PROJECT ID:
609

Oxsol-Free and Low-VOC Surface Ship Topside Coatings for Maintaining Environmental Regulations

Sailors painting the freeboard of the USS Essex (LHD-2) with single-component polysiloxane topcoat. (Photo Credit: Erick Iezzi)

OBJECTIVE

The objective of the project is to test Oxsol-free and low volatile organic compound (VOC) polysiloxane topcoats to the majority of MIL-PRF-24635, Type V/VI performance requirements, demonstrate and validate their performance in the field compared to a qualified topcoat, then transition to the fleet.

PROBLEM STATEMENT

Parachlorobenzotrifluoride (PCBTF), commercially known as Oxsol 100, is used in haze gray coatings for the exterior topside (freeboard and superstructure) of Navy surface ships because it is the only solvent that is VOC-exempt with a flash point >100 degrees F. However, this solvent was recently deemed carcinogenic, and South Coast Air Quality Management District (SCAQMD) in California plans to remove it from their VOC-exempt list, thereby rendering current topside coatings environmentally noncompliant and preventing topside maintenance painting on Navy surface ships in San Diego.

DESCRIPTION

Navy surface ships in dry dock are typically painted with a two-component (2K) polysiloxane coating, whereas ships that are pier side or at sea are painted with a single-component (1K) polysiloxane topside coating. The 2K polysiloxanes are designed to be spray-applied by contractors while the 1K polysiloxane coating is designed for roll and brush applications by sailors over a wide range of temperatures and humidity.

Several coating manufacturers have already reformulated their polysiloxane topside coatings to be Oxsol-free while retaining a flash point >100 degrees F and a VOC content of ≤250 g/l. However, none of the reformulated coatings have been tested to MIL-PRF-24635 requirements by the Naval Research Laboratory (NRL) or

demonstrated on active Navy surface ships; thus these coatings cannot be approved for use by the Naval Sea Systems Command (NAVSEA).

This project team will test both 1K and 2K polysiloxane coatings to MIL-PRF-24635, Type V/VI performance requirements. The first phase of the project (6-12 months) encompasses selection of one or more formulations. Assuming an acceptable formulation is identified, the process will move to applications on active Navy surface ships. Coatings will be inspected after a 6-month+ period. NRL will write a laboratory performance and shipboard demonstration report for each Oxsol-free polysiloxane topcoat that meets all requirements. These will be provided to the Technical Warrant Holder (TWH) for Coatings at NAVSEA 05P for review and approval as part of the qualification package submitted by the coating manufacturers.

RETURN ON INVESTMENT

The cost per gallon for the Oxsol-free topcoats is expected to increase slightly due to topcoats possessing a greater solids content and less solvent. However, the coverage per gallon for the Oxsol-free topcoats will be greater, meaning that reduced quantities of coating will be required to paint a ship, thereby reducing overall costs.

NAVY BENEFITS

Presently, there is not an alternative solvent to Oxsol 100 that would comply with the new regulations while also meeting NAVSEA's flash point requirement. The reformulated coatings will alleviate maintenance concerns at many domestic Navy bases, especially Naval Base San Diego. The reformulated polysiloxane coatings will enable the fleet to remain compliant to California's regulations, in addition to alleviating a health and environmental hazard.

This new coating will also benefit the Naval Facilities Engineering Command's (NAVFAC's) Improved Navy Lighterage System (INLS) of craft (e.g., Causeway Ferry) located in San Diego, which currently uses an IOZ primer and silicone alkyd topcoat. However, silicone alkyds are an antiquated technology and maintainers would prefer to use polysiloxanes, which offer 4-5 times the exterior durability of silicone alkyds. An IOZ/polysiloxane system will provide ultra-low VOCs, excellent corrosion resistance, excellent durability, and a longer service life, all impacting mission readiness.

TRANSITION DESCRIPTION

Topcoats that have met all requirements and demonstrated sufficient performance will be approved by NAVSEA and added to the QPD. In addition, NRL will work with the coating manufacturers and defense logistics agency (DLA) to obtain new national stock numbers (NSN) for the reformulated polysiloxane topside coatings. Furthermore, NRL will assist NAVSEA with adding verbiage about the new topcoats to NAVSEA Standard Item 009-32 and Naval Ship's Technical Manual (NSTM) 631 so the topcoats can be applied by waterfront contractors and sailors, respectively. Finally, NRL will generate a fact sheet that provides a summary of the project and resulting Oxsol-free coatings.

CONTACT

For more specific information about this project, contact the Principal Investigator at 202-404-2889.

ABOUT THE NESDI PROGRAM

The Navy Environmental Sustainability Development to Integration (NESDI) program is the Navy's environmental research and development demonstration and validation program, sponsored by OPNAV N4I Installations Division and managed by the Naval Facilities Engineering Systems Command from the Engineering and Expeditionary Warfare Center in Port Hueneme, CA. The mission of the program is to provide solutions by demonstrating, validating and integrating innovative technologies, processes and materials and by filling knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring Navy readiness and lethality.

For more information, visit the program's web site at www.navfac.navy.mil/nesdi or contact Ken Kaempffe, the NESDI Program Manager at 805-982-4893, DSN: 551-4893 or kenneth.c.kaempffe.civ@us.navy.mil.