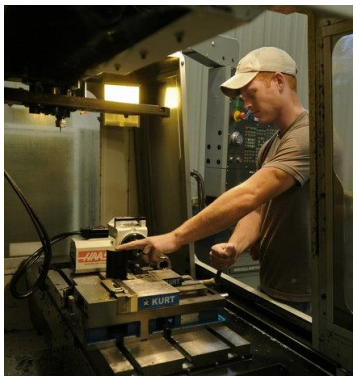
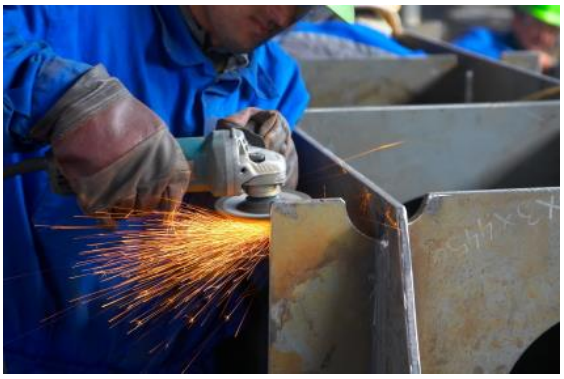
Best Management Practices to Mitigate Toxics and Implement a Greening Program for Small Manufacturing Businesses

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U.S. Environmental Protection Agency Region 2
Pollution Prevention and Climate Change Section

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Introduction

Hurricane Sandy, which cut a path 1,100 miles along the Atlantic coast, was the deadliest and most destructive hurricane of the 2012 Atlantic hurricane season and the second-costliest hurricane in United States history. One of the many unfortunate results of this storm was the release of toxic materials from small businesses that were impacted by flooding, storm surge, and high winds. Given the significant impacts this storm and other severe weather events such as Hurricanes Katrina and Irene, had on small businesses, and the likelihood of similar events occurring in the future, sound management of toxics needs to be well understood and implemented to reduce the potential for future releases of toxic materials.

This best management practices (BMPs) guide prepared by the Pollution Prevention and Climate Change (P2C2) Section of EPA Region 2, provides information on minimizing potential public health and environmental impacts posed by chemicals used in small manufacturing business facilities. This material together with energy, water and solid waste management strategies, can help your business save money, enhance your reputation in the eyes of your employees, your customers and the community. Part I of the BMPs provides recommendations focusing on good housekeeping, Part II discusses the benefits of environmentally preferable products and services, reducing energy and water consumption, and implementing a sound waste management program. Part III discusses how to sustain an environmental management program at your business.

Although the BMPs primarily focus on voluntary efforts, related regulatory information is periodically highlighted in the document by the icon pictured on the left. These BMPs are not designed to replace or overrule local, state or federal regulatory requirements applicable to business operations. You must consult with the appropriate regulatory agencies in your area to ensure compliance with all applicable laws and regulations.

Please contact the P2C2 Section at 212-637-3890, if you have questions about this document.

Part I Good Housekeeping

Good Housekeeping is a safeguard against unexpected and costly environmental problems at your business. Good housekeeping can be organized into six major categories: Procurement, Proper Storage, Handling, Spill Preparedness, Disposal and Training.

Procurement

- Start by taking a look at your purchasing practices. Establish a procurement schedule. Chart your material use and needs, and the vendors you use. Check your vendors' policies on "buy-back" or returns, material guarantees, and any other amenities they may provide.

- If possible, minimize your toxics material inventory. Many vendors will work with you on the concept of "just in time and just the right amount." This means that they will deliver your raw material more frequently in amounts that match your process needs.

- Do an assessment of alternatives to reduce toxicity; (e.g. water-based, not solvent based.) The Small Business Assistance Program may be able to help you in identifying non-toxic alternatives to some of the chemicals you may presently be using.

- EPA's Safer Choice Program (formally the Design for the Environment or DfE Program) at http://www2.epa.gov/saferchoice identifies a number of products that are cost-effective that may be environmentally preferable to some of the products you are currently using in your business.

Proper Storage

- In areas of flood risk, consider storing materials indoors or at a minimum on higher ground.

- Take a close look at the chemicals in your work area weekly or so. If you notice containers in bad condition get rid of them (using proper disposal) or transfer their contents to a new container.

- Check to see that containers have good caps that are tightly closed and that the chemicals are unable to permeate, erode, or leak.

- Ensure that you are using the proper container type (one that does not react with the toxic material).

- Materials that are incompatible should not be stored together since they may have a violent reaction if accidentally mixed.

- Make sure chemical containers are located in a safe area (i.e., that is, away from the edges of shelves, away from high traffic areas, and out of the way of swinging doors.

- Do not reuse storage containers that previously contained a different toxic material unless you are sure that there will be no chemical reaction.

- Ensure that proper ventilation is in place where toxics are being stored.

- Ensure that toxics that are reactive with others are properly sealed with no possibility of mixing.

- Put containers holding hazardous chemicals or wastes into other containers, trays, or drip pans to catch and contain any chemical that spills or leaks out.

