Pollution Prevention
in the Coastal Zone
NATIONAL POLLUTION PREVENTION CENTER FOR HIGHER EDUCATION

Pollution Prevention in the Marinas of Broward County, Florida

By Juan Espejo, Webb Smith, and Scott Thomas;
Division of Marine Affairs, University of Miami.

Many industries incorporate pollution prevention techniques into their operations. Through environmentally sound practices, businesses may realize more efficient processes, while decreasing waste materials and increasing profit.

Broward County's Department of Natural Resource Protection (DNRP)[1] encourages the use of "green practices" in the marina industry to aid in compliance with current regulations with the ultimate goal of reducing coastal pollution. The county initiated its Pollution Prevention Program in the latter part of 1991, one year after the enactment of the federal Pollution Prevention Act of 1990. The program consists primarily of a series of guidelines, or Best Management Practices (BMP), tailored to the activities of marinas that, when implemented, ensure that participants comply with county regulations.[2] This approach may be instructive for coastal management agencies nationwide, particularly those concerned with furthering pollution prevention and control.

This county is located in southeastern Florida, south of Palm Beach County and north of Dade County. Broward's jurisdiction encompasses 1,197 square miles with 23 miles of Atlantic Ocean coastline. The resident population numbers 1.34 million, with 150,000 residing in the City of Fort Lauderdale, the county's largest municipality and seat of the county government.[3] With 300 miles of navigable waterways, Broward County is known as the "Venice of America."[4]

Broward County's economic prosperity depends partly upon the success of the marina industry. From 1991 to 1994, yearly recreational boat registrations averaged 40,521 in Broward County and represented 5.9 percent of Florida's total number.[5] In 1993, marine services accounted for 16,610 jobs, over $245 million in earnings, and a total direct and indirect revenue of over $789 million.[6] Currently, 46 permitted marinas operate there.[7]

Numerous problems associated with the use and maintenance of marine craft have increased with the growth of the marina industry. Because boat repair and maintenance facilities are typically located on the waterfront, many types of waste generated by their activities may pollute neighboring waters.

The DNRP Environmental Monitoring Division monitors air, surface water, and groundwater at several sites around the county. In 1991, DNRP[8] initiated an extensive analytical study to identify the nature and magnitude of water quality problems in the New River system, located in central Broward County, which the majority of permitted marinas in Broward County border.[9] Preliminary monitoring data indicated elevated sediment concentrations of metals commonly associated with marina activities, such as copper, zinc, and tin. Within 18 months, DNRP analyzed 3,000 water and sediment samples for 35 parameters, and in 1993, published the findings in the "New River Study: Final Report." The study confirmed that boatyard activities adversely impacted sediments and benthic biota. More importantly, the report established baseline data necessary for the ongoing evaluation of the New River system's water quality.

In the 1980s, Broward County adopted the Broward County Natural Resource Protection Code, which protects air, water, soil, and other natural resources of the county.[10] These regulations affected all industries in the county, not only the marina industry. The agency responsible for administration and enforcement of the code at that time was the Broward County Environmental Quality Control Board. The Board initially focused on licensed industries, only sporadically enforcing the regulations.[11] When the Board enforced the code, it engaged a "command and control" approach commonly employed by regulators throughout the country, which included fines for violations. Seldom did it allow violators a grace period.[12]

Animosity arose in the marina industry toward the Board's code enforcement program because of the ambiguity of the regulations.[13] While several marina owners/operators failed to realize that they did not comply with the new regulations, others were aware, but lacked the information and technology necessary to reach compliance. As a result, they were forced to rely on their own resources and developmental research.[14] In several cases, however, the Board rejected new ideas and methods and refused to guarantee their acceptance.[15]

