

Integrated Pest Management

Cornell Cooperative Extension
Suffolk County

ccesuffolk.org



Anti-fouling Paints and Boat Bottom Maintenance

5.2 Best Management Practices for Hazardous Waste Minimization Strategies

Waste Minimization Opportunity Assessment (WMOA) is essentially a waste minimization audit.

This will help to identify ways to reduce or eliminate waste and by extension reduce or eliminate hazardous waste. This can be done in 4 Steps:

- Organization and Planning
- Assessment
- Feasibility Analysis
- Implementation

Begin by reviewing Marina waste streams.

- Select specific areas of assessment.
- Usually boat bottom maintenance and painting.

After pinpointing WMOA focus, develop and screen options to potentially minimize waste in chosen area.

Then evaluate economic and technical feasibility of selected options, settling finally on those that qualify for implementation.

Elements of the Organization and Planning Phase:

- Obtain commitment for WMOA.
- Set your WMOA goals, pick certain individuals to focus on these goals = assessment team

Elements of Assessment Phase:

- Collect process and facility site data.
- Prioritize and select assessment targets.
- Review data and inspect site.
- Generate options.
- Screen and select options for feasibility.

How to collect process and facility data:

- First step – Identify and characterize waste streams of chosen area of assessment. For boat bottom maintenance and painting, information on waste streams may be available through:
 - Previous hazardous waste manifests.
 - SPDES reports.
 - Routine sampling programs, like TCLP.
- Prepare diagrams to identify quantity, types, rates of waste generating processes within the process and facility data gathered above.

Prioritize these waste generating processes and evaluate for:

- Quantity of each kind of waste.

- Hazardous principles of each kind of waste.
- Regulations associated with each kind of waste.
- Employee safety issues that may be associated with each kind of waste.
- Economics of dealing with each kind of waste.

Review your findings, then select target within your prioritized waste stream.

- Once you have made your final selections, identify who has the knowledge of or direct responsibility for your selections (for instance not just the person doing the painting, but the individual responsible for sweeping up and disposing of dust and chips or debris from hull stripping).
- Now review, with the additional individuals you have selected, process data in advance of an inspection.
- The inspection should follow the target process from the point where raw materials enter the facility to points where products and wastes exit.
 - Identify suspected sources of waste, including:
 - Maintenance tasks on boats.
 - Areas for storage of raw material, finished products.
 - Areas with work in progress.
- Inspection will hopefully point directly to some of the conclusions already formed about waste minimization opportunities at your facility...but full confirmation of these conclusions may require additional data collection, analyses and site visits.

The next step in WMOA is to generate waste minimization options for further consideration without ruling out any previously generated options.

- Use information from site inspections and reports, gathering ideas from outside sources, or stakeholders, e.g. vendors, external agencies, for waste minimization options.
- Don't forget about using source reduction and recycling:
 - Source reduction: good operating practices.
 - Technology changes.
 - Input material changes.
 - Recycling: includes use and reuse of waste stream like:
 - Solvent reclamation.
 - Reclamation of wastewater by filtration and closed loop system.

Next step in WMOA is to screen and select options for feasibility study:

- Select most promising options for full feasibility study from a technology and economic standpoint.
- Then eliminate any options that do not work because they are marginal, impractical, inferior.

Elements of Feasibility Analysis Phase

- For technology: processes and equipment changes need to be assessed for their overall effects on:
 - Waste quantity.
 - Product quality.
- Economic evaluation carried out by looking at standards such as:
 - Payback period.
 - Return on investment.
 - Net present value.
 - Can break down capital costs.
 - Also consider changes in revenue and savings.

Implementation Phase

People involved in WMOA continue process of tracking waste and identifying opportunities for waste minimization and periodic reassessment.

Hazardous Waste Considerations for Hull Maintenance

Painting is the most common operation in marine maintenance and repair yards.

