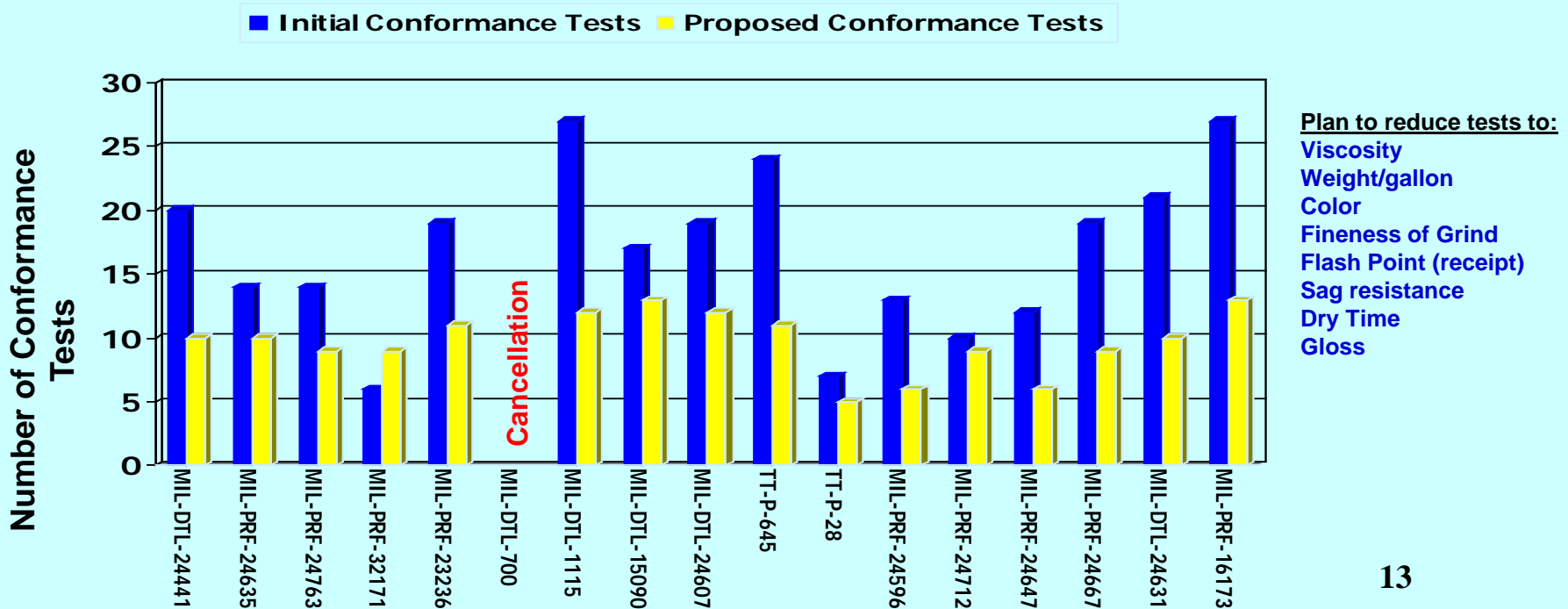
- SEA 05P23 alerted to paint specification conformance testing not being conducted by paint vendor or shipbuilder or shipyard –

**PROBLEM:** Too many tests, duplicative approaches, too time consuming.

**SOLUTION:** Reduce number of tests in a LEAN mode to the “right” number for shipyard OQE and paint manufacturer’s process.

## Accomplishments:

- Cancelled MIL-DTL-700.
- Published updates to MIL-PRF-23236, MIL-PRF-24635, MIL-PRF-24763, MIL-DTL-24441 in 2009. Published MIL-DTL-24607, MIL-DTL-15090, MIL-DTL-1115 in Oct. 2010.



# Single Coat Paint

- Application of rapid-cure, edge-retentive, high-solids paints in a single-coat more cost effective than applying multiple coats.

**PROBLEM:** Ultra-high-solids coatings require three coats (i.e., primer, stripe, and top coat) = Excessive Labor.



**SOLUTION:** Single-coat system based on application of a single color of paint, during a single coating evolution in the tank, with multiple passes of the paint gun. Cure time only four hours at 77F and one day to service.

## Accomplishments:

1. FY-11, Standard Item 009-32 ONLY ALLOWS use of single-coat system in ballast tanks, voids, and chain lockers.
2. Completed single-coat installation on well-deck overheads with shipyard savings of \$246K.
3. SSN 688 Class SHAPEC incorporated notionals ( $\approx 30\%$  paint application savings) into availability planning.
4. Completed demonstration installation of single-coat paints in submarine CHT tanks.
5. Completed one-year (April 2008 – Oct. 2009) inspection of single-coat on USS GREENEVILLE (SSN-772) – CCIMS Condition 1.
6. USS WASP (LHD-1) June, 2003 install, 20,000 sq.ft. tank still CCIMS Condition 1.