See the references section for further information on safe storage.

Handling

- When you move a chemical container from one place to another, put small containers in a bucket or pail and place larger containers in a tub with hand grips or onto a cart with sides on it that will prevent any spill from flowing off.

- When transferring a chemical from its original container, be sure the new container will safely hold the chemical you are pouring into it: Is it made of a material that won't react with or dissolve in the chemical? Does it have a tight fitting cap? Be careful not to overfill the new container.

- Have proper labels on all containers. When transferring chemicals from the original container to new one, label the new container right away so you won't forget what it is.

- At the end of a shift, be sure your employees tightly close any chemical containers they are using and return them to their designated storage space.

- When deciding on a label for a waste container, be specific. If not, too soon you will have a mixture of wastes that will be hard to classify, unsafe to handle (because you don't know what's in it) and more costly to ship out.

When deciding on a label for a waste container, it makes a big difference whether or not it is a "hazardous waste" as defined by regulations. Hazardous wastes have particular requirements, including labeling. You should still label wastes that are not hazardous so you don't get them mixed up with hazardous wastes and because many non-hazardous wastes can still be toxic and pose hazards to your employees. If you are not sure what labels are required, consult the Small Business Assistance Program or Region 2 EPA's Division of Enforcement and Compliance Assistance.

- Material handling activities including storage, loading and unloading, transportation or conveyance, of any raw material, intermediate product, by-product, final product or waste product in the outdoor space of your facility, should be conducted in a storm-resistant shelter. These shelters include completely roofed and walled buildings or structures with only a top cover but no side coverings, provided material under the structure is not otherwise subject to any run-on and subsequent runoff of storm water.

  In general, temporary outdoor sheltering of industrial materials and activities should only occur during facility renovation or construction. Additionally, EPA recommends the following:

  - That a designated individual regularly conduct inspections of containers stored in outdoor storm shelters.
  - Any time external containers are open, deteriorated or leaking, they must immediately be closed, replaced or sheltered.
  - Containers, racks and other transport platforms (E.g., wooden pallets) used with the drums, barrels, etc., can be stored outside providing they are contaminant-free.

If you are storing chemicals in above ground storage tanks (ASTs) outside, you must satisfy the following conditions:

- They must be physically separated from and not associated with vehicle maintenance operations.
- There must be no piping, pumps or other equipment leaking contaminants that could contact storm water.

- Wherever feasible, ASTs should be surrounded by some type of physical containment (e.g., an impervious dike, berm or concrete retaining structure) to prevent runoff in the event of a structural failure or leaking transfer valve.

Additional information about material handling is cited in the references section of the BMPs.

Spill Preparedness

- To reduce the chance of spills from damaged containers, have Standard Operating Procedures in place for regular inspections of toxic materials.

- When checking for leaks and bad containers, check the labels too. If any are falling off or fading, write the label information on a fresh sticker and attach it to the container.

- If a spill occurs, know which toxic materials can be neutralized and how to do this, as well as any ways to best isolate toxic materials to reduce the chance of inadvertently mixing two or more toxic materials.

- Have supplies and Personal Protective Equipment (for example, safety goggles, gloves, etc.) for safely cleaning up small spills in each work space, in a location that is easy to get to and is well marked, and ensure employees are trained on when and how to use them. Further information on proper safety equipment can be found in the references section.

- Locate all the drains on your property, both indoors and outdoors, and determine where they go to. If your building is old, you may be surprised to find that the drain you were sure led to the sanitary sewer and your local wastewater treatment plant actually connects to the storm sewer system that drains directly to a lake or river. After you go to all this trouble, mark your drains accordingly. Consider locating drain covers and spill supplies close by drains so you can quickly close these drains off if there is a spill, if you have time and it is safe to do so.

- If you don't have a Chemical Incident Response Plan, make it a high priority to develop one. This doesn't mean your employees have to know how to clean up a spill by themselves. In fact, they should not clean up chemical spills at all, except for tiny ones, unless they have had extensive training. But, anyone in your business who works with chemicals should know how to keep themselves and their coworkers safe if there is a spill and who to call for help.

- Take some time to ask about the capabilities of your city or county emergency services. Do they have a Hazardous Materials Response Team (often called a HAZMAT team)? If so, do they have the necessary equipment and training to clean up the types of spills that could happen at your business? If you call them in, how much will it cost?

The Emergency Planning and Community Right-to-Know Act (EPCRA) identifies hazardous chemical storage reporting requirements. For any hazardous chemical used or stored in the workplace, facilities must maintain a material safety data sheet (MSDS). MSDSs, or a list of chemicals, must be submitted to their State Emergency Response Commission (SERC), Local Emergency Planning Committee (LEPC) and local fire department. Facilities must also report an annual inventory of these chemicals by March 1 of each year to their SERC, LEPC and local fire department. Further information about the EPCRA storage reporting requirements is in the references section.