The inability of enforcement officials to suggest economical methods further compounded resentment by the marina operators. In some instances, the Board first suggested a new method to attain compliance (which boatyards implemented usually at a great expense) and then determined that the new method was unacceptable.[16] For example, according to a representative of the marina industry, one operation installed a $60,000 pressure washer system, and later the Board required the company to develop and install an entirely different system. Overall, the Board maintained a relatively lax attitude to the compliance inquiries of marinas, frequently advising them the compliance problems did not fall under its authority.[17] One representative of the Marine Industries Association of South Florida (MIASF), a recreational marine trade organization, explained the marine industry's position as one of involuntary non-compliance.[18]

A New Approach

According to DNRP, until 1991, non-compliance with the existing regulations was pervasive in the marina industry.[19] At this time, the Department of Natural Resource Protection (DNRP), the new county environmental regulatory agency formed in 1991 to replace the Board, adjusted both its focus on reducing pollution and revised its attitude towards enforcement of legislation related to the marina industry. DNRP wished that the marina industry would achieve complete compliance with the Code. Having seen the unproductive effects of the approaches employed by her predecessors, new DNRP Director Mira Barer instituted a new policy that focused on pollution prevention and concentrated on cooperation and non-confrontation.[20] To initiate a new type of relationship between the two parties, DNRP extended an invitation to the MIASF to become a liaison for the marina industry.

Because many of its members were also marinas targeted for compliance by DNRP, the organization's inclusion seemed to be a wise choice. Following MIASF's acceptance, DNRP invited marina operators and owners to participate in the construction of a series of guidelines tailored to the marina industry that would assist all marine owners and operators to attain compliance. At these fora, DNRP attempted to treat the boatyard owners as equal participants, and both parties brainstormed to formulate guidelines.

Not only did the regulators listen to the industry, but they also incorporated industry's ideas into the end product.[21] As negotiations progressed, DNRP granted a grace period for those marinas that had been experimenting with new technologies.[22] In general, most marina operators felt less of a regulatory sting because DNRP included them in the process of developing the guidelines.[23] As a result of this year-long process, the Best Management Practices (BMPs) emerged as a new vehicle for regulation of marinas.

Best Management Practices for Marine Facilities

DNRP officials stated that any company that followed the *Pollution Prevention and Best Management Practices for Marine Facilities* would be in compliance with present regulations.[24] The BMP guidelines incorporate enforceable county and state regulations. The agency designed the guidelines to

> streamline the environmental permitting or licensing process for the industry and to consolidate local environmental regulations into an understandable and workable document.[25]

Primary objectives of the BMPs are

> to develop a pollution prevention and best management practice for marine facilities operating in Broward County which facilitates compliance with applicable environmental regulations, minimizes wastes, and fosters a pollution prevention attitude within [the] industry.[26]

The BMP guidelines apply to all recreational boat docking facilities with 10 or more slips, all boat storage facilities with 10 or more storage spaces, and all commercial boat docking facilities.[27]

One major focus of the BMPs is the discharge of wastewaters and garbage from ships. For example,

BMP 001 obligates marine facility owners to advise tenants about the illegality of discharging untreated sewage into county waters, as well as the location of the nearest public sewage pumpout facility. According to BMP 003, marine facilities that have live-aboard vessels must have an operating sewage pumpout facility and maintain an agreement with a mobile waste hauler. BMP 016 establishes that facilities must provide leak-proof containers for solid waste and garbage disposal.

The BMPs refer to other vessel maintenance activities that may be pollution sources, such as spray-painting, bottom paint removal, high-pressure washing, steam-cleaning, sandblasting, engine parts washing, and storage of materials. Many of the wastes generated from these activities are considered hazardous due to the toxicity of the utilized materials. Volatile organic compounds (VOCs), such as toluene, represent a significant source of air pollution emitted by marinas during painting processes.[28] Paint stripping activities, such as high-pressure washing and sandblasting, can introduce metal-based paint chips into the surrounding waters, where they accumulate in the bottom sediment and assimilate in the food chain.[29] According to BMP 013, spray painting operations, for example, should involve good work practices which prevent solvent evaporation. Other guidelines recommend use of solvents with low VOC content. Pressure cleaning must be restricted to an area with an impermeable surface and a retaining wall that allows wastewater to be collected. This wastewater may only be discharged by sanitary sewer if it meets applicable water quality standards (BMP 010). Engines and parts must be stored on a covered, impervious surface so that oil and grease do not leak into the ground (BMP 014).