## When Fully Implemented

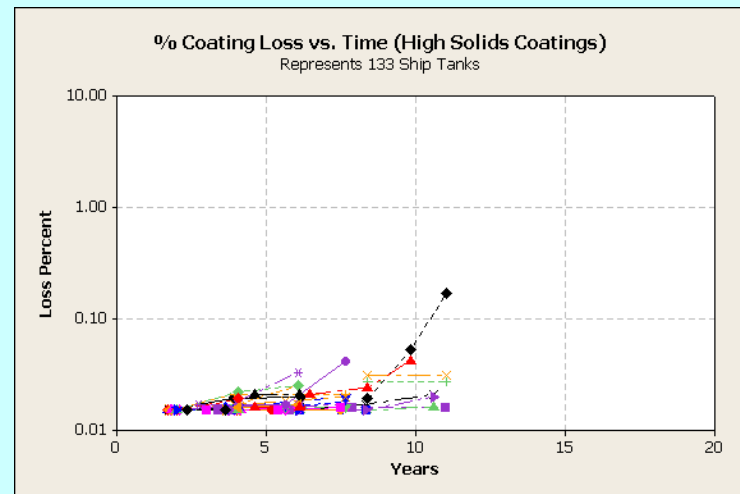
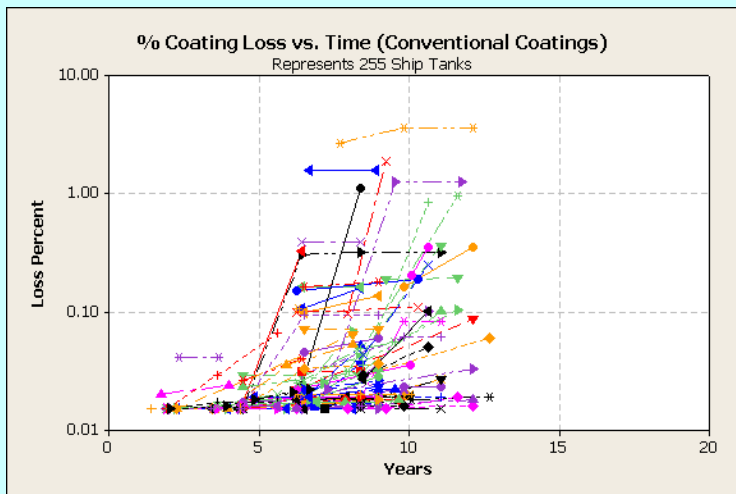
“Top down” cost estimate suggests annual savings of \$7.1M.

“Bottom Up” cost estimate suggests annual savings of \$6.5M.

Single-coat Performing “As Advertised” Saving Time/Money.

# High Solids, Single Coat Paint Works

- Application of edge-retentive, high-solids paints statistically appears on track to provide intended 20-year service life, single-coat in data mix, but too few installs to draw conclusions.



## Conventional Coating v. High Solids Materials in Seawater Ballast

(Bin = 2 Year Period Ending...



# Reduce Color Shift of Navy Topside Paints

## Issue:

- Office of Naval Research estimates Navy could save over \$5M/year by avoiding sailor and contractor labor to overcoat ships with “pink paint.”

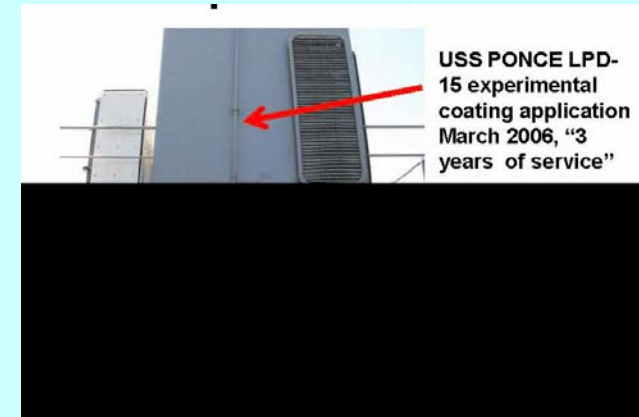


**Problem:** First generation, Low Solar Absorbance (LSA) paints lose gloss and color shift toward red over time

**Solution:** Accelerate implementation of improved, LSA paints that more slowly.

## Accomplishments:

- FY-11 Standard Item 009-32 only allows use of the Type III, 250 g/l paints because these products are three to four times more resistant to pinking than Type II, 340 g/l products.
- Issued Naval Message 271732Z OCT 10 that provides NSNs for MIL-PRF-24635:  
Type II products – no longer authorized.  
Type III products – recommended.  
Type V products – highly recommended.
- Qualified Sherwin Williams PXLE-80, International Interfine 979, and Ameron PPG PSX-700 polysiloxane as MIL-PRF-24635, Type V, High Durability systems May 2010.
- Vendors working on “sailor proof” quart/gallon kits.