Disposal

No matter how much you improve procurement, storage, handling and spill preparedness, proper disposal of toxics is critical if you are maintaining the use of *any* chemicals on site.

- Empty containers should be marked as such and properly disposed of right away, or at least staged at a labeled bin or shelf, so they don't get confused with products still in use.

- Think about the schedule that is in place for waste removal from your business – are toxic materials sitting in your facility for long periods waiting to be disposed? Track how your business is generating toxic waste and establish the schedule for waste pick-up accordingly.

- Follow appropriate protocols for disposal of each chemical (the protocol should be on the product label; if applicable, make sure to follow any local regulations, in addition to those on the product label).

- Ensure that toxics are disposed separately from everyday non-toxic waste (such as food waste or other landfill trash) so as to not put trash collectors at risk.

- Never pour toxics down drains, flush them town toilets, or dump them outside.

- When disposing of aerosols, ensure containers are completely empty to avoid explosive risk and follow the disposal method found on the aerosol container's label.

- When disposing chemicals, make sure that you are in compliance with federal and state hazardous waste regulations. For further information contact your state's small business assistance program or Region 2 EPA's Division of Enforcement and Compliance Assistance.

Training

Pollution prevention training should become part of your business culture. Everyone from top management to staff should implement practices that improve the overall operation of your facility, protect the environment and build a good neighbor image.

- Make sure you have training programs as required by regulations. Develop a list of training topics that make sense for each job, beginning with training required by regulations.

- Have material safety data sheets (MSDS) accessible for all toxics and ensure that all employees know how to read them.

- Have a protocol in place to secure toxic materials during an impending extreme weather event. This should include a designated person or persons to carry out such protocols – such as a designated Hazardous Materials Team. If you are already doing OSHA Right-to-Know (Hazard Communication Standard) training, which is about how to keep safe when using chemicals, it is a simple thing to add a short segment on how to properly handle and dispose of wastes associated with the use of that chemical. Your State Small Business Assistance Program or Small Business Environmental Ombudsman can help.

- If your business is employing non-English speaking employees, training materials and standard operating procedures should be made available in the language spoken by those employees (in addition to English).

Good housekeeping practices will help ensure that your business will be in compliance with relevant federal and state environmental regulations and have the following important benefits:

- Compliance with regulations can lower the cost of liability insurance, because insurance companies will have less concern about the future costs of a clean-up or the risk of harm to the health of your employees and community.

- Before loaning money, banks usually require buyers to pay for a professional review of previous property uses to see if the property may have been contaminated in some way. Because of this, if you ever need to change locations or use your property for collateral, it will become important to demonstrate that your activities have not caused contamination.

Keep records of your efforts and successes. Good records tell you at a glance what's going on and what needs to be done on a regular basis (like annual training or weekly inspections). They also put you in a better position to pass a regulatory inspection. Most inspectors start with a close look at your environmental records. It pays to be clear on what files you must have to be in compliance and get them organized first.

After that, you can decide what information has additional value to you. Some records are essential to protect you from legal and financial troubles down the road. Others can give you valuable data on business performance, or come in handy when you want to show your customers and neighbors that your business is "green." Be sure to go back and look at the records and documents that you are required to maintain by the particular regulations that apply to your business to make sure nothing is missing. Consult your state's Small Business Assistance Program or Small Business Environmental Ombudsman if you are not sure.

If you do get inspected (even just once) it will pay to be prepared. The inspector will usually look at records first and then ask for a tour of your operations. Environmental regulations warrant record keeping

associated with spill response, training, waste management, air management, wastewater management and storm water management. Responsible parties who fail to take notice of (or severely disregard) environmental regulations may be criminally prosecuted and may even serve jail time.

When your business is fined for environmental violations or has an accidental spill it often ends up as front page news – not the kind of publicity a business prefers. Not only can an undesirable image hurt sales in your local market, it can also hinder expansion activities you may be planning.

Part ll Saving Money through Sound Environmental Management

There are opportunities to make your business more profitable, productive and more environmentally friendly. Sound environmental management can be organized into four major categories: Green Procurement, Saving Energy, Saving Water and Reducing Waste Management Costs.

Green Procurement

EPA developed the Greener Products Portal to assist you in identifying a variety of products that you may wish to use in your small business. If you are looking to replace existing appliances, office products or supplies, electronics, cleaning products and other items, then consult the Greener Products Portal for cost-competitive goods that pose less impact to the environment at: http://www.epa.gov/greenerproducts/

Saving energy

Saving energy in your business translates into saving money. Using less electricity means burning less coal or natural gas, which reduces greenhouse gas emissions and other forms of air pollution and also conserves resources for future generations. There is free assistance available to help your business explore some of the more involved energy saving options – so why not take advantage of it? Below are some practices you can implement to lower your energy use.

- Turn off lights or office equipment at night and on weekends or take advantage of natural daylight for lighting needs.
- Disconnect unnecessary equipment completely.
- Turn up or turn back the thermostat during unoccupied times or consider buying a programmable thermostat.
- Caulk and weather-strip windows and doors.
- Install blinds or shades to keep out summer sun to lower air-conditioning costs.
- Purchase fans to keep warm air from accumulating at the ceiling during winter.
- Insulate hot water holding tanks and hot and cold pipes and improve insulation of the climate controlled portions of your facility.

