Boat Hull Cleaning and Hull Paint

Introduction

Pollutants generated from boat hull maintenance and cleaning may impair water quality and threaten the health of aquatic systems. Chemicals used in top side and under water cleaning can also degrade water quality. Water quality impacts can be avoided or lessened by using non-toxic cleaning products, minimization or elimination of toxic cleaning agents, and implementation of practices that prevent or reduce opportunities for toxic products to contact surface water.

California's Non Point Source Pollution Control Program (CNPSP) recommends management measures to avoid or minimize impacts to water quality and habitat from boating and marina activities. These measures were developed for facilities with 10 or more boats, but may also be appropriate for small facilities. This factsheet focuses on BMPs related to in-water boat hull cleaning and hull paints. It does not address boat maintenance above the water line, minor maintenance conducted in the on-shore areas of marinas, or boat maintenance in commercial boat yards. At the time the CNPSP was approved there were no management measures related to boat hull maintenance, this is an area of expanding regulation and development of hull paint alternatives.

Boat hull paints and threats to water quality

Boats that are kept in the water have always required maintenance effort to remove species such as barnacles, oysters, mussels, shipworms, or algae that become strongly attached to boat hulls. These so-called "fouling" organisms cause drag that can significantly slow the vessel, alter maneuverability, and damage the hull. Copper has been a standard ingredient in hull paints for many decades, but it has only been in the last ten years that water quality sampling has shown that the paint, in some cases, can cause exceedences of water quality standards.

Antifouling coatings work by slow release of a toxic chemical (biocide) from the hull coating, or by presenting a hard or slippery surface that minimizes attachment by organisms. Some antifouling paints are made to slowly release particles over time (ablative coating), continually exposing fresh biocides to fouling organisms.

Copper-based antifouling hull paints are currently the most commonly used antifouling coating. Copper discourages fouling organisms, but also slowly leaches into the water column and can be released from the hull as particles that fall to the sediment. In some southern California waters high densities of boats with copper bottom paint and restricted circulation have exceeded water quality standards and been included on the state's list of impaired waters[1].

Since no antifouling paints are completely effective, in-water hull cleaning is a standard maintenance practice for boats that are kept in the water. In the case of soft or ablative copper paints, this maintenance also releases some paint to the water column. Ideally this should be paint that already has release copper at a slow rate that does not cause exceedences of water quality standards. If hull cleaning is too vigorous, or if the paint is not properly adhering to the

[1] Clean Water Act Section 303(d) requires state's to list waters that have ongoing failure of water quality standards and develop a schedule for restoring water quality by various methods possibly including a total maximum daily load (TMDL) limit on discharges that can create restrictions on land use.

hull, "fresh" paint with active copper or paint flakes can be released to the water. These conditions significantly increase the likelihood that the water will fail water quality standards.

Copper Free Hull Paints

New alternatives to copper based antifouling hull paints have been developed in response to water quality concerns, although not all alternative coatings have been registered by the California Department of Pesticide Regulation. Non-toxic paints will not need to be registered. The purpose, frequency of use, and storage location of a boat will determine what type of hull coating is appropriate.

Alternative hull coatings can be classified into two categories: biocide and non-biocide hull coatings. Biocide coatings are designed to slowly release toxic substances such as copper, zinc pyrithione, fluorine, chlorine and various organic biocides, including a new organic biocide called Econea. Non-biocide coatings can be further classified as soft or hard. Soft non-biocides may contain silicon or fluoropolymers that result in a slick surface making it difficult for organisms to attach. Hard non-biocides may be ceramic or epoxy and are generally used on racing boats and boats stored out of water. Non-biocide products generally last longer than copper-based and zinc oxide paints.

The effectiveness in terms of cost, application, efficiency, longevity, maintenance, and antifouling properties of alternative copper-free coatings were compared in an EPA-sponsored study conducted by the Port of San Diego and the Institute for Research and Technical Assistance (IRTA)[2]. Application and cleaning methods were also evaluated to consider the cost of alternative paint use compared to copper-based paint.

The cost to convert a copper-based paint to an alternative coating is based on multiple factors. Conversion can be expensive since alternative coatings often require stripping of the copper paint and because the cost for spray application is higher than painting with a roller (in part due to the facilities needed to ensure that sprayed paint is not released to the environment). Long term cost variability includes differences in hull cleaning frequency, and longevity of the paint before reapplication, which could be longer for non-biocide paints when compared to copper paint.

The cleaning schedule and appropriate tools for cleaning alternative paints may be different than for copper-based paints[3]. The study recommends that boats with alternative coatings could be inspected regularly and cleaned when a visual inspection determines the presence of fouling organisms, and cleaning of biocide coatings could be concentrated in areas of dense growth. A slime layer may not require immediate cleaning. Soft biocides are hand cleaned to prevent damage to the coating if extra pressure is used to remove fouling organisms.

