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EC95-739 Pollution Prevention: A Tool Kit for Farm Cooperatives

Janet R. Hygnstrom
University of Nebraska - Lincoln, jhygnstrom1@unl.edu

Wayne Woldt
University of Nebraska - Lincoln, wwoldt1@unl.edu

Mohamed F. Dahab
University of Nebraska - Lincoln, mdahab1@unl.edu

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University of Nebraska Cooperative Extension EC 95-739-S

Pollution Prevention

Helping Your Business and the Environment

A Tool Kit for Farm Cooperatives

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Kenneth R. Bolen, Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.

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While technical reviewers provided guidance in copy revisions and assisted in assuring accuracy of content, the views expressed in these tool kits are those of the authors and do not necessarily reflect the views of either the technical reviewers or the agencies they represent.

Technical review was provided by Todd MacFadden and Karen Bucklin Sanchez, Montana State University; Becky Shannon, Missouri Department of Natural Resources; Theresa Hodges, Kansas Department of Health and Environment; and John Steinauer, Nebraska Department of Environmental Quality.

The Great Plains-Rocky Mountain Hazardous Substance Research Center, US Environmental Protection Agency Region VII, as well as the Biological Systems Engineering Department, the Center for Infrastructure Research, and the Water Center at the University of Nebraska provided partial support for this project.

These materials were written by Jan Hygnstrom under the direction of M.F. Dahab and W.E. Woldt, Biological Systems Engineering, LW Chase Hall, University of Nebraska-Lincoln 68583-0726. Special thanks to Sheila Smith, Biological Systems Engineering artist, for help in layout and design.

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Please let us know what you think of these materials. A postage-paid self-folding evaluation is included for your use. Please call Wayne Woldt at (402) 472-8656 if it is missing.

The Pollution Prevention Tool Kits are industry-specific. Tool Kits are available for the following industries:

- Autobody Repair
- Vehicle Maintenance
- Drycleaning
- Metal Finishing
- Farm Cooperatives

For ordering and price information, contact :

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Room 105 Agriculture Communications Building
PO Box 830918
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Telephone: (402) 472-9713

Pollution Prevention

Helping Your Business and the Environment

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Would you like to:

✓ Reduce your operating costs by using fewer materials and supplies?

✓ Reduce hazardous and nonhazardous waste transportation and disposal costs?

✓ Reduce liability and risks associated with hazardous waste?

✓ Reduce the paperwork and record keeping requirements associated with hazardous waste?

✓ Improve workplace safety and employee health?

✓ Help safeguard the environment?

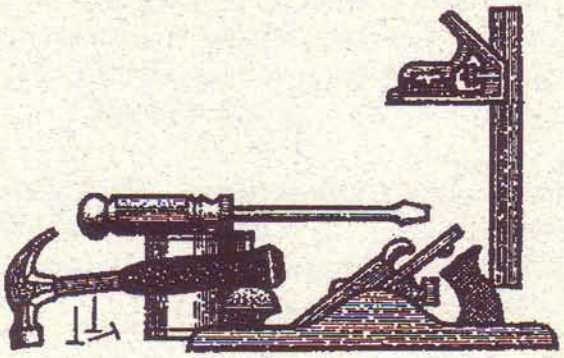
✓ Improve your company's image?

✓ Increase your company's business activities?

If you answered "*Yes*," to any of the above questions, you may want to look at the materials in this pollution prevention tool kit.

It's called a tool kit because it contains information, or tools, to help you prevent pollution in your business. The tools will help you identify wastes, both hazardous and nonhazardous, that your business produces. You will be able to look at your operation in a different light, keeping pollution prevention in mind.

The first tools will help you understand what pollution prevention is, how it can benefit your business, and characteristics of successful programs. Later tools contain pollution prevention ideas that are specific to your business.



Incidentally, as you read through materials, you'll notice the words pollution and waste are used interchangeably. Any waste, whether it's the paper you don't need anymore or hazardous waste like spent solvents, has the potential to become pollution. By reducing the waste your business generates, you're reducing the chances that you'll be polluting your neighborhood, your community, your environment.

A Look at What's Ahead

1a Pollution Prevention Contacts for EPA Regions VII and VIII. This chart lists telephone numbers and addresses of people who work with pollution prevention. Use this if you need information specific to your state or EPA region.

2 Why the Concern About Waste? And just what is pollution prevention anyway?

3 Getting Off to a Good Start. Some successful pollution prevention program strategies are given, as well as reasons why some programs never get off the ground.

4 Hazardous Waste. The ultimate goal is to not produce any sort of waste. In the meantime, the hazardous waste your business produces subjects you to some special regulations.