- Replace light bulbs with more efficient ones. However, some of the more efficient bulbs meet the definition of hazardous waste when disposed of and they need to be managed accordingly. (For example fluorescent bulbs contain mercury which is toxic.) See EPA's website on compact fluorescent light bulbs at: http://www2.epa.gov/cfl

- Replace light bulbs with the most energy efficient technology that also has and no toxics. This is the "Light Emitting Diode" technology; known as LEDs. More information about LEDs can be found here: https://www.energystar.gov/index.cfm?c=lighting.pr_what_are

- Place your lights on motion detectors or install timers on lights and electric equipment to keep them on only when in use.

- It may be worthwhile to replace lighting fixtures instead of just the bulbs. The new fixtures can allow you to utilize a smaller bulb and get the same amount of light, or reuse the ballast portion of the light.

- Call your local utility company to see if they still have a program to evaluate your building for energy efficiency. If the service is available, the utility will provide you with specific options for making your business more energy efficient, usually for free. If your local utility company does not provide this service, check with your state's energy program to see if they do, or know who does.

- Consider participating in the ENERGY STAR program which offers useful guidance to small businesses at : http://www.energystar.gov/buildings/facility-owners-and-managers/small-biz?c=small_business.sb_index

Saving Water

Most business activities are using part of a limited supply of water that is good enough to drink! Only a tiny fraction of the planet's water is drinkable. Ninety-seven percent is sea water, which is expensive and difficult to desalinate. About two percent is caught in polar ice caps. That leaves just one percent to sustain life. Your business pays for using this resource. This may not seem like a large part of your overhead until you realize that you pay for it twice: coming to the tap and going to the sewer. Take a look at your combined water-sewer bill to get a more accurate cost of using water.

Industrial process water that normally goes to a publically owned treatment works (POTW) facility might in times of severe storms bypass the facility and go directly into the local waterway. If your business has process wastewater holding capacity on-sight, and a heavy storm is approaching, you might consider holding your process wastewater for a few days after the storm is over before discharging to the POTW.

If you want to save some money while reducing the impact of your business on your community's water supply, consider some of the water saving ideas below:

- Keep your plumbing fixtures in good working order and upgrade older fixtures.

- Test for leaks in the toilet- put food dye in the toilet tank and let it sit for an hour or two without flushing. If you see dye in the toilet bowl, you have a leak. Also, check to make sure the overflow tube is not flowing continually.

- Consider an inspection program for leaks.
- Repair dripping faucets by replacing washers.
- It may be worthwhile to replace plumbing fixtures with more water efficient options.
- Faucet aerators with flow restrictors are available to reduce water use.
- Some heating and cooling equipment models reuse or recycle water.
- Automatic shut offs on water supplies such as sinks and hose nozzles will keep them from being left on.
- High pressure/low volume cleaning nozzles on spray washers also use less water.
- Cover liquid holding areas when not in use to reduce evaporation.

(See the reference section at the end of this document for additional information on water saving and efficiency best management practices.)

Reducing Waste Management Costs

In addition to energy and water use, waste disposal can drive up your costs. Here are some tips for reducing your waste costs:

- If you hire a hazardous waste contractor, ask them to help you find ways to cut down on costs. While it might seem that it is not in your contractor's best interest to do this, the hazardous waste market has gotten so competitive that contractors are looking for ways to add value to their service and set themselves apart from the competition.
- Look for ways to reduce the amount of wastes your business creates. A simple example is to reuse corrugated boxes two or three times before you send them off for recycling. Since new boxes are expensive, savings can add up fast.
- Consider any reuse opportunities for chemicals. Another option for reuse is to provide it to someone else who may have a use for it – such as a school or other business.

Part lll Keeping Your Environmental Program Alive

Environmental efforts within your company will be more successful if employees are directly involved. Employees are a great source of knowledge on environmental issues related to their work areas and the effectiveness of current procedures. Consider setting up an Environmental Management Team and making a company environmental policy. The team should include representatives from throughout the company. For example, at a small company, a team could include supervisors from each process line as well as people responsible for human resources, sales, and plant operations.

The first task is to write a company environmental policy. The policy should reflect your commitment to the environmental program. It should be short, to the point, and well communicated throughout the company so that employees understand and remember the policy.

Ways to Keep Employees Involved

- Post the Environmental Policy at prominent locations throughout your business.
- Set up a suggestion box for environmental improvements. Recognize or give awards to employees who make suggestions that get incorporated into environmental management procedures.
- Inform employees through a company newsletter or bulletin board and provide them updates on the company's progress in fulfilling its Environmental Policy.
- Once you have a policy established, you can build on it. Whenever the environmental policy changes, enlist the Environmental Management Team to communicate those changes to your employees. Employees want to know why it is important to accomplish a particular environmental task and what part they are to play in achieving selected goals.