Other BMPs touch petroleum and fuel storage, handling, fueling operations, and potential spills. New and waste oils, kerosene, engine coolants, and paints must be stored on impermeable surfaces to prevent rain from entering the containers and avoid the discharge of the liquids to the ground (BMP 004). Spills greater than 10 gallons must be reported to authorities. Marine facilities must stock petroleum absorbent materials and have a written Spill Prevention and Contingency Plan (BMP 004).

The facilty owner is responsible for informing tenants by sign about the BMP requirements. According to BMP 020, marine tenants should realize that they:

- must not discharge raw sewage or oil-contaminated bilge water to county waters
- must dispose of all hazardous chemicals in marked containers
- must report all spills of hazardous materials to the facility operator
- may wash only with a minimum quantity of biodegradable soaps
- must dispose of removed paint chips and sandy debris in appropriate barrels

Marina P2 Examples

The National Pollution Prevention Act of 1990 defines pollution prevention as activities that lead to source reduction, including activities that increase efficiency or protect natural resources via conservation. The Act also establishes a pollution prevention hierarchy, with prevention and source reduction being most preferable, followed, respectively, by recycling and re-use, treatment, and disposal.[30] The practices employed by Broward marina owners and operators and suggested by the BMP provide examples of pollution prevention techniques in maintenance and operations.

Hull Cleaning. Harbour Towne Marina has installed a power-wash water filtration system and wash-down pad on its premises at a cost of $46,415.[32] The pad is located 100 feet inland, to avoid contamination of the marine environment, and has a stormwater drain tie-in. When a boat is cleaned at this pad, all wastewater and debris are washed into the drain and filters. A large mesh covering the drain traps all large pieces of marine growth, and the wastewater enters the filter system where it is treated with three chemicals. Then, it is drained into the sewer drain as graywater. Rain water that collects in the pad is diverted via a drain bypass system into an adjacent mangrove swamp.

Summerfield Boat Works, Inc., uses a closed-loop water-recycling system which, unlike the Harbour Towne Marina system, does not discharge wastewater.[33] Instead, this $30,000 system contains an ultraviolet light ozone generator that oxidizes all dissolved pollutants that accumulate via boat cleaning. The water, once cycled through the generator, can be safely reused. The marina conserves 24,000 gallons of water per year from this activity[34], which benefits both the marina in its operating costs and the environment.

Painting Operations. For bottom-paint removal, Associated Marine Technologies (AMT) uses an innovative technique to prevent pollution in its sandblasting operations. Rather than using the typical sand particles as a blasting agent, AMT utilizes a plastic media system, which discharges small plastic pellets. A vacuum system collects the paint and reusable plastic particles; subsequently, a hopper separates the two products. The procedure produces only one or two pounds of dry paint waste for a 50-foot vessel.[35] This method drastically reduces materials and waste and is a good example of prevention and source reduction.

Many marinas promote pollution prevention by replacing traditional paints with those that are water-based or low in volatile organic compounds (VOCs).[36] Water-based paint systems allow for easier cleanup and reduce toxic air emissions.[37] Painting techniques may also reduce pollution. The High Volume Low Pressure (HVLP) paint application technique allows the user greater control over the area to be sprayed and simultaneously prevents excessive overspray.[38] A combination of low-VOC paint and HVLP spraying technique greatly reduces the pollution generated during painting operations. The AMT marina uses such a system and asserts that it reduces paint costs while protecting the environment from overspray.[39]