5 Material Safety Data Sheets. You can learn a great deal about the materials your business uses by understanding what Material Safety Data Sheets are and what they say.

5a Material Safety Data Sheets-A Closer Look. There's more information than meets the eye. Take the time to understand the terms in the MSDS and you'll be better equipped to make sound decisions involving use, handling, and storage of hazardous materials.

6 Pollution Prevention Strategies for Your Business, Through Changes in:

Housekeeping and Maintenance
Inventory
Basic Operations
Equipment
Raw Materials
Process Technology

Waste Exchanges and Recycling

7 Ready to Begin Preventing Pollution? This is a series of worksheets to help you collect and analyze information on your business.

Analyzing Pollution Prevention Options
Pollution Prevention Program Review

8 Yard Waste, A Growing Concern. Yard wastes from homes and businesses account for a large percentage of our waste. If your business has a green space, here are some ideas to make it greener, in terms of lawn health and reduced waste production.

9 Blow Your Horn! Publicize Your Pollution Prevention Efforts. Publicity and rewards, both within your business and the community are two methods for sustaining a pollution prevention effort.

10 Worksheets: A more in-depth look at

Waste Assessment
Costs of Processes
Screening Pollution Prevention Options
Technical Feasibility
Economic Feasibility
Pollution Prevention Option Summary
Evaluation of Pollution Prevention Project

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Pollution Prevention Contacts for EPA Regions VII and VIII

Your city or county health department may have information about local programs and contacts. Another good source of information is your state Clean Air Act Small Business Advocate, or local Extension office.

EPA Region VII Steve Wurtz US EPA Region VII 726 Minnesota Avenue Kansas City, KS 66101 (913) 551-7315		
IA	Jim Olson Iowa Waste Reduction Center 75 Biology Research Complex University of Northern Iowa Cedar Falls, IA 50614-0185 (319) 273-2079	Larry Gibson Waste Reduction Assistance Program Iowa Dept. of Natural Resources Wallace State Office Building Des Moines, IA 50319 (515) 281-8489
KS	Michelle Feenstra Kansas State University Engineering Extension Manhatten, KS 66506 (913) 532-6026	Theresa Hodges, Pollution Prev. Director Dept. of Health and Environment Forbes Field, Bldg. 740 Topeka, KS 66620-0001 (913) 296-6603
MO	John Atkinson, Engineering Extension University of Missouri W 1000 SBE Columbia, MO 65211 (314) 882-8880	Becky Shannon Missouri Dept. of Natural Resources P.O. Box 176 Jefferson City, MO 65102 (314) 526-6627
NE	Wayne Woldt University of Nebraska-Lincoln L.W. Chase Hall Lincoln, NE 68583-0726 (402) 472-8656	Wanda Blasnitz, Pol. Prev. Coordinator Nebraska Dept. of Environmental Quality P.O. Box 98922 Lincoln, NE 68509-8922 (402) 471-2266

EPA Region VIII Marie Zanowick 999 18th Street, Suite 500 Denver CO 80202-2405 (303) 294-1065		
CO	Harry Edwards Waste Minimization Center Colorado State University Dept. of Mechanical Engineering Fort Collins, CO 80523 (303) 491-5317	Neil Kolwey, Pollution Prevention Program Colorado Department of Health HMWMD-B2 4300 Cherry Creek Dr. S Denver, CO 80222-1530 (303) 692-3309
MT	Karen Bucklin Sanchez Pollution Prevention Coordinator Montana State University Extension Service Taylor Hall Bozeman, MT 59717-0312 (406) 994-3451	Don Vidrine Solid & Hazardous Waste Bureau Dept. of Health & Environmental Sciences Cogswell Building Helena, MT 59620 (406) 444-1430
ND	Jeffrey L. Burgess Environmental Health Section Dept. of Health & Consolidated Laboratories 1200 Missouri Ave Rm 201 Bismarck, ND 58502-5520 (701) 221-5150	Neil Knatterud Dept. of Health & Consolidated Laboratories Division of Waste Manag. 1200 Missouri Avenue P.O. Box 5520 Bismarck, ND 58502-5520 (701) 221-5166
SD	Carrie Jacobson Office of Waste Management Dept. of Environment & Natural Resources 523 E Capitol Ave Pierre, SD 57501 (605) 773-3153	Vonni Kallemeyn Office of Waste Management Dept. of Environment & Natural Resources 523 E Capital Ave. Pierre, SD 57501 (605) 773-6035
UT	Kitt Farrell-Poe Ag. Tech. & Ed. Systems Utah State University Logan, Utah 84322-2300 (801) 750-3389	Sonja Wallace & Stephanie Bernkopf Dept. of Environmental Quality PO Box 144810, 168 N 1950 W Salt Lake City, UT 84114-4810 (801) 536-4477
WY	Pat Gallagher Senior Environmental Analyst Solid Waste & Hazardous Waste Div. Department of Environmental Quality 122 W 25th St Cheyenne, WY 82002 (307) 777-7752	Joe Hiller Extension Water Specialist P.O. Box 3354 University of Wyoming-Laramie Laramie, WY 82071 (307) 766-2196