The IRTA study concluded that for recreational boaters, non-biocide coatings have many advantages over copper-based paints over the long run. Alternative paints currently cost more to

[2] Institute for Research and Technical Assistance (IRTA), U.S. Environmental Protection Agency Project NP00946501-4; Safer Alternatives to Copper Antifouling Paints for Marine Vessels Final Report; January 2011 (Los Angeles: The Alternative, IRTA Newsletter, Winter 2011).

[3] Unified Port of San Diego and Institute for Research and Technical Assistance, US Environmental Protection Agency Project, NP00946501-4: Safer Alternatives to Copper Antifouling Paints for Marine Vessels Final Report (San Diego: Port of San Diego, January, 2011)

purchase and initially apply than copper paints; however, because the non-biocide coatings last longer and need less frequent cleaning, these may be more cost effective over time.

The California Professional Divers Association (CPDA) developed a handbook of Best Management Practices for boat hull cleaning in response to water quality concerns. Research by the University of California Cooperative Extension concluded that the BMP's used by the CPDA for alternative antifouling coatings, a schedule of frequent cleanings with the softest tool possible, is effective cleaning boat hulls in water and minimizing the release of copper to the environment[4]. The University of California Cooperative Extension Coastal Resource program conducts research on antifouling paints and provides extensive information and resources on their website.

Example BMPs*In-Water Boat Hull Maintenance*

- Do not create a visible plume of bottom paint during in-water hull cleaning.
- Consider conducting regular hull inspections, but only clean the hull when the extent of fouling growth requires cleaning.
- Soft non-biocides can be cleaned every three or four weeks, depending on the season and extent of fouling growth. Use soft cleaning tools, do not use power brushes.
- Minimize cleaning of biocide coatings to maintain the antifouling properties of the coating.
- Clean boat hulls only by hand and using cloth, plastic scrapers or soft scrubbers to remove fouling organisms. If growth cannot be removed by hand tools or requires metal scrapers the boat should be hauled out for cleaning or other methods used to capture paint and fouling organisms.
- Use the least abrasive method available
- Refrain from cleaning any paint system with wet sand paper
- Do not sand or strip hull paint underwater
- Suspend cleaning practices on new painted bottoms for at least 90 days
- Report all paint problems (chips, flaking, cracks, etc.) to supervisor or boat owner.
- Report observations of paint in the water or heavy fouling to the dock master.
- Detergents and cleaning products used for washing boats should be phosphate-free and biodegradable, and amounts used should be kept to a minimum.
- Detergents containing ammonia, sodium hypochlorite, chlorinated solvents, petroleum distillates or lye should not be used.
- In-the-water hull scraping or any process that occurs underwater to remove paint from the boat hull should be minimized to the maximum extent practicable and Best Management Practices should be implemented.

[4] University of California Cooperative Extension and California Sea Grant, To clean or Not to Clean: Managing Fouling on Boat Hulls; (Published Feb. 2011 online at http://ucanr.org/sites/coast/Nontoxic_Antifouling_Strategies/)

- Hull maintenance areas should be cleaned regularly to remove trash, sanding dust, paint chips and other debris.
- Painting or abrasive blasting should be performed within spray booths or plastic tarp enclosures to prevent residue from being carried into surface waters. If tarp enclosures are used, blasting should not be done on windy days.
- Boat hull maintenance areas shall be designed to contain potential sources of pollution. Hull maintenance over land allows for the collection and proper disposal of debris, residues, solvents, spills, and polluted runoff. Use tarps to prevent paint overspray, sandblasting media, and debris from boat sanding and refinishing from polluting air and water resources.
- Use vacuum sanders to remove paint from hulls and to collect debris during sanding. Vacuum sanding shall not occur over water.

Recommended Information for Boat Hull Maintenance

- ❖ The Coastal Commission has information on clean boating and marina water quality on the Boating Clean and Green Campaign website: http://www.coastal.ca.gov/ccbn/ccbndx.html.
- ❖ The California Clean Marina Toolkit was developed by CCC staff in 2004.
- ❖ An extensive bibliography of antifouling paint information can be found at: http://www.cdpr.ca.gov/docs/emon/surfwtr/caps/biblio_aquatic_studies_copper_antifouling_paints.pdf.
- ❖ A matrix for selection of alternative coatings appropriate for boat type and use and information about the study of safer alternatives to copper antifouling paints for marine vessel is provided by the Unified Port of San Diego on their website: http://www.portofsandiego.org/environment/alternative-hull-paints.html.
- ❖ A link to the Clean Marinas Program Handbook can be accessed though this website, http://www.cleanmarinascalifornia.org/