The next task is to communicate your environmental efforts to those outside your business. The opinions of your neighbors and the community around you can be important to the success of your business.

Ways to Keep Communities, Suppliers and Vendors Informed

- You may post a copy of your environmental policy so that it is visible to anyone who visits your business.
- If your business has a website, you may wish to post some of the environmental results that you have achieved under your environmental management program.
- Information about your company's environmental achievements can be added to the product packaging.
- You may also communicate with your suppliers and vendors that you favor materials and services that result in improved environmental performance.

Finally, while this BMP guide will help you get started, there is also a wealth of information available to you about environmental regulations, management systems, policies and pollution prevention practices beyond this guide. We encourage you to reach out to Federal, state and local government agencies, non-profit organizations and companies specializing in assessments and implementations of environmentally beneficial and cost saving practices specifically designed for your business.

Contacts for more Environmental Information

- For questions concerning pollution prevention practices, contact the Region 2 EPA Pollution Prevention and Climate Change Section: 212-637-3755 or 212-637-3764.

- For questions regarding compliance with federal environmental regulations, contact Region 2 EPA's Division of Enforcement and Compliance Assistance at 212- 637-3565.

- For questions concerning state environmental regulations contact:

    - The New Jersey Department of Environmental Protection Small Business Assistance Program at: 609-777-0518.

    - The New York State Small Business Environmental Ombudsman at: 877- 247-2329.

    - The New York State Department of Environmental Conservation – Division of Environmental Permits, Pollution Prevention Unit at: 518-408-0213.

Major References

1. **Practical Guide to *Environmental Management for Small Business***: EPA Publication 233-K-02-001, September 2002. This practical guide will help you design a management plan that addresses all of the environmental concerns of your business. The guide will also help you save money and make your business look good in the eyes of your customers and your community. Go to: http://nepis.epa.gov/Exe/ZyPDF.cgi/P100EDKE.PDF?Dockey=P100EDKE.PDF

2. **Building an Environmental Management System: H-R Industries' Experience.** Creating an Environmental Management System (EMS) might seem like an overwhelming task, especially for a small or medium-sized company, but many of the elements needed for an EMS may already be in place at your facility. Such elements as your procedures to track environmental compliance or your state-required pollution prevention plans can be used directly to give you a significant head start for developing your EMS. To learn more see "**Appendix One – *H-R Industries***."

3. **Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations**. This comprehensive guide is designed to explain Environmental Management System (EMS) concepts and to support and facilitate the development of an EMS among small and medium-sized organizations. Go to: http://www2.epa.gov/ems/environmental-management-systems-implementation-guide-small-and-medium-sized-organizations

Other References

4. Zero Waste Network developed a database that includes 537 success stories. Each case study explains of how a real facility saved money, reduced waste, and/or lowered their regulatory burden through innovative P2 practices. Go to: http://www.zerowastenetwork.org/success/index.cfm Exit

5. Lean Manufacturing is a business model and collection of methods that emphasize eliminating non-value added activities while efficiently delivering quality products on time at least cost. This EPA website contains techniques and strategies for integrating environmental considerations into Lean initiatives and methods. Go to: http://www2.epa.gov/lean/lean-manufacturing-resources

6. Here are three examples of companies that provide lean manufacturing training, implementations and case studies:
    a. Go to: http://www.tpslean.com/ Exit
    b. Go to: http://continental-design.com/lean-manufacturing/success-stories.html Exit
    c. Go to: http://www.emsstrategies.com/ Exit

7. Green Chemistry is the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances. Go to: http://www2.epa.gov/green-chemistry

8. Green Engineering is the design, commercialization and use of processes and products that are feasible and economical while reducing the generation of pollution at the source and minimizing the risk to human health and the environment. Go to: http://www2.epa.gov/green-engineering

9. Many organizations have found that implementing lean concepts and tools results in improvements in environmental performance, even when lean activities were not initiated for environmental reasons. This EPA site has examples of the types of environmental benefits that result from lean implementation. Go to: http://www2.epa.gov/lean

10. New Jersey Department of Health compiled useful Sandy Recovery Resources that include guidance on dealing with mold and asbestos. Go to: http://www.state.nj.us/health/er/hurricane_recovery_resources.shtml Exit

11. EPA's Mold homepage has on-line training courses. Go to: http://www2.epa.gov/mold

12. EPA resource: **Guidance Manual for Conditional Exclusion from Storm Water Permitting Based On "No Exposure" of Industrial Activities to Storm Water**, EPA 833-B-00-001; June 2000. Go to: http://www3.epa.gov/npdes/pubs/noxguide.pdf

13. EPA resource: **Developing your Stormwater Pollution Prevention Plan: A Guide for Industrial Operators**, EPA 833-B-09-002; February 2009. Go to: http://www3.epa.gov/npdes/pubs/industrial_swppp_guide.pdf