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Pollution Prevention

Helping Your Business and the Environment

Number 2 University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

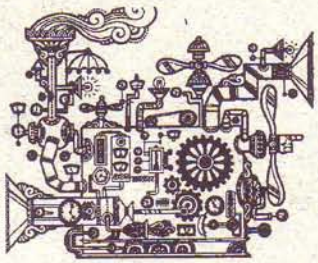
Why the Concern About Waste?

For some businesses, waste disposal costs are going through the roof.

As a business owner, you've noticed waste disposal costs climb year by year. Along with that have come increased regulations from federal, state, and local governments, especially in the area of hazardous waste. How did we get to this point?

Throughout early history, it was common practice to get rid of waste by pitching it on the land or down the river. As people became frustrated with the flies or rodents and even ill due to diseases resulting from waste, we learned to carry it farther from our homes and businesses. Later, burning and burial offered solutions.

Over the years, new technology was developed. We learned how to make plastics from petroleum. This opened a whole new world to us, from unbreakable cups to artificial hearts. Plastics solved some problems of earlier packaging types; plastic is light and unbreakable. Because of plastic packaging, we have less food waste, but unfortunately, we have the packaging waste on our hands.



As technology has developed, our waste has changed.

With the development of affordable computers, people felt that written documents would become history. Information and correspondence would be transmitted by computer disk, or over telephone wires. Now, we realize that computers have allowed us to generate more documents at a faster rate. The result: more paper waste.

We also learned how to make materials that can kill pests, clean our homes, keep our autos running, and generally make life easier. The manufacturing by-products and leftover materials were disposed of like our other wastes, thrown in a dump or down a drain. Some of these materials and disposal methods have come back to haunt us.

> Love Canal became a symbol of the nation's toxic waste problems in the late 1970s when chemicals dumped there 30 years earlier began leaking into yards and basements. An estimated 2,500 people had to leave their homes.

The Superfund was developed to put these waste "ghosts" to rest. Billions of dollars are spent cleaning up abandoned hazardous waste sites, and, unfortunately, the list of sites is growing, not shrinking.

Until recently, the focus has been on pollution control.

The Environmental Protection Agency (EPA) came into existence in 1970, due to concern about what was happening to our environment. Its focus has been on what to do with pollution after it is generated. How can it be handled, treated, and disposed of so that our land, water, and public health are not harmed? As a result of these efforts, the U.S. has made progress in cleaning up our water and air. Lake Erie, declared dead in the 70s, has come back to life. Lead air emissions have decreased by 96% since 1970, due mainly to the phase-out of leaded gasoline. In almost every category of air pollution, emissions have either leveled off or declined since 1970.

In order to continue making progress toward the goal of a clean, healthy environment, the EPA has focused on a new approach called pollution prevention. So what exactly is it? If you want an official definition, pollution prevention is the elimination or reduction in waste quantities or toxicities at the point of generation. The simple definition is *"try not to make pollution in the first place."* Rather than control waste once it is generated, don't make it. Period. This approach is so obvious, it's amazing we didn't consider it sooner!

Pollution Prevention: Try not to make waste in the first place.

If we don't make waste, we don't have to figure out where to store it. We don't have to pay for handling, transporting, treating, or disposal of it. We don't have to deal with the regulatory red tape, especially where hazardous materials are concerned.

Pollution Prevention: What It Isn't

Pollution prevention is not changing waste from one form to another. Burning paper waste in an outdoor burn barrel instead of throwing it in the landfill merely changes the form of pollution from solid waste to air pollution. And, incidentally, in some areas burn barrels are illegal.

Pollution prevention is not treatment to detoxify or to recover energy. Nor is pollution prevention disposal. These are examples of pollution control instead of prevention.

Because it may take time to reduce or eliminate pollutants, those generated should be reused or recycled in an environmentally safe manner. As a last resort, in the absence of feasible prevention or recycling opportunities, waste should be treated and/or disposed of in such a way as to reduce the risk to public health, safety, welfare, and the environment. Considering that rural areas may not have the recycling options due to prohibitive transportation costs, pollution prevention is a wise choice.