Housekeeping. This is perhaps the best method employed by marina operators to prevent pollution discharge into the environment. By constantly maintaining a tidy work environment, operators spot and prevent potential problems before they occur. Through the proper use of tools and materials, operators expend less time and resources for cleanup. The absence of trash and unattended materials reduces the possibility that these materials will enter the environment. A clean shop and workplace portray a professionally managed operation that may impress potential clients.[40] For example, the Harbour Towne Marina in Broward County maintains a greenbelt of grass on the perimeter of the facility to act as a runoff filter and to improve the appearance of the marina.[41] It, like many other clean marinas, has recycling bins, fish cleaning stations, and other such facilities on the premises that both protect the environment and attract customers.

Incentives for Implementing Pollution Prevention Programs

Many businesses in the marina industry employ pollution prevention techniques solely to achieve compliance. However, other incentives exist. "Green" techniques can raise a marina's image, improving customer relations and increasing the client base. And the economic benefits of pollution prevention range from lower raw material and waste disposal costs to the avoidance of fines and costly cleanup measures later; pollution prevention also makes it easier for marinas to comply with future regulations.

Enhanced Public Image. DNRP intends to launch a pilot project that will explain the benefits of "clean" marinas and advertise "them to the public.[42] To earn the "clean" designation, marina owners and operators must participate in a mentor program, through which they educate their peers on pollution prevention practices and technologies. At the federal level, the U.S. EPA recently recognized 25 marinas and boatyards as "nationally outstanding clean marinas."[43]

Economic Benefits. In Neil Ross' nationwide study of clean marinas, he found that all but one stated that higher occupancy rates more than offset the sometimes higher cost of pollution prevention techniques.[44] Environmental improvements can also have direct economic benefits for marinas.

The Hall of Fame Marina spent $16,200 on a system that pumps out yachts in their own slips. The system's annual operating costs of $3,788 are more than offset by the estimated $300,000 the marina grosses each year in transient slip income.[46] The Summerfield Boat Works saved more than $86,000 in 1995 because of its closed water-recycling system.[47] Thanks to Summerfield's pollution prevention measures, MIASF labeled it a "model operation."[45] And AMT's $24,229 investment in the recycled plastic media sandblasting system was so cost-effective that it paid for itself within the first year.[48]

Although the implementation of pollution prevention programs and techniques can be costly, marina operators defer a majority of the cost to the customers with either a flat rate or a small (1–2.5) percentage of the total bill.[49] These surcharges are used for a variety of purposes; frequently, they encourage the development of other pollution prevention techniques.[52] For instance, AMT assesses a one-percent "environmental surcharge" on all repair invoices over $500; these funds

are used for environmental enhancements, training, and equipment.[50] Summerfield charges an "environmental cost obligation" (based on boat length) for repair work.[51] According to Tom Correll, Summerfield's operations manager, these funds help offset the costs of new compliance and prevention technologies. He noted that marinas inform clients of the surcharge and its intended purpose before work commences, and in almost every instance, clients seem willing to pay.[53]

Conclusions

Both the marina industry and DNRP agreed that the marina pollution prevention program creates aesthetic, economic, and recreational benefits for Broward County. However, marina operators' actions did not begin to parallel their environmental concerns until 1991, when DNRP began the marina P2 program. The initiation of a cooperative relationship between marinas and regulators, as well as the advent of the BMPs, further aided compliance efforts in the marina industry and resulted in a decrease of pollutants entering the waterways. According to DNRP evaluations, the majority of permitted marinas in Broward County now comply with current regulations.[54]

The development of the BMPs was a fresh approach to the relationship between the agency and the industry, with benefits for all involved. The marina owners and operators have had the opportunity to voice their concerns and viewpoints. The respect and equal standing that DNRP gave the industry during negotiations was perhaps the cornerstone that enabled development of the BMPs and fostered a continuing cooperative relationship between the parties.[55]

Despite the many successes of the BMPs, they do not always promote the highest levels of pollution prevention associated with the EPA hierarchy. The BMPs present strategies to prevent waste from entering the environment, but they could further require the modification of processes in marina operations to promote source reduction. Despite the BMPs' limitations, however, they do seem to have reduced pollution created by Broward County marinas.

