

Nontoxic Antifouling Strategies Demonstration Project

Dissolved copper exceeds federal and state standards of 3.1 parts per billion (ppb) in boat basins in San Diego Bay, Newport Bay, and Marina Del Rey. Oceanside Harbor also has elevated levels of dissolved copper. According to the Southern California Coastal Water Research Project and the Total Maximum Daily Load (TMDL) studies by the San Diego Regional Water Quality Control Board and the US EPA, as much as 90% of the copper in San Diego and Newport Bays comes from boat bottom paints. Scientific studies show that such high levels of dissolved copper affect growth, development, reproduction, and survival of marine life such as mussels, oysters, scallops, sea urchins, and crustaceans. Regulations to reduce copper released by boats are being planned and will likely include nontoxic antifouling strategies.

To help boat owners make decisions about nontoxic antifouling strategies, the University of California Sea Grant Extension Program (UCSGEP) conducted a field demonstration of nontoxic boat bottom coatings in 2002-2003. The demonstration was funded in part by the US EPA and the California State Water



Demonstration Project Vessel New Ceramic Epoxy Coating

Resources Control Board 319(h) program. The UCSGEP tracked the performance of one silicone- and two epoxy-based coatings on six recreational boats in San Diego Bay for over a year. Underwater hull cleaners reported on coating condition, fouling growth, cleaning tool, and diver effort twice a month for epoxy coatings and more often for silicone coatings each time the vessels were cleaned. The findings will provide boaters with vital information for choosing the best nontoxic antifouling strategy for their vessels.

Results From Diver Report Data

The average fouling growth on the epoxy coatings ranged from dark algae to hard growth; the average interval between hull cleanings for the epoxy coatings was from 14 to 18 days. The average fouling growth on the silicone coatings was from moderate silting to dark algae; the average interval between hull cleanings for the silicone coatings was from 7 to 12 days. The following are the means (averages) of the coating conditions as rated by the underwater hull cleaners each time a boat was cleaned. Note that a coating condition of 1 is equal to a new or nearly new coating condition while a coating condition of 5 is equal to the lowest rating of a coating's condition. Three boats received new formulas of the same paints during the project.

Coating Condition Ratings

- 1: New, slick finish, still shiny if appropriate to type of coating
- 2: Shine is gone or surface is lightly etched on all of coating, no physical blemishes or defects
- 3: Some blemishes or defects in coating on up to 20% of boat bottom
- 4: Some blemishes or defects in coating on 20%-50% of boat bottom
- 5: Blemishes or defects on over 50% of boat bottom

Ceramic Epoxy		
Boat	Coating Condition Aug 02-Sep 03	Coating Age
Diesel Electric	Mean= 2.0	13.9 months
Sailboat	Mean= 2.9	9.4 months
Sailboat New Formula	Mean= 2.0	5.2 months

Epoxy		
Boat	Coating Condition Aug 02 - Sep 03	Coating Age
Powerboat	Mean= 1.7	15.2 months
Sailboat	Mean= 2.6	56.5 months

Silicone		
Boat	Coating Condition Aug 02 - Sep 03	Coating Age
Powerboat	Mean= 2.4	13.4 months
Powerboat New Formula	Mean= 1.6	2.6 months
Sailboat	Mean= 2.0	12.2 months
Sailboat New Formula	Mean= 1.5	2.5 months



Visual Assessment of the Nontoxic Boat Bottom Coatings Demonstration Project at Final Haulout

- The powerboat and the sailboat with ceramic epoxy coatings had nearly new coating conditions with only minor scarring from calcareous growth after one year. The coatings had a sheen but no shine. The coating was sprayed on the sailboat and rolled on the powerboat. The pores from the roller application on the powerboat were fouled as they are a prime area for marine organisms to grow.
- The powerboat coated with an epoxy coating also had nearly new coating condition after one year with some wearing on the edges of the chines and light etching on the surface due to cleaning.
- The other vessel with an epoxy coating entered the project when the coating was almost 4 years old. By the end of the project, this epoxy coating was almost 5 years old and was expected by the boatyard operator to last another two years. The coating condition was rated at a level 3 out of 5 with some blemishes or defects on up to 20% of the boat bottom.
- The powerboat and the sailboat with the silicone coating had nearly new coating conditions after a year. The sailboat had the new formula of the silicone coating applied after 13 months to increase the slickness of the bottom for racing. The powerboat also had the new silicone formula applied. With the new formula, the performance of the coating improved for both vessels.



Sailboat- Silicone (1 year)



Powerboat- Silicone prepped to receive new formula



Diesel Electric- Ceramic Epoxy (14 months) with tubeworm remnants



Sailboat- Ceramic Epoxy (5 months) after 13 days of growth



Powerboat- Epoxy (15 months) with wearing on edges of chines



Sailboat- Epoxy (almost 5 years)

Available at <http://seagrant.ucdavis.edu>:

"What You Need to Know About Nontoxic Antifouling Strategies For Boats" provides technical information on nontoxic antifouling strategies for recreational boats and environmental effects of copper.

Request the following from ltjohnson@ucdavis.edu:

"Making Dollars and Sense of Nontoxic Antifouling Strategies for Boats" provides information on economics of switching to nontoxic bottom paints.

"Staying Afloat with Nontoxic Antifouling Strategies for Boats"

Presents full analyses and results of the field demonstration on nontoxic bottom paints (available late 2004).

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