And pollution prevention works

Pollution prevention has increased business profits.

Throughout the U.S., as businesses have watched waste disposal costs soar, some have tried to reduce the amount of waste produced. In many cases, by just altering a few methods for minimal cost, they've seen dramatic results - decreased waste and increased profits.

● The Washington State University's Office of Publications and Printing began a 5-year program in 1991 to reduce the amount of hazardous and nonhazardous waste produced. They chose to implement all the components of the program in one year and reduced hazardous wastes and toxic air emissions by 97%. Overall, their waste reduction program saved them $95,000 in one year.

● A Minnesota manufacturer of cabs for agricultural and construction equipment spent $270 for equipment and labor, and saved $13,000 annually on solvent purchase and disposal.

● A tool company in North Carolina changed its manufacturing process to recover nickel from wastewater. This change cost $1,000, which was recovered in 5 weeks. The company sees an annual savings of $10,000 due to the switch.

Pollution prevention benefits include

- reduced raw material costs
- reduced treatment and disposal costs
- reduced liability
- reduced paperwork
- improved business image
- safer workplace

Even very small businesses can profit from pollution prevention. A family-owned autobody repair shop employing 17 people saved $4,800 a year by using a still to reclaim spent solvents on-site. The payback period for the still was less than one year. The amount of solvents sent off-site for treatment or disposal decreased by 80%. The owner of this company believes that improvements made due to environmental issues resulted in safer working conditions for his employees. This in turn led to higher quality work and greater efficiency, which has attracted more business.

By using pollution prevention methods, your business will be more efficient. Face it, waste started out as a resource that you paid money for, whether it's that paper you threw out, or spent solvents from cleaning machine parts.

If you eliminate hazardous waste generation, you get out from under the regulations. Wouldn't life be simpler without manifests for hazardous waste? The solution is not to get rid of the manifest system. It has an important role in making sure hazardous waste is handled safely. The solution is to not generate hazardous waste.

You are responsible for waste generated by your business, even after it leaves your premises. By not generating waste, you escape the liability associated with it.

There are other benefits to using pollution prevention opportunities. You will create a safer working environment. This in turn increases employee morale and productivity.

The public, which includes your customers, has a concern for the environment and its quality. By adopting pollution prevention methods, you will improve community relations and improve your business image. Your company may be better able to compete in the marketplace if you not only use pollution prevention methods, but publicize your efforts.

Pollution prevention strategies include changes in:

- housekeeping and maintenance
- inventory methods
- equipment
- raw materials
- process technology

Many of the general pollution prevention methods are simple to implement, and not costly. Take a close look at your housekeeping and maintenance procedures, as well as how you handle your inventory. You may also be able to modify your equipment to make it more efficient. Perhaps new equipment would save money in the long run, especially if there are fewer waste disposal costs to pay. There may be less toxic raw materials available to substitute for those you presently use. Later tools will take a closer look at these pollution prevention strategies.

The next tool will give you ideas on how to successfully implement pollution prevention in your business.