14. To aid in the safe storage of materials, this is a useful compatibility chart. Go to: http://www.trainex.org/osc2012/uploads/541/incompatiblematerials.pdf Exit

15. This EPA site has a good hazardous waste handbook for small businesses entitled, "**Managing Your Hazardous Waste: A Guide for Small Businesses**" in English and Spanish. Go to: http://www2.epa.gov/hwgenerators/managing-your-hazardous-waste-guide-small-businesses

16. Emergency Planning and Community Right-to-Know Act (EPCRA) Hazardous Chemical Storage Reporting Requirements. Go to: http://www2.epa.gov/epcra/epcra-sections-311-312

17. OSHA proper safety equipment for cleanup (Personal Protective Equipment.) Go to: https://www.osha.gov/SLTC/personalprotectiveequipment/ Exit

18. EPA Enforcement. Go to: http://www2.epa.gov/enforcement

19. U.S. Small Business Administration – Industry Laws & Regulations. Go to: https://www.sba.gov/content/environmental-regulations Exit

20. EPA's emergency management activities and regulations help protect the environment and human health from releases or discharges of oil, chemicals and other hazardous substances. This EPA site has information on chemical accident prevention, chemical reporting, oil spills and hazardous substance releases. Go to: http://www2.epa.gov/regulatory-information-topic/emergencies

21. EPA's role in responding to oil spills; chemical, biological, radiological releases. This EPA site includes response tools, partners and contacts. Go to: http://www2.epa.gov/emergency-response

22. This EPA site defines hazardous waste generators and the three categories: Conditionally Exempt Small Quantity Generators, Small Quantity Generators, and Large Quantity Generators. Go to: http://www2.epa.gov/hwgenerators/categories-hazardous-waste-generators

23. EPA site for water-efficiency best management practices and EPA's WaterSense program. Go to: http://www3.epa.gov/watersense/commercial/bmps.html

24. The Alliance for Water Efficiency non-profit organization has information about water efficient products and programs, and provides information and assistance on water conservation efforts. Go to: http://www.allianceforwaterefficiency.org/about/default.aspx Exit

25. The Reuse Marketplace is a free service to find, sell, trade, or give away reusable/surplus items that would otherwise end up as trash. Businesses including sole proprietorships are welcome to create accounts and post or browse listings. Go to: http://www.reusemarketplace.org/ Exit

Appendix One – *H-R Industries*

A Cooperative Project between the U.S. Environmental Protection Agency and PWB Manufacturers Nationwide

December 1997

EPA 744-F-97-010

design FOR THE ENVIRONMENT

Design for the Environment U.S. EPA

PRINTED WIRING BOARD CASE STUDY 8

PRINTED WIRING BOARD PROJECT

Building an Environmental Management System: H-R Industries' Experience

Creating an environmental management system (EMS) might seem like an overwhelming task, especially for a small or medium-sized company, but many of the elements needed for an EMS may already be in place at your facility. Such elements as your procedures to track environmental compliance or your state-required pollution prevention plans can be used directly to give you a significant head start for developing your EMS. Many printed wiring board (PWB) manufacturers are paying particular attention to EMSs, since they are the basis of ISO 14001 certification.

One company, H-R Industries, found that their existing ISO 9000 Quality Management System gave them a significant advantage in ISO 14000 certification. H-R Industries became the first PWB manufacturer in the U.S. to obtain ISO 14001 certification. The company was established in 1976 and is a wholly owned subsidiary of McDonald Technologies, Inc. With approximately 300 employees at facilities in Richardson and Bonham, Texas, the company produces a wide range of multilayer boards.

The ISO 14001 system, the international standard for environmental management systems, was closely modeled on ISO 9000, and as a result, there is significant overlap between the two standards. Many of the elements are similar, and some are nearly identical. Management systems, whether for quality or environmental protection, share common elements including developing and documenting procedures, training, recordkeeping, auditing, and corrective action.

This case study introduces the initial steps necessary for developing an EMS, and shows the similarity between the requirements for ISO 14001 and ISO 9000.

Do You Need an EMS?

As companies strive to improve their management of environmental issues and increase profits at the same time, many have found that an EMS can do more than improve their environmental performance — it can help them meet their business goals too. By providing a systematic way to review and improve operations for better environmental performance, an EMS can help a company use materials more efficiently and streamline operations.

Companies that have implemented EMSs have experienced benefits such as:

- better environmental performance
- cost savings in operations
- increased efficiency of operations
- resource conservation
- lower insurance costs
- improved public relations

Even companies not pursuing certification are using the ISO 14001 model for their EMSs because it is quickly becoming the industry standard for environmental management. By basing your EMS on the ISO framework, you can go on to apply for certification under ISO 14001, if it makes sense for your company. **Any company can reap the benefits of an EMS, whether or not the company plans to obtain ISO certification.**

First Steps in Creating an EMS

Getting management buy-in and assessing your current practices up-front will save you a lot of time when developing your EMS.