# Paint Center of Excellence

## FY-11 Program Status

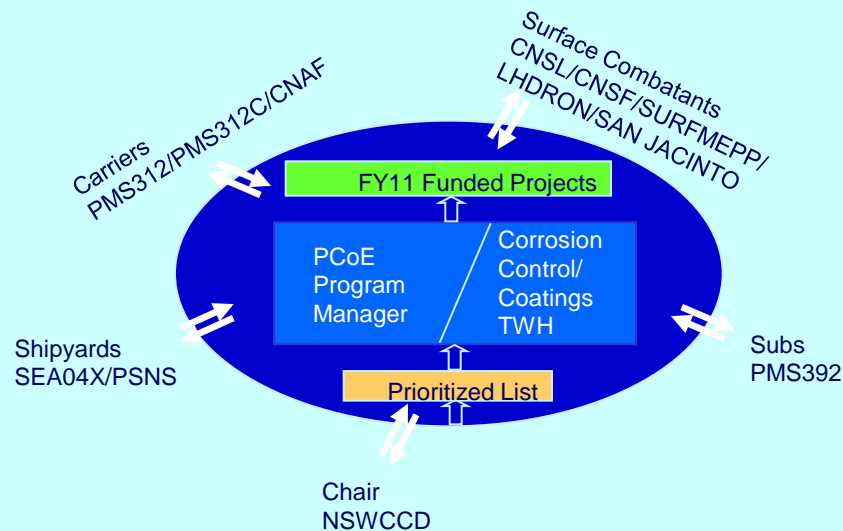
Paint issues have the potential to offer high total ownership cost savings (up to U.S.\$2.4B/year).

**PROBLEM:** Funding required to develop, qualify, and field new coating systems, preservation processes, and Fleet support strategies.

**SOLUTION:** Obtain resources to support paint & corrosion control material & process improvement.

### Accomplishments:

- OPNAV provided funding for FY-11 Paint Center of Excellence.
- Project selection involves fleet and NAVSEA.