Three painting-related activities that generate hazardous waste are:

- Hull surface preparation
 - Surface preparation frequently means removal of fouling organisms plus existing paint.
 - Wastes Produced:
 - Chemical paint strippers.
 - Sanding dust and chips.
 - Blast media
 - Abrasive blasting with garnet, sand, flint or steel shot; Not effective on Aluminum, Fiberglass.
 - Chemical stripping: often very toxic chemicals involved leading to hazardous waste.
- Painting
 - Antifouling paints
 - Other boat bottom paints.
 - Topside paints (not as toxic as antifouling boat bottom paints).
 - Paint thinners and solvents.
 - Repair compounds: resins, curing and mold release agents, fiberglass and reinforcement.
 - Tarps, tools, empty containers, personal protective equipment like gloves.
- Equipment cleaning generates:

- Solvents
- Thinners
- Acids

NOTE: SURFACE PREPARATION AND EQUIPMENT CLEANING ARE MAJOR SOURCES OF PAINT RELATED HAZARDOUS WASTE.

What kind of hazardous waste is generated from hull preparation, painting and equipment cleaning?

- Toxic biocide residues:
 - Paint chips containing antifoulants are hazardous waste but may be diluted by blasting medium and the resulting mixed waste may be non-hazardous but MUST test to be sure before managing it as non-hazardous waste.
- Waste from non-blasting mechanical stripping (thermal or scraping) is going to be primarily paint residues:
 - Therefore, if the paint was antifouling, this equals hazardous waste.
- Most waste from chemical paint stripping is hazardous waste because most strippers themselves are hazardous waste and if used to strip antifouling paints are also hazardous waste.
 - High VOC potential.

What kind of hazardous waste does equipment cleaning generate?

- Equipment cleaning generates waste solvents, thinners, and acids.
 - Paint spray guns are cleaned with solvents or thinners so potential for hazardous waste.
 - Brushes: generally cleaned with solvents, thinners.
 - Other equipment (putty knives, scrapers): generally cleaned with solvents, thinners.
 - Rinsate is often considered hazardous waste.

NOTE: Evaporation of solvent and associated VOCs is associated with solvents applied with rags which can be both hazardous waste and highly combustible.

- Acids: hazardous residues may be generated during application of acids by rag or brush.
- Wastewater contaminated with acids is generated by washing off acid etched hulls.
- Reinforced and composite plastics: hazardous waste from spent cleaning solvents.
 - Gelcoat and resin oversprays.
 - Styrene emissions.
 - Scrap material.

Potential Sources and Their Hazardous Waste:

- All operations involved with boat bottom maintenance are likely to have leftover materials or residues in empty containers.
- Air emissions from storage areas or open processing operations or equipment: Volatile organic compounds (VOC) emissions.

- Grit blasting and chemical stripping: Waste water containing blasting media and paint sludge, heavy metals, stripping chemicals, VOC emissions.
- Spray painting: waste paint, thinners, degreasers, solvents, resins, gelcoat, VOC emissions.
- Equipment cleaning area: toxic debris and waste water, paints, solvents, oils, degreasers.

Waste Minimization Options

Major waste streams source minimization:

- Material Substitution.
- Process or Equipment Modification.
- Better operating practices: recycling, ordering only what you will use.

Chemical waste stream minimization of stripping agents and paint sludges.

- Minimize generation of chemical stripping wastes.
 - Waste segregation: cost efficient reuse and recycling but be careful not to cross contaminate strippers if you are saving them for reuse or recycling!!!
 - Use of less toxic stripping agents: easier to treat on site, may not even qualify as hazardous waste. Substitute instead:
 - Dibasic esters.
 - Semiaqueous terpene products.
 - Detergent based products.
 - C9-12 based hydrocarbon strippers.
 - Store and reuse stripping agents: solvent strippers can be reused several times but need appropriate collection and storage systems if reusing.
 - Recycle spent strippers: treat to remove contaminants.
 - Filter to separate paint sludge from stripper, then reuse stripper (may need to add make up chemicals)
 - ♦ Sludge is then treated as hazardous waste, but a smaller amount, so less money to dispose.
 - ♦ Tip: if you are dipping parts in solvent, let them drain a little longer to save product.

Abrasive Blast Wastes

- Most commonly used blast media is sand or grit with a high volume of water.
- This is a hazardous waste because of antifoulant paint chips; blast wastewater is generally the GREATEST waste stream from many repair yards.
- Waste minimization solutions involve using alternative blasting media and techniques and include:
 - Plastic media blasting: plastic is recyclable but does not work well on epoxy or urethane paints; can use on fiberglass which cannot be chemically stripped.

