2002 DOD Maintenance Symposium

Beau Brinckerhoff
Corrosion Control Division

Shipboard Coatings

Superstructure & Catwalks (Enamel, Silicone Alkyd)

Interior Bulkheads & Decks (Chlorinated Alkyd)

Tanks & Voids (Epoxy)

Underwater Hull (Antifouling)

Topside Camouflage & Freeboard (Enamel, Silicone Alkyd)

Machinery Space/Passageway (Enamel, Silicone Alkyd)

Bilge/Wet Spaces (Epoxy)

Flightdeck & Topside Decks (Non-Skid)

Customers

- Congress
- SECNAV
- OPNAV
- Fleet
- U.S. Coast Guard, U.S. Army, MSC
- NAVSEA 08 (Nuclear Reactors)
- Program Executive Offices (PEO's)
- Board of Inspection and Survey (INSURV)
- Maintenance Activities (e.g. IMA's, TRF's)
- Shipyards (Public and Private)
- Life Cycle Managers (LCM)
- Ship Design Managers
- Navy International Programs Office
- Others

Metrics Used by NAVSEA

Performance Measures/Metrics *Current Navy…..*

Cost: Reduce ownership cost
Schedule: Responsiveness to customers
Innovation: Improve readiness

Performance Measures/Metrics *Next Navy…..*

Cost: Cost efficiency/effectiveness
Schedule: Responsiveness to customers
Performance: Customer communication – How/How often?

Performance Measures/Metrics *Navy After Next….*

Cost: revenue/streams of funding/sponsor base
Schedule/Cycle Time: Responsiveness to customers
Performance: Customer satisfaction/Influence
People: Skill mix/experience/quantity of workforce

Technology Development Methodology

Fleet requirements form NAVSEA priorities.

- ✓ Identify technologies to meet those requirements.
- ✓ Validate technologies with Fleet cooperation .
- ✓ Technology = Improved Processes + Advanced Materials.

Methods

- **Identify commercial products to meet performance requirements.**
  - **Modify commercial systems to suit.**
  - **Initiate projects to develop systems.**

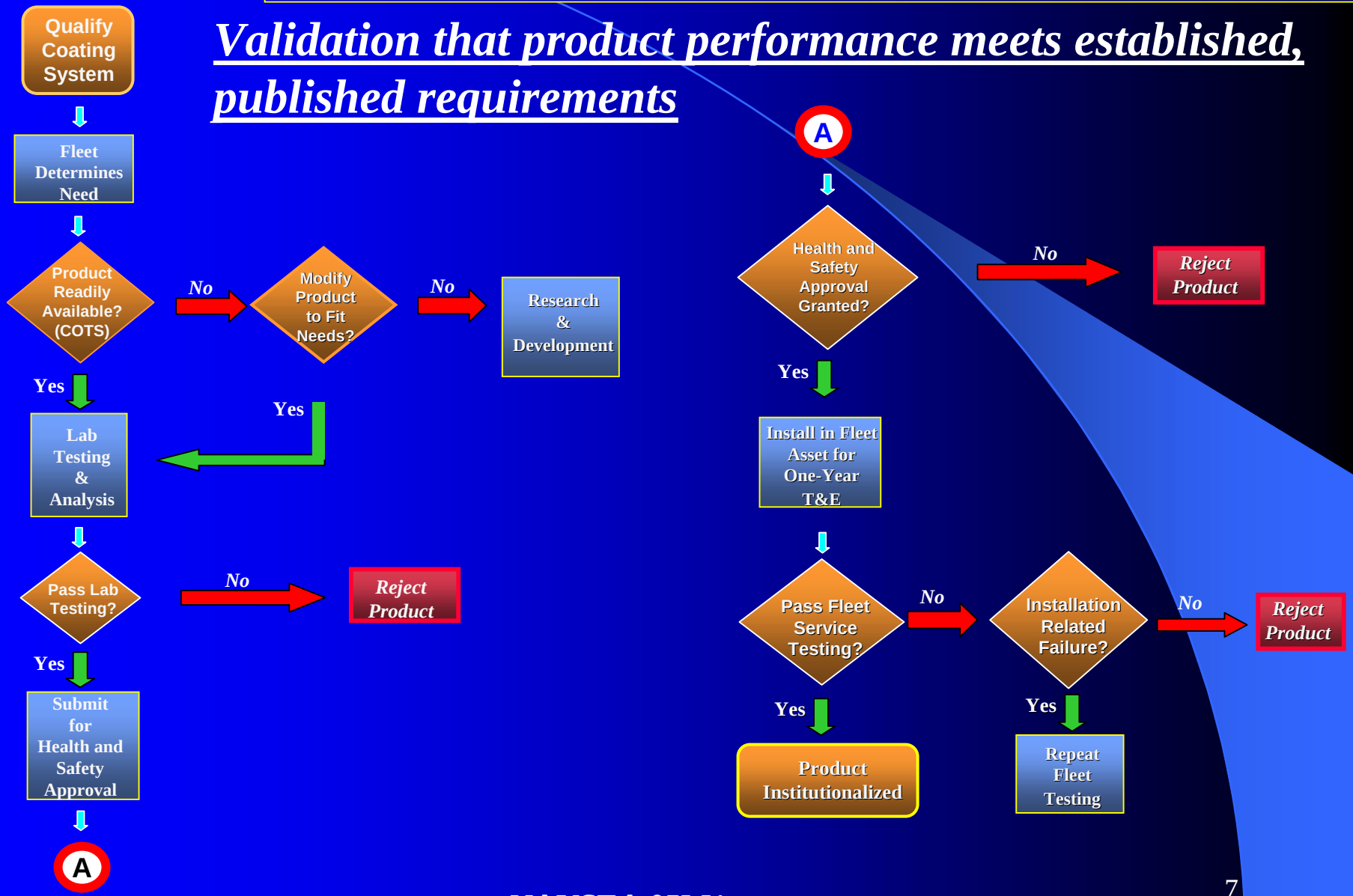
Selected Goals for New and Improved Paints