# Paint Center of Excellence

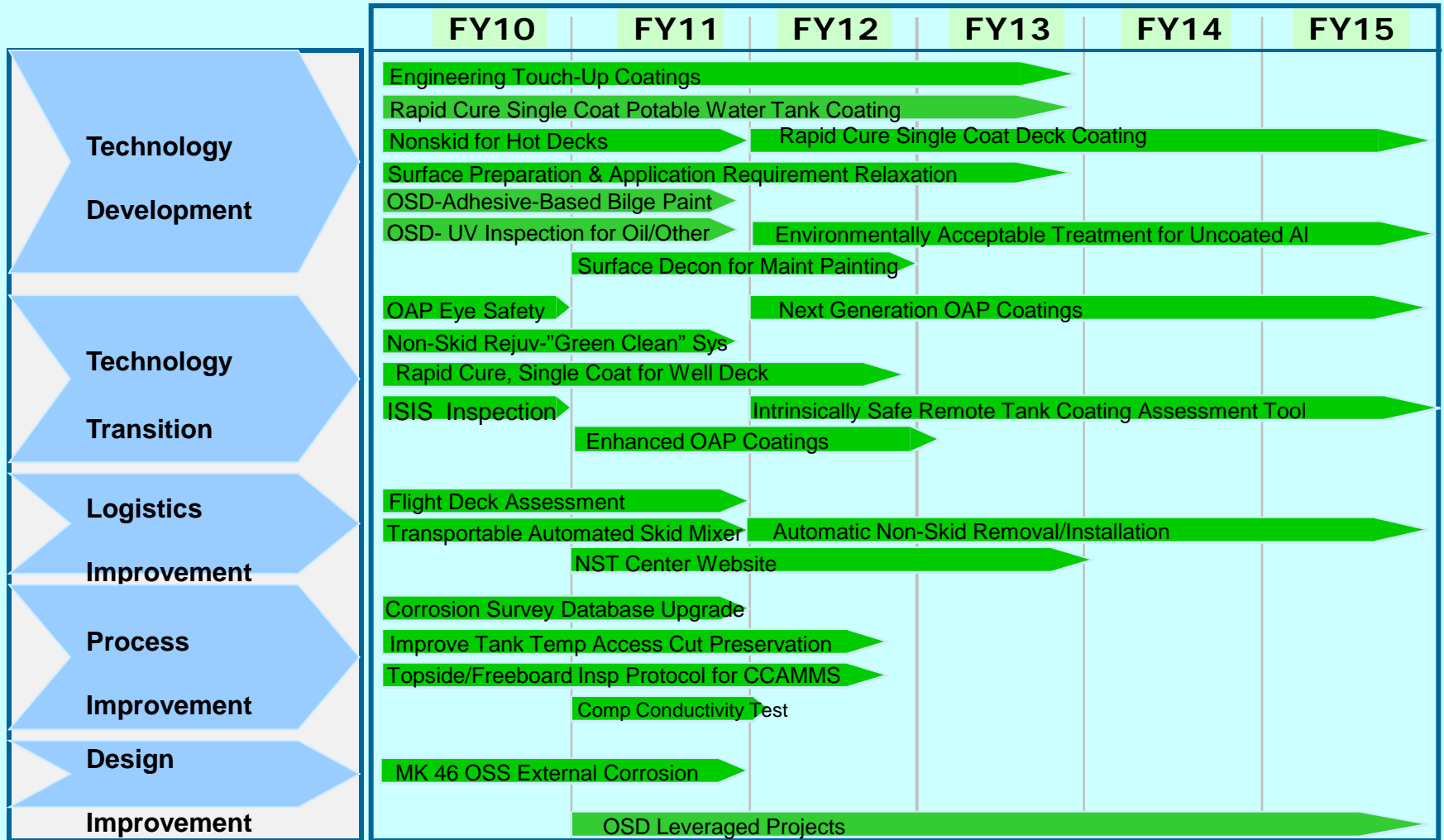
## FY-11 New Starts

- Resources in place for four FY-11 new-start tasks:
  - \* **Optically Active Pigment (OAP) project to look at application over heavily pitted steel to provide the best means of covering rough, blasted steel.**
  - \* **Surface decontamination with hydrogel.**
  - \* **Comparative testing of conductivity test methods to determine lowest cost option for measuring surface contamination of SaltSmart, Bresle, RPP Device, and Elcometer.**
  - \* **Maintain operations of [www.nstcenter.com](http://www.nstcenter.com) web site.**

[All Projects Useful to NAVSEA and supported by TWH](#)

# Paint Center of Excellence

## Milestones



# NSRP New Start Tasks

## SEA 05P23 / NSRP

### NSRP PROJECT

### SEA 05P23 Comments

#### **Evaluation of “Spot and Sweep” Blasting as a Cost Effective method of Underwater and Outer Hull Surface Preparation**

**Objective:** To evaluate and recommend a reliable, efficient, and cost-effective alternative to completely blasting and painting Navy underwater hull in a method consistent with MSC and commercial ship owners “shave and a haircut.”

**Good project, lower Total Ownership Cost (TOC) immediately apparent.**

**Need to determine population of long service life underwater hull primer to avoid false economy of repair.**

#### **Cost Reduction of Surface Preparation in the Shipyard with Laser Ablation Featuring the New Technology of Closed-Loop Control**

**Objective:** Perform lab tests to validate laser surface prep process and continue with the limited research conducted at U.S. Naval Base Kitsap- Bangor that shows laser technology can be used as a safe, non-destructive method. Perform “in the field” tests at Naval shipyard.

**Need to address the TOC issue, how much does laser cost to buy and operate vs. productivity improvement?**

#### **Compatibility of “Single Coat” Tank Coatings with Retained Pre-construction Primer**

**Objective:** Determine if qualified, single-coat systems are compatible by applying them to test tanks constructed as part of a previous NSRP project.

**Good project that addresses key technical issue with single-coat.**

**Need to perform analyses of alternative surface preparation methods:**

**Brush blast?**

**Pressure wash?**

**Laser?**

**Need data on disbondment before moving to ship test.**

# Conclusions

- NAVSEA goal is to reduce coating application costs from new ship acquisition through to ship disposal.
- NAVSEA making progress toward:
  - Making Standard Item 009-32 the Universal Paints Requirements Document.  
**Work with NSRP to continue to reduce total ownership costs.**
  - Specification Update (Paint Conformance Testing and Receipt inspection.)
  - Implementing findings of Cumbersome Work Practices tasks:
    - Rapid Cure, Single Coat.
- NAVSEA to continue with FY-11 new start tasks.
  - NSRP
  - PCOE
- NAVSEA to support NSRP SP-3 new start projects.