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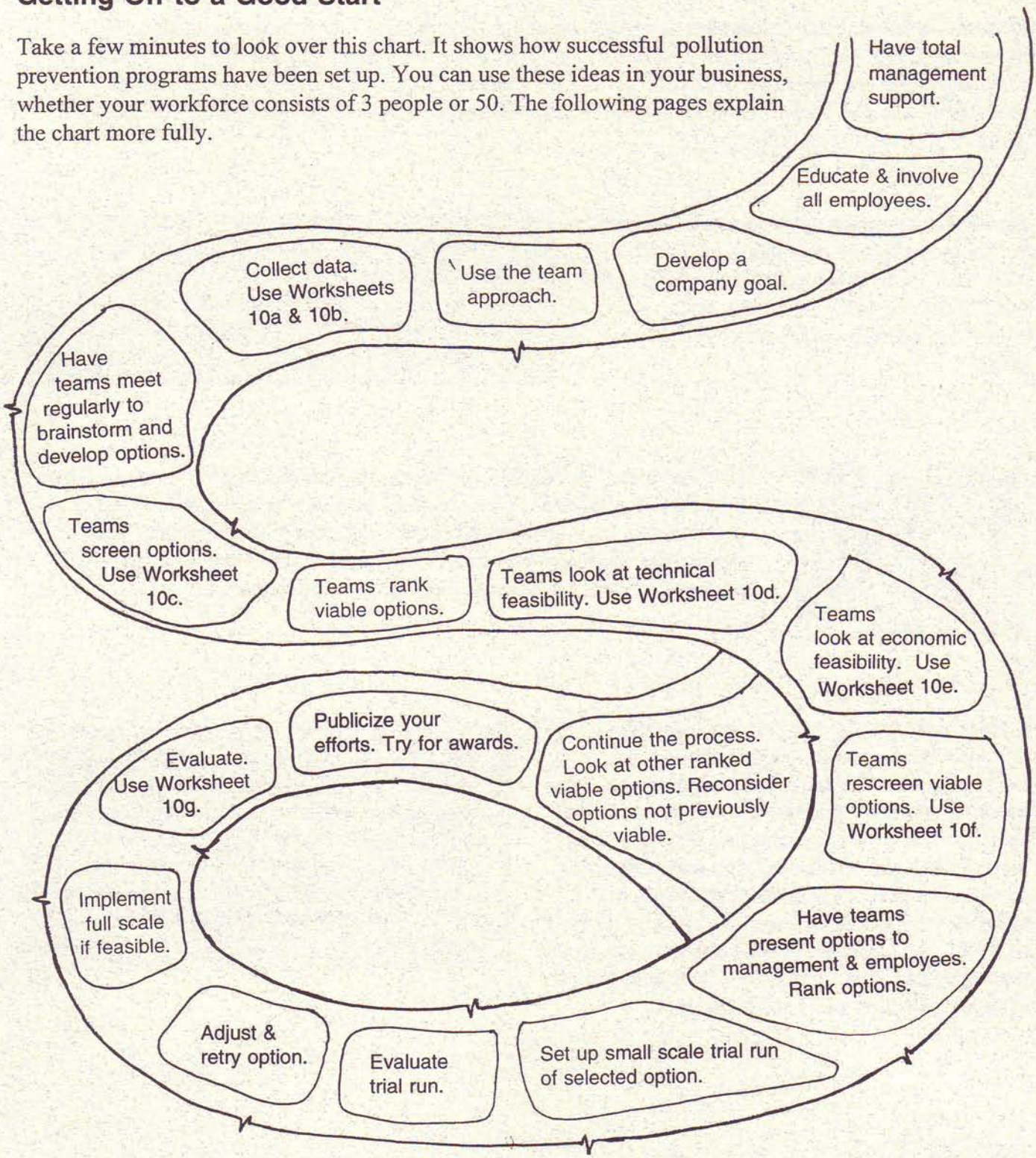
Pollution Prevention

Helping Your Business and the Environment

Number 3 University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

Getting Off to a Good Start

Take a few minutes to look over this chart. It shows how successful pollution prevention programs have been set up. You can use these ideas in your business, whether your workforce consists of 3 people or 50. The following pages explain the chart more fully.



Have total management support.
In some cases, pollution prevention may have been brought to the attention of management by a concerned employee. To show your commitment, write a policy on pollution prevention in your business. A sample appears at right.

> At Acme Printing Company, we believe a clean, healthy environment is very important. We are committed to preventing pollution through eliminating or reducing our use of toxic materials, conserving energy, and reducing wastes.

Educate & involve all employees from the beginning. Just as total support of management is necessary, employee involvement is crucial to an effective program. Employees have the hands-on experience and see the direct results of production methods. Once they understand the pollution prevention concept, they will be invaluable in generating ideas. Who better to include in making plans for preventing pollution?

Develop a company goal to work toward.
Set measurable and obtainable goals. You may want to decrease your solid waste output by 25% in one year. Or reduce your hazardous waste by 10% every year for 5 years.

> One ambitious business set a goal of zero hazardous waste in 10 years. They realized that they may not ever reach that goal, but they wanted to get as close as possible. And they *are* seeing results.

Use the team approach to divide work and maintain motivation. Large businesses have teams. Each consists of 6 to 8 people from different departments, including maintenance, accounting, management, and production. Different viewpoints and knowledge of various parts of the business are shared. A small business may have everyone on one team.

Collect data. This will help you identify opportunities for pollution prevention, and establish a baseline for measuring progress. Many business owners are amazed at the actual dollars spent on waste management and disposal. You may want to use Worksheet 10a and conduct a waste assessment to determine the types and amounts of waste generated. Worksheet 10b will help you get a handle on where money is spent in your business. This information will help you evaluate pollution prevention options.

> Some businesses have incorporated a cost allocation system. Departments and managers are charged for pollution control and waste management costs. Labor costs, liability, regulatory compliance, disposal and oversight costs should be included. This provides real incentive to prevent pollution.

Have teams meet regularly. First, they'll brainstorm. This involves dreaming up as many pollution prevention ideas as possible. Ideas are not judged or evaluated at this point. Just keep generating ideas.