- Epoxy Fast Cure Systems
- Epoxy Low Temperature Cure Systems
- Epoxy High Temperature Application Systems
- Cure Under Moist Conditions
- Compatibility with Other Products and itself for Repair
- Polyurethane single-coat systems
  - ✓ Wider substrate application temperature range than advanced epoxy systems
  - ✓ More flexible than advanced epoxy systems
  - ✓ Higher abrasion resistance than advanced epoxy systems
  - ✓ More UV resistant than advanced epoxy systems
  - ✓ Moisture intolerant
  - ✓ Less forgiving in application than epoxies
  - ✓ Single coat application saves schedule
  - ✓ High build (same as advanced epoxy)
  - ✓ Edge retentive (same as advanced epoxy)
  - ✓ 20 year service life (same as advanced epoxy)
  - ✓ Installation of polyurethanes requires installer certification from manufacture and specialized application equipment
  - ✓ Adherence to installation protocol is ***critical***

Product Qualification Flow Chart

NAVSEA
NAVAL SEA SYSTEMS COMMAND

Validation that product performance meets established, published requirements



Example Product Qualification Criteria

Characteristics for Initial Qualification

- Solvent Free
- Edge Retentive
- High Build

Requirements for Phase One Qualification

- Satisfactory 90-day Cathodic Disbondment
- Satisfactory condensing humidity

Requirements for Final Qualification

- Satisfactory one-year cyclical seawater/fuel/air
- Satisfactory 6-month continuous fuel immersion *(for products to be subjected to fuels)*
- Satisfactory overcoat compatibility
- Satisfactory one-year in-service performance

National Surface Treatment Center

www.nstcenter.com

A NAVSEA sponsored website and database portal providing information about surface coatings and related products, equipment, procedures, and regulations linking users to the resources needed to apply the best available technologies.

Impediments to Implementation

Implementation by the Maintenance and Shipyard communities

- Historically, inconsistent funding for Corrosion Control LCM (NAVSEA) Engineering.
- Proper planning for installation in the entire Fleet.
- Proper programming of funds for *timely* installation in the entire Fleet.
- Maintenance facilities and Shipyards accepting changes to existing practices
- Work sequence

Impediments to Implementation *(Cont)*

Adherence to Application Rules

Maximum service life of coating systems can be expected only when established protocols are followed. If not adhered to, projected cost avoidance will not be realized.