End Notes

[1]DNRP is a county agency that "protects, restores, and enhances Broward County's natural resources." It administers a variety of resource management programs, such as licensing, environmental response, compliance, and pollution prevention. Its educational programs focus on protecting groundwater, natural habitats, and air quality. DNRP also controls the use and disposal of hazardous materials and responds to reports of pollution incidents from the general public. Those facilities that store, generate, or dispose of hazardous materials or utilize storage tanks must receive licenses from the Pollution Prevention Division of DNRP. Non-regulatory staff develop best management and pollution prevention practices for industries. Further, the division's emergency response team manages urgent pollution incidents. Another section ensures compliance and evaluates and monitors remediation programs.

[2]Broward County Department of Natural Resource Protection, *Pollution Prevention and Best Management Practices for Marine Facilities* (Fort Lauderdale: Broward County Board of County Commissioners, 1996), ii.

[3]A.C. Price, *1995 Florida Statistical Abstract,* 29th ed. (GainesvilleL: Florida University Press, 1995), 50.

[4]Marine Industries Association of South Florida, *Greater Fort Lauderdale Marine Guide* (Fort Lauderdale: MIASF, 1995), 3.

[5]Earnst and Young, LLP., *Economic Impact of the Recreational Marine Industry, Broward County, Florida* (Broward Economic Development Council, Inc., 1995), II-4.

[6]*Ibid*.

[7]Kay Gervasi, Pollution Prevention Manager, Broward County Department of Natural Resource Protection, Pollution Prevention and Remediation Programs Division, interview by authors, Fort Lauderdale, 9 February 1996.

[8]DNRP was officially created in 1993, when it was upgraded from the Office of Natural Resource Protection (ONRP). The agency will be referred to as DNRP throughout the paper to avoid any confusion. (Gervasi, interview.)

[9]Broward County Department of Natural Resource Protection, *New River Study: Final Report* (Fort Lauderdale: Technical Report Series TR 93-06, 1993).

[10]Broward County Code (Chapter 27), §§27-1 to 27-433.

[11]Gervasi.

[12]Frank Herhold, Executive Director, Marine Industries Association of South Florida, Inc., interview by authors, Fort Lauderdale, 15 March 1996.

[13]*Ibid.*

14. Thomas Correll, Manager, Summerfield Boat Works, Inc., interview by authors, Fort Lauderdale, 21 March 1996.

[15]Ted James, General Manager, Associated Marine Technologies, Inc., interview by authors, Fort Lauderdale, 21 February, 1996.

[16]*Ibid.*

[17]Correll.

[18]Herhold.

[19]Gervasi.

[20]*Ibid.*

[21]Herhold.

[22]Gervasi.

[23]Herhold.

[24]Gervasi.

[25]*Pollution Prevention and Best Management Practices for Marine Facilities*, i.

[26]*Ibid.*

[27]*Ibid.*, ii.

[28]U.S. Department of the Interior, Office of Environmental Affairs, *Pollution Prevention Handbook, Marinas and Boatyards,* No. 18 in a Series of Fact Sheets (Washington: 1993).

[29]*New River Study*.

[30]U.S. Code, vol. 42, §13101(b).

[31]Neil Ross Consultants, *Clean Marinas —Clear Value: Environmental and Business Success Stories* (Washington: EPA, 1996), 69.

[32]*Ibid.*, 70.

[33]*Ibid.*, 92.

[34]*Ibid.*

[35]James.

[36]*Ibid.*

[37]U.S. Department of the Interior.

[38]*Ibid.*

[39]Ross Consultants, 23.