Screen options. Have teams use worksheet 10c to determine which options should be considered further.

Rank viable options. Have each team rank their options. Some may not be viable at this time. Shelve those for future consideration.

Look at technical feasibility. Use worksheet 10d to have teams determine whether the technology exists for the viable option. Shelve those which are not technically feasible for a later date.

Look at economic feasibility. Use worksheet 10e to have teams determine whether the option is economically feasible. Shelve those which are not feasible now for consideration later.

Within your business, let everyone know how close you are to your goal. Post a sign or pass a memo showing waste reduction results. Many businesses embark on a paper recycling program, and educate everyone about how to recycle. Often, after the initial contact, the employees never hear if the program is continuing, much less if their efforts are having an impact. This reduces the motivation to continue recycling. The same is true of pollution prevention.

Rescreen viable options. Have teams use worksheet 10f to look those options over again. Each team should select one option to follow through.

Have teams present options to management and employees. Rank these. Implement simple ideas first, to gain support for the program. Start with one or two basic ideas to get everyone working together. This will reap benefits quickly and provide motivation to do more.

Set up small scale trial run of selected option. The team may have to do additional research and legwork. After they feel enough information has been collected, try implementing the option on a small scale.

Reward employees periodically for their pollution prevention efforts and ideas. Tool 9 has some ideas.

Evaluate. After the trial run, sit down and talk over the results. Are there any areas that need special attention?

Adjust and retry the option. Make any adjustments that may make the option run more smoothly. Run another trial. If you feel it really is feasible....

Implement full scale. Try the option throughout your business.

Evaluate option. Use worksheet 10g. Determine whether the option was successful. Did you prevent pollution? Improve worker safety? Realize economic benefits? Reduce your liability?

Monitor progress periodically and revise goals if needed. It is important to keep track of your efforts and see if you're really on track. If you were unrealistic in your goals, revise them and make them more attainable.

Publicize your efforts. Tell your community what you're up to. If you have succeeded in reducing your waste generation by 25%, let people know. This shows your concern for the environment and your neighbors. Tool 9 has some ideas.

Apply for local, state, regional, or national awards. Even if you don't win, you may get ideas for more pollution prevention possibilities just by going through the application process. Tool 9 has information on this, too.

Barriers to a Successful Pollution Prevention Program

What are some potential barriers to developing and maintaining a successful pollution prevention program? If you are aware of them and plan for them, your chances of preventing pollution, reducing waste management costs, reducing liability, improving your business image, and improving workplace safety will be greater.

If you don't have management and employee support, a successful program will be a tough row to hoe. You can demonstrate management support by developing a written company policy on pollution prevention, setting goals for reducing waste, and publicizing and rewarding success.

People who are resistant to change will be difficult to deal with. For pollution prevention to work, people will have to look at business operations with a fresh eye. Forget that "it's always been done this way." You have to be willing to experiment a bit to get the kinks out, and test new ways of doing things.

Taking on too much at once may doom your pollution prevention program from the start. Set a goal and pace yourself. Try simple options first. As you gain experience and have some successful projects under your belt, look at more difficult options.

The next tool explains what hazardous waste is. You'll see why reducing or eliminating its generation may be in your business's best interests.

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Pollution Prevention

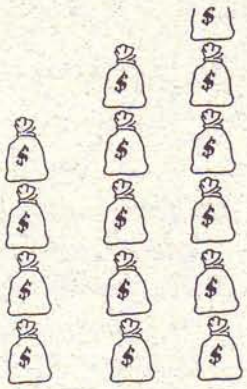
Helping Your Business and the Environment

Number 4 University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

Hazardous Waste and Your Business

Money Spent on Hazardous Waste Management Services in the US (includes analytical, environmental consulting, design and engineering, remediation construction, transportation, storage, and disposal costs).

= $3 billion



*Estimates by William T. Lorenz & Co.

Ignoring hazardous waste regulations is a serious matter. Besides endangering public health and the environment, improper handling of hazardous waste can bring fines and even jail sentences, as the article at the bottom of this page shows. This tool gives you an idea of some of the regulations hazardous waste generators must deal with. As you'll see, there are benefits to pollution prevention - not producing hazardous waste. In trying to reach that goal, the less hazardous waste your business generates, the lower the number of regulations you'll have to deal with. That means savings in terms of time and money. But first.....

What is Hazardous Waste?

Although reducing the amount of any waste your business produces will benefit you, there is special concern about hazardous wastes. These are wastes that can cause injury or death. They may also damage or pollute land, air, or water. Hazardous wastes are regulated by federal and state laws.