Coating failures are due to:

- ✓ Improper surface preparation
- ✓ Improper coating application
- ✓ Improper storage and mixing
- ✓ Expired shelf life of coatings
- ✓ Improper environmental control
- ✓ Improper material selection
- ✓ Product formulation/production problem

Preservation Teams

- **Problem:**
  - Sailors devote more than 16 man-yrs/yr/ship to organizational level preservation.
  - Sailors lack the training to utilize advanced coatings.
  - Ships lack the resources to conduct warfare training and execute preservation.
- **Solution:**
  - Provide contracted, corrosion control specialists to complete organizational level preservation.
  - Utilize advanced coatings to drive down life –cycle maintenance costs.
- **Status**
  - Contacts in place for *17* primary teams and *8* secondary teams.
  - Installed new technology preservation teams on 682,000 ft^2 of a total of ≈20M ft^2

Sailor
Needle Gunning

Contractor
Needle Gunning

Preservation Teams *(Cont)*

Empirical Data

Information collected from in-service inspections:

- **10 in-service reports from 10 ships with coatings in service for 12-18 months.**
  - **Coating systems on all ships in large majority of areas in excellent-outstanding condition.**

Initiative Total Projected Cost Avoidance ≈*$35.3M/yr.*

ROI for Initiative ≈ *1.05*

Cost Avoidance Achieved To End of FY-01 ≈ *$6.64M/year*

Tanks and Voids

The #1 Cost Avoidance Initiative for the Fleet

Problem:

- Current solvent-based coatings fail within 5 yrs.
- About 11,700 tanks targeted (128M ft^2)

Solution:

- Implement high build, solvent free epoxy protocols extending:
  - ✓ Sea water tanks from 5 yrs to 20 yrs.
  - ✓ CHT tanks from 2 yrs to 8 yrs.
  - ✓ Fuel/comp fuel tanks from 5 yrs to 20 yrs.
  - ✓ Potable water tanks from 5 yrs to 20 yrs.

Initiative Total Projected Cost Avoidance ≈ *$174M/yr*

ROI for Initiative ≈ *347*

Cost Avoidance Achieved To Date ≈ *$12.6 Million/year*

USS Ogden new technology tank coatings after 6 years

USS Ogden old technology tank coating after 3years

Well-Deck Overheads

Problem:

- Current paint coatings fail within 12-18 mos.
- Fleet-wide, Sailors spend 4,290 man-days/yr maintaining well-deck overhead coating systems.

Solution:

- Install NAVSEA approved high solids, edge-retentive systems to extend service life from 3 to 10 yrs.

Status:

- ***Program embraced and implemented by the Fleet***
- ***Two*** **new technology coatings approved for Fleet use.**
- ***One*** **new technology coating approved for field test.**
- **Installed new technology well-deck overhead coatings on 23 of 38 ships.**

Initiative Total Projected Cost Avoidance ≈*$5.4M/yr*.

ROI for initiative ≈ *9.3*

Cost Avoidance Achieved To Date ≈ *$3.17M/year*

Well-Deck Overhead with specialty coating

Well-Deck Overhead with MIL 24441 System

2002 ERM/CI Labor Status

INITIATIVE	*PROJECTED COST AVOIDANCE*	*COST AVOIDANCE TO DATE*	*% OF REALIZED COST AVOIDANCE*	*COST FOR CORROSION CONTROL ENGR*
High Durability Coatings/Coverings	$577M/year	$22.68M/year	4%	$0.828M/yr.
Tank and Void Preservation	$173.6M/year	$12.6M/year	7.26%	$2.5M/yr.
S4 Heads	$134.25M/year	$1.80M/year	1.3%	$1.6M/yr
Non-Skid	$30.00M/year	$0.507M/year	1.7%	$0.316M/yr
Anti-Stain	$39.35M/year	$3.84M/year	9.76%	$0.567M/yr.
Preservation Teams	$35.3M/year	$6.64M/year	18.8%	—
Tank Monitoring	$14.65M/year	$0.216M/year	1.47%	$0.900M/yr.
Bilge Preservation	$21.72M/year	$1.02M/year	4.7%	$0.361M/yr.
Composites	$10.25M/year	$0.14M/year	1.4%	$.982M/yr.
Water Jetting	$8.15M/year	$1.11M/year	13.6%	$1.07M/yr.
Well Deck Overheads	$5.38M/year	$3.17M/year	59%	$0.820M/yr.
TOTAL	**$1.050 Billion/yr**	**$53.72M/yr**	**5%**	**$9.94M/yr.**

Total ROI To Date: $47.08M/yr. ÷ $9.94M/yr ≈ 5 *(Preservation Team Numbers not Included)*

Seven Initiatives Still in Infancy