[40]James.

[41]Ross Consultants, 71.

[42]Gervasi.

[43]Ross Consultants, 9.

[44]*Ibid.*, 8.

[45]*Ibid.*, 94.

[46]*Ibid.*, 62–63.

[47]*Ibid.*, 92.

[48]*Ibid.*, 22.

[49]D. S. Liebl, D. S. Natchez, and N. W. Ross, *Reducing Waste and Preventing Pollution in Marinas and Boatyards: A New University of Wisconsin - Madison Videoconference* (University of Wisconsin - Madison, College of Engineering, 1996), 2.

[50]James.

[51]Correll; Ross Consultants, 93.

[52]*New River Study.*

[53]Correll.

[54]Gervasi.

[55]Herhold.

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U.S. Code, vol. 42, §13101(b).

Discussion Questions

1. DNRP enforces BMPs only on facilities with 10 or more slips. They do not pertain to small sites or to small mobile operations that travel from job to job.

   a. Why are the BMPs only binding for marinas with more than 10 slips? What are the advantages and disadvantages of this policy? Should they be implemented for smaller marinas and backyard operations?

   b. Some of the current operators, as well as DNRP, have expressed concern about backyard operations. What is their real environmental effect?

2. Cleaning hulls with SCUBA gear appears to have a great negative environmental effect, because all discharges enter the water directly. Do any regulations concerning this activity? Should it be included in the BMP as a means of pollution prevention?

3. Although some organizations provide updated pollution prevention techniques to interested parties, not all members of the marina industry are aware of these resources. As regulations change and as technology evolves, the marina industry needs an entity to deliver this message to them.

   a. Who is best suited to bring pollution prevention ideas to the marina industry, a trade organization (such as MIASF) or the county?

   b. Should the costs that an organization like MIASF expends to provide such a service be paid for with an increase of membership dues? Why or why not? How would such an approach parallel the environmental surcharge imposed by marinas?

4. Despite the advances in marina compliance, some owner/operators believe DNRP enforcement officials may not have the expertise in marina operations to detect noncompliance and suspect many marinas are deceiving DNRP. Resentment is mounting between marina owners actively complying with the letter and intent of the BMP and those operators that are not complying or pretending to comply.

   a. Are those marinas that follow the "intent" of the BMP and invest in greater pollution prevention technologies put at a competitive disadvantage with those marinas that do not?

   b. What justifications do marina managers have when deciding whether or not to follow the "intent" of the BMP?

5. Tom Correll of Summerfield Yachts has proposed a method to help others regain compliance. A small group of peer-elected members of the industry would initiate a partnership with DNRP, through an organization such as MIASF, and then locate and visit marinas that are either not reaching compliance or hiding their noncompliance. The group would then assist the marina by sharing pollution prevention techniques in use at their own facilities.

   a. How might peer review stimulate compliance and further pollution prevention in the marina industry?

   b. What are the advantages/disadvantages of a peer group, not a regulatory agency, helping others attain compliance?

6. The BMP and their development are an uncommon approach used by Broward County regulatory agencies.

   a. How might other counties and regulatory agencies incorporate these ideas into their regulatory scheme?

   b. What other aspects of industry may benefit from this type of approach?

7. Do the BMPs promote pollution prevention, do they simply assist compliance within the industry, or do they do both?

8. How do Broward County BMPs rank on the pollution prevention hierarchy?

National Pollution Prevention Center for Higher Education
430 East University Ave., Ann Arbor, MI 48109-1115
734-764-1412 • fax: 734-647-5841 • nppc@umich.edu

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In addition to developing educational materials and conducting research, the NPPC also offers an internship program, professional education and training, and conferences.

The NPPC provides educational materials **free of charge** on the World Wide Web: see **http://www.umich.edu/~nppcpub/** Please contact us if you have comments about our online resources or suggestions for publicizing our educational materials through the Internet.