The following information, taken from federal hazardous waste regulations is meant to give you an idea of what a hazardous waste generator must do for compliance. Your state and local regulations will be *at least* this stringent, never more lenient. For more information on your state hazardous waste regulations, contact your Cooperative Extension office, Health Department, or Environmental Agency.

Polluters Get Jail Terms, Fines

The production manager of a metal coating facility was sentenced to 40 months in prison after a jury found him guilty of burying drums of spent solvents at the facility. The president and an officer of the parent company are awaiting trial.

The chief executive officer of an industrial waste trap cleaning company was sentenced to three years in prison and his firm fined $1 million. He knowingly discharged wastes that were prohibited by the Clean Water Act into the city's sewer system.

A dry cleaning businessman went to jail owing $30,000 in state fines for dumping carcinogenic waste into a village water supply. He also faces 300 days of electronic home detention.

Names and locations purposely omitted.

How do I know if a waste is hazardous?

There are 3 main ways a waste falls into the hazardous category.

1. Listed wastes - appear on any one of four lists of hazardous wastes contained in the Resource Conservation and Recovery Act (RCRA). These have been listed because they contain any number of toxic materials that have been shown to be harmful to the environment, or they exhibit one of the characteristics described below. Listed wastes may be generated from manufacturing processes or may consist of discarded commercial chemical products.

2. Characteristic wastes - have one or more of the following characteristics:

Ignitable

A. *Ignitable* - have a flash point of less than 140° F. The flash point of a liquid is the lowest temperature at which it can release enough flammable vapor to ignite. Ignitables can be liquids, solids, flammable gases, or oxidizers. At standard temperature and pressure, non-liquid ignitables may cause fire through friction, absorption of moisture, or spontaneous chemical changes. Some ignitable hazardous wastes include kerosene, mineral spirits, toluene, and xylene.

Reactive

C. *Reactive* - unstable or undergo rapid or violent chemical reaction when exposed to heat, pressure, water, or other materials. The reactions may produce toxic fumes or gases. Chromic acids, perchlorates, and peroxides fall into this category.

Corrosive

B. *Corrosive* - extremely alkaline (pH greater than or equal to 12.5) or extremely acidic (pH less than or equal to 2), or can corrode steel at a rate of greater than 0.25 inches per year. These dissolve skin, metals, and other materials. Special containers are necessary to resist corrosion. Corrosive wastes include waste rust removers, waste acidic or alkaline cleaning fluids, and waste battery acid.

Toxic

D. *Toxic* - contain high concentrations of some heavy metals such as lead, cadmium, or mercury; or contain certain pesticides. This is determined through testing with the Toxics Characteristic Leaching Procedure (TCLP). Toxic wastes can cause cancer, kidney damage, birth defects, and blood disease.

3. Mixtures -

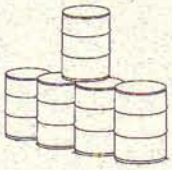
- of listed hazardous waste and non-hazardous waste.
- of a characteristic hazardous waste and a non-hazardous waste if it exhibits a characteristic (ignitable, corrosive, reactive, or toxic).

It is your responsibility to determine whether your wastes are hazardous. The **Material Safety Data Sheet (MSDS)** that you receive for each hazardous material you purchase is a good place to look for information. The amount of hazardous waste your business produces will determine the amount of paperwork and regulations you must comply with. Tools 5 and 5a have more on the MSDS.

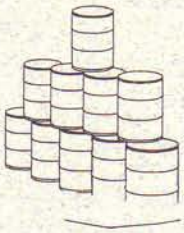
Some wastes are called *acutely* hazardous. These are wastes so dangerous in small amounts that the EPA regulates them in the same way as large amounts of other hazardous wastes. Dioxin-containing wastes and some pesticide wastes fall into this group.

The amount of hazardous waste your business generates and stores determines what category your business falls into: Conditionally Exempt, Small Quantity, or Large Quantity Generator. Each category has certain regulations that the generators must comply with. *These names and amounts may vary by state. Be certain to check your state's.* These are the federal categories:

Conditionally Exempt Generators produce no more than 220 lbs (about 25 gal) of hazardous waste and no more than 2.2 pounds of acutely hazardous waste per month. No more than 2,200 lbs of hazardous waste can be stored on your property.



Small Quantity Generators produce between 220 and 2,200 pounds (between 25 to less than 300 gal) of hazardous waste and no more than 2.2 lbs of acutely hazardous waste per month.