Gain management commitment. Upper management can demonstrate their commitment by playing an active, visible role in the EMS implementation process, providing funding and allocating resources, and promoting employee awareness and motivation. An EMS should be viewed as a tool to achieve continuous envi-

ronmental improvement, rather than daily "firefighting" just to keep up with regulatory requirements.

Review your current environmental programs. Once you have management commitment, the next step is to conduct and document a preliminary review of your company's current environmental programs and management systems. This process includes reviewing your existing environmental management policies, operating procedures, and training programs, as well as your methods for identifying your regulatory requirements.

Determine what's missing. Next you need to evaluate how closely existing procedures conform to the requirements of an ISO 14001 EMS. Such a "gap analysis" identifies the actions necessary to build your EMS. To do this, you'll need to compare your existing procedures to the five main stages of an ISO 14001 EMS.

1. Environmental Policy
2. Planning
3. Implementation and Operation
4. Checking and Corrective Action
5. Management Review

Repeating these five steps forms a cycle of continuous EMS improvement, with the overall goal of improving environmental performance.

Links Between ISO 14001 and ISO 9001

If your company is ISO 9000 registered, the gap analysis may reveal that many of the materials already prepared for your quality system will be helpful in developing your EMS. This is because ISO 9000 and ISO 14000 use similar management frameworks. Table 1 provides an outline of the ISO 14001 EMS standard and shows corresponding ISO 9001 elements, where they exist. The ISO 9001 standard is used for comparison in this case study because it is the most comprehensive of the ISO 9000 series of standards. Most of these comparisons are also applicable to facilities registered under ISO 9002.

The most direct linkages with ISO 9001 occur within three phases of the EMS: Implementation and Operation, Checking and Corrective Action, and Management Review. The elements addressed within these phases, such as organizational structure and responsibility, training, document and records control, and audit and management review requirements, have direct parallels within the ISO 9001 system. In some cases, however, there is no direct link between ISO 14001 and ISO 9001.

The H-R Industries Experience

H-R Industries has been active in reducing the environmental impact of its operations in past years through changes such as using glycol-free strippers and aqueous solder masks. The company viewed the creation of a formal EMS and ISO 14001 certification as a way to achieve discipline in its environmental programs, incorporate environmental responsibility into all job descriptions, demonstrate industry leadership, and gain a marketing advantage.

When in-house staff at H-R Industries conducted a gap analysis, they found that they would be able to borrow significantly from their ISO 9002 Quality Management System. The overlap included using the same forms and stamps to indicate document approval, and using the same procedures and personnel for documentation control.

In general, the company used the same documentation system for writing EMS policies and procedures as it had for its quality program. Specific examples of how H-R Industries used its quality system to develop several EMS elements are described below.

1. **Environmental Policy.** H-R Industries modified its Quality Policy to include its environmental policy. The policy was enlarged to poster-size, signed by all employees, and posted as a reminder of the company's commitment.

2. **Planning.** A key element of an effective EMS is identifying the environmental aspects of your company's activities, products, and services, and determining which aspects have significant impacts on the environment. These "significant aspects" form the basis for setting your environmental objectives. Although there is no parallel element in ISO 9002, H-R Industries extended its ISO 9002 purchasing policy to address potential environmental impacts by making suppliers and contractors aware of the environmental aspects associated with their products. For example, the formality of an EMS provided the incentive to work with a chemical supplier to convert their permanganate bath maintenance procedure. Sodium hypochlorite additions were replaced by permanent electrodes in the solution for electroregeneration, extending bath life 2 to 3 times. This change resulted in reductions in hazardous waste generation, material handling, reporting, and recordkeeping. Annual savings totaled over $32,500.

3. **Implementation and Operation.** Essential to both quality and environmental management systems is the assignment of responsibility, authority, and adequate resources. To make the most of limited resources, H-R Industries assigned the same individuals responsibility for both quality and EMS elements where there was overlap. For example, the Safety/Health Officer provides training required by ISO 9002 and ISO 14001. Documentation and records for the Quality and Environmental Management Systems are controlled and maintained by the same individual.

Successful implementation of an EMS also depends on both management and employees fully understanding and controlling the company's potential impact on the environment. H-R Industries uses the training framework already in place for

ISO 9002, safety, and employee right-to-know programs to inform new employees of ISO 14001 EMS requirements. Training had to be expanded to educate employees about the environmental aspects of their activities and the potential environmental consequences of their performance. For example, platers needed to know that dumping a contaminated bath to wastewater treatment could not only disrupt the treatment system, but also may cause an unacceptably high level of metals discharged to the environment.

According to H-R Industries' Process Engineering Manager, "With ISO 9002, quality had to become everybody's business. With an EMS, everybody had to become aware of how their work impacted the environment." For example, wastewater treatment operators revised procedures to address environmental aspects of treatment operations.

- **Checking and Corrective Action.** H-R Industries transferred its ISO 9002 procedures for making corrective action requests directly to its EMS. The EMS Manual simply refers to the Corrective Action Request form already in use for quality. For example, such a form might be used for a tank leak. Similarly, H-R Industries incorporated the records control and audit procedures established under ISO 9002 into its EMS.