- Water jet stripping: separate paint chips from water, then treat the water; not as efficient as blasting and more money but not as much hazardous waste.
- Thermal stripping: not practical.
- Dry ice pellets: not practical.
- Laser paint stripping: not practical.
- Cryogenic stripping: not practical.
- Segregate and recycle blast media: in most cases contaminated grit can be used several times.

Paint and solvent waste minimization potential solutions include:

- Minimize overspray.
- This is a major component of runoff into adjoining surface waters, especially if the operation is near the water's edge or in uncontained areas.
- IF YOU ARE SPRAYING YOU MUST USE A TARP OR PLASTIC SHEETING AND SHOULD BE IN SOME KIND OF SPRAY BOOTH.
- Tighter inventory control such as buying only quantity needed, have only a single person order for the entire facility.
- Buy a single type if possible so less chance of cross contamination.
- Prioritize tasks so that those that require less solvent or lesser strength can be done last with reused product.
- Substitute water-based products for paint and solvents.

NOTE: Solvent based paints are more durable, however, dry quickly and are less corrosive to metal. They are more toxic than water-based products.

Tip for Solvent Recycling: There are companies that will take your used solvent, clean it up, and sell it back to you again, or just sell it to a recycler.

Waste Segregation

- Placing different wastes into different containers is critical to success of reduction and recycling of hazardous waste like solvents.
- Much easier to reuse and recycle if segregated and it will also drastically reduce contamination.
- Having a common liquid waste drum rather than a segregated one can be dangerous and makes everything not reusable.
- Make sure to have multiple signs posted and clearly readable as to what materials go where.
- Waste segregation also decreases overall quantity of hazardous waste produced (for example, a single source of mixed hazardous and non-hazardous mixed liquid waste means you have to treat, and pay, for the whole thing as hazardous waste.

Storage, Solvents and Hazardous Materials Best Management Practices:

Store hazardous waste containers on pallets to prevent corrosion and possible leaks:

- Inspect weekly

Document hazardous waste training for each employee's file as it happens.

If hazardous waste is sent offsite for storage or disposal, a "MANIFEST" must be prepared to accompany the waste from beginning to end. The forms for New York State Department of Environmental Conservation (NYSDEC) can be found at the following links:

<https://www.dec.ny.gov/chemical/60805.html>

<https://www.dec.ny.gov/chemical/8793.html>

It is the generator of the waste's responsibility to ensure that the driver and vehicle are certified to handle hazardous waste.

The transporter must sign the manifest and the facility receiving the waste must also sign the manifest, with a final copy returned to the generator once the waste is properly:

- Treated.
- Stored.
- Disposed of .

NOTE: NEVER dispose of any hazardous material by dumping it into or on:

- Sink.
- Floor Drain.
- Storm Drain.
- The Ground.

Place signs in the languages most likely to be spoken at your marina on regular trash dumpsters about what CANNOT be dumped, including:

- Boat Bottom Paints
- Solvents or Thinners
- Varnish

Make hazardous waste containers a different color so they look different than regular trash containers to minimize cross contamination.

Best Management Practices for Minimizing Use of Hazardous Materials:

- Avoid use of products that are:
 - Corrosive.
 - Reactive.
 - Toxic.
 - Ignitable.
- Adopt inventory control plans to minimize hazard materials:
 - Do not purchase a quantity larger than you need.
 - Do not store large quantities.

- Date your hazardous materials with a black indelible marker in a location it is unlikely to be dissolved or covered by the product:
 - Use your product on a "First In, First Out" basis. Boat bottom paints have a definite shelf life.
- Dispose of excess material EVERY 6 MONTHS!

Making a hazardous waste determination:

- See if material is listed as a hazardous waste for New York State.
- Look up SDS or MSDS.
- Determine if the waste has one or more characteristics of hazardous waste:
 - Toxicity.
 - Ignitibility.
 - Corrosive.
 - Reactivity.
- Test for hazardous qualities by sending out waste to local laboratory for TCLP (Toxic Characteristic Leaching Potential) Test (see factsheet).