- **Management Review.** Management must periodically review the EMS to evaluate its suitability and effectiveness. ISO 9001 contains the same requirement. Although there is some overlap in personnel on the quality and environmental review committees at H-R Industries, the two systems are reviewed separately. The review format and control of meeting records, however, is the same. H-R Industries feels that smaller companies may have an advantage in the review process in that the committees may be composed of the same

Table 1: Similarities Between ISO 14001 and ISO 9001

Shading indicates where similarities exist between the two systems.

ISO 14001 Element		ISO 9001 Equivalent
4.1	**General Requirements**	**4.2.1 General**
4.2	**Environmental Policy**	**4.1.1 Quality Policy**
4.3	**Planning**	
4.3.1	Environmental aspects	Although there is no direct equivalent in ISO 9000, opportunities for considering environmental aspects may exist in areas such as contract review, purchasing, handling, storage, packaging, preservation, and delivery.
4.3.2	Legal and other requirements	
4.3.3	Objectives and targets	
4.3.4	Environmental management programs	
4.4	**Implementation and Operation**	
4.4.1	Structure and responsibility	4.1.2 Organization
4.4.2	Training	4.18 Training
4.4.3	Communication	
4.4.4	EMS documentation	4.2.1 General
4.4.5	Document control	4.5 Document and data control
		4.3 Contract review
		4.6 Purchasing
4.4.6	Operational control	4.7 Control of customer-supplied product
		4.9 Process control
		4.15 Handling, storage, packaging, and delivery
4.4.7	Emergency preparedness and response	
4.5	**Checking and Corrective Action**	
4.5.1	Monitoring and measurement	4.11 Control of inspection, measuring and test equipment
4.5.2	Nonconformance and corrective and preventive action	4.14 Corrective and preventive actions
4.5.3	Records	4.16 Control of quality records
4.5.4	EMS audit	4.17 Internal quality audits
4.6	**Management Review**	4.1.3 Management review

personnel, allowing both quality and environmental systems to be reviewed at the same time.

Lessons Learned About the EMS Process

The process of developing an EMS for a small or medium-sized company need not be overwhelming. H-R Industries' experience shows that a company can use its existing environmental policies and procedures, and those developed for ISO 9002 registration, to help build an EMS that is integrated with its quality assurance program. H-R Industries' advice is to begin with simple, achievable goals, and focus on programs where there is obvious economic benefit. As your EMS matures, the procedures and programs can be expanded to further improve environmental performance and to continue integration of the EMS into other business functions.

Time required to develop and maintain the EMS: The time required to implement an ISO 14001 EMS depends on the current status of your company's environmental programs, the resources your company is willing to commit, and whether your organization is ISO 9000 registered. At H-R Industries, it took about 18 months to obtain certification. During the first year it took the equivalent of one fourth of an employee's time for preliminary planning and exploring issues. The final 6 months required the time-equivalent of 1.5 employees to implement the EMS. For a company without a well-developed system, implementation may take about 2 years. At H-R Industries, one full-time employee maintains both environmental and quality systems; several other employees have EMS responsibilities requiring the time equivalent of an additional half-time employee.

Certification cost: At H-R Industries, certification cost $18,000, which included preliminary and on-site audits, follow-up audit for deficiency, audit report, registration fee, and auditor time and expenses. H-R Industries saved on auditor expenses by scheduling the ISO 14001 certification audit and the ISO 9002 six-month surveillance audit at the same time and with the same firm.

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What is the Design for the Environment (DfE) Printed Wiring Board Project?

The U.S. Environmental Protection Agency's (EPA's) Design for the Environment (DfE) Printed Wiring Board Project is a cooperative, non-regulatory effort in which EPA, industry, and other interested parties are working together to develop technical information on pollution prevention technologies specific to the PWB industry.

Additional Resources for the PWB Industry

In addition to this case study, the DfE PWB Project has prepared other case studies that examine pollution prevention opportunities for the PWB industry. All case studies are based on the experiences and successes of facilities in implementing pollution prevention projects. The other case study topics available include:

- ***Pollution Prevention Work Practices***
- ***On-Site Etchant Regeneration***
- ***Acid Recovery and Management***
- ***Plasma Desmear***
- ***Reusing Microetchant***
- ***Pollution Prevention Beyond Regulated Materials***
- ***Identifying Objectives for Your Environmental Management System***

These case studies, and other documents published by the DfE Project, are available from:

Pollution Prevention Information Clearinghouse
U.S. EPA 401 M Street, SW (7409)
Washington, DC 20460
phone: 202-260-1023; fax: 202-260-4659
e-mail: PPIC@epamail.epa.gov
DfE PWB information: http://www.epa.gov/dfe
or www.ipc.org/html/ehstypes.html#design

The DfE Program welcomes your feedback. If you implement any of the ideas in this series of PWB case studies or have any comments, please let us know by calling the DfE Program at 202-260-1678 or via e-mail at oppt.dfe@epamail.epa.gov.