Best Management Practices for Storage of Chemicals and Hazardous Materials:

- Best Management Practice is to store chemicals indoors, in covered containers.
- If chemical storage needs to be outside and in the open, you must store in completely watertight containers.
- Never store the following items in dock boxes:
 - Flammable items
 - Combustible items
 - Hazardous waste items
- If you have more than a couple of small cans, store in fire safe containers that are UL listed or Factory Mutual approved.
- Containers must meet U.S. Department of Transportation standards for protection against risks to life and property inherent to transport of hazardous materials.
- Approved containers have specification markings (e.g. D.O.T. 4B24OET).
- Small quantity of solvents can be stored in the containers they were purchased in.
- Keep storage area neat so there are fewer accidental spills.
- Label all stored and containerized materials with date of purchase and date opened.
- For hazardous WASTE mark the date on the waste-holding container with the date accumulation of waste began and the date it ends accumulating. Mark this with a black indelible marker somewhere that the contents of the hazardous waste will not dissolve.
- Store containers on pallets in protected, secure locations away from:
 - Drains.
 - Water.
 - Sources of Ignition.

- Routinely inspect ONCE EACH WEEK.
- Minimize air pollution and evaporation of product by firmly capping solvents, thinners, boat paint products when not in use.
- Store rags and paper toweling soaked in solvent in tightly closed and clearly marked containers with date in black indelible marker.
- Separate hazardous chemicals by hazardous class (check labels).
- Assign control over hazardous supplies to only a few people who have had hazard training and understand the policy of “first product in is the first product out”.
- Make sure these individuals routinely check the dates of the hazardous materials to prevent them from being retained beyond their shelf life.
- The fewer people involved, the more control you will have.
- Call your local Fire Marshall for a basic fire inspection of the area where you have hazardous chemicals to make sure:
 - You meet State fire codes.
 - You meet hazardous material storage requirements.
 - Keep a Pollution Report and Action Log on a clipboard in the maintenance area or other easy access location:
 - Check this daily and update daily if something is reportable.
- Check with marina for storage requirements and options.
- Check with your town for S.T.O.P. (Stop Throwing Out Pollutants) programs.
- It is illegal to wash, scrape, paint boats on the following:
 - Tide Grid, a series of wooden or concrete beams laid on land near the high tide line that lets you bring your boat to this location of dock at certain times.
 - Or while beached in an intertidal zone.

NOTE: Most marine paints and cleaners are toxic and therefore should NOT be placed in a marina dumpster.

- Ask the marina operator about hazardous waste disposal on site.
- OR, use the S.T.O.P. (Stop Throwing Out Pollutants) program in your community (and ask specifically about boat waste).

NOTE: Marinas should put up cameras if inappropriate hazardous waste dumping in regular dumpsters is an issue.

Best Management Practices for Hazardous Products and Hazardous Waste

- Ways a product can become a hazard:
 - Interaction with other chemicals.
 - Corrosiveness.
 - Immediate toxicity.
- Long lasting environmental impact:
 - Heavy metal.
 - Cancer causing.
 - Causes other illnesses.
 - Chronic environmental issues:
 - Reduced wildlife populations
 - Fish consumption advisories
- Liquid hazardous waste, which can be hazardous in very small quantities, is an issue for ground water and surface water, particularly during:
 - Transport.
 - Disposal.
- Improper Disposal of Hazardous Waste:
 - NEVER Down the Drain.
 - NEVER Down the Storm Drain.
 - NEVER Out with the Household Waste.
 - NEVER Pour on the Ground.
- Best Management Practices:
 - Store in small quantities.
 - In original container.
 - With secondary containment around the original container.

Pollution Report and Action Log

Report Date	Staff Reporting	Problem Description	Action Taken	Action Date	Staff Responsible

EXTENSION EDUCATION CENTER
423 GRIFFING AVENUE, SUITE 100 | RIVERHEAD, NEW YORK 11901-3071 | 631-727-7850 | CCESUFFOLK.ORG

Prepared by: Tamson Yeh (2022-10)

Funding provided by the Environmental Protection Fund as administered by the New York State Department of Environmental Conservation. Any opinions, findings, and/or interpretations of data contained herein are the responsibility of the author(s) and do not necessarily represent the opinions, interpretations, or policy of Rochester Institute of Technology and its NYS Pollution Prevention Institute or the State.

Cornell Cooperative Extension is an employer and educator recognized for valuing AA/EEO, Protected Veterans, and Individuals with Disabilities and provides equal program and employment opportunities. Cornell Cooperative Extension is funded in part by Suffolk County through the office of the County Executive and the County Legislature.



New York State
Pollution Prevention Institute

Cornell Cooperative Extension
Suffolk County