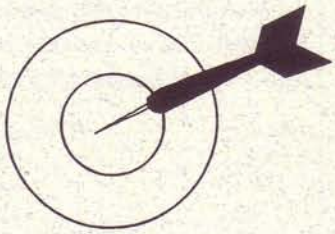
Large Quantity Generators produce 2,200 pounds (about 300 gal) or more of hazardous waste or more than 2.2 lbs or acutely hazardous waste per month.

The next section of this tool gives the federal guidelines for determining what wastes to include when calculating hazardous waste totals. Be sure to look at your state and local regulations to determine what wastes must be included and what wastes need not be.

A chart summarizing federal hazardous waste generator requirements is included to give you an idea of the regulations you must comply with, depending on the amount of hazardous waste your business generates. Again, be sure to check state and local regulations.

There is a great deal of paperwork involved with managing hazardous waste. Besides the paperwork, time must be spent training employees, inspecting storage areas, and keeping up with changing regulations. If you didn't generate hazardous waste, these regulations would not apply to you.

That makes zero hazardous waste production a pretty good target to aim for.



Calculating Hazardous Waste Totals

Listed below are federal requirements for calculating hazardous waste totals. Remember, your state and local requirements may be more strict. Contact your local Cooperative Extension office, Health Department or Environmental agency for state and local regulations.

When calculating hazardous waste totals:

What wastes do I include?

All listed and characteristic wastes that you:

- accumulate on-site for any period of time prior to subsequent management.
- package and transport off-site.
- place directly in a regulated on-site treatment or disposal unit.
- generate as still bottoms or sludges and remove from product storage tanks.

Do not include wastes that:

- are specifically exempt from counting, such as used oil that has not been mixed with hazardous waste or spent lead-acid batteries that will be sent off-site for reclamation.

- may be left in the bottom of containers that have been completely emptied through conventional means, such as pouring or pumping. Containers are considered empty if no more than 1 inch of residue remains, or no more than 3% by weight remains in a container that holds 110 gallons or less, or no more than 0.3% by weight remains in a container that holds more than 110 gallons. Acutely hazardous waste containers must be more thoroughly cleaned by triple-rinsing with an appropriate solvent.

- are discharged directly to a public utility that treats industrial and domestic sewage, without being stored or accumulated first. However, this discharge must comply with the Clean Water Act.

- you reclaim continuously on-site without storing prior to reclamation, such as dry cleaning solvents. Any residues removed from the dry cleaning machine and any spent cartridge filters must be counted, however.

- you manage in an elementary neutralization unit, which is a regulated tank, container, or transport vehicle designed to contain or neutralize corrosive wastes.

- you manage in a totally enclosed treatment unit or a wastewater treatment unit.

- you have already counted once during the calendar month and treated on-site or reclaimed in some manner and used again.

- are left as residue in the bottom of product storage tanks if the residue is not removed from the product tank.

Material in this Pollution Prevention Tool Kit is intended only to provide general information. Contact your state and local officials, local Extension office, and vendors for information specific to your business, location, and equipment. These materials were written by Jan Hygnstrom under the direction of M.F. Dahab and W.E. Woldt, Biological Systems Engineering, LW Chase Hall, University of Nebraska-Lincoln 68583-0726.

Summary of Federal Hazardous Waste Generator Requirements

Your state and local requirements will be *at least* this stringent, *never* more lenient.
Contact your Cooperative Extension office, Health Department, or Environmental agency for state and local requirements.

Federal Regulation	Large Quantity Generators- Generate ≥2,200 lbs HW or ≥2.2 lbs AHW per month	Small Quantity Generators- Generate >220 lbs but <2,200 lbs HW, and < 2.2 lbs AHW per month	Conditionally Exempt Generators- Generate <220 lbs HW and <2.2 lbs AHW per month
Inventory	Identify all HW on-site. Determine lbs generated per month. Determine maximum amount accumulated at any one time.	Identify all HW on-site. Determine lbs generated per month. Determine maximum amount accumulated at any one time.	Identify all HW on-site. Determine lbs generated per month. Determine maximum amount accumulated at any one time.
ID number	Obtain state and EPA ID number.	Obtain state and EPA ID number.	Obtain state ID number if required.
HW Accumulation	Up to 90 days, in containers: ·compatible with HW stored. ·closed unless adding/removing HW. ·handled to avoid damage. ·stored 50 ft from property line if they hold Ignitable or Reactive wastes. ·stored separately if HW is incompatible. ·stored following EPA containment standards if >100 containers used.	Never accumulate > 13,200 pounds of hazardous waste on-site in any 180-day period, or, if allowed, 270 days if TSD is more than 200 miles away. Otherwise, same requirements as fully regulated generators.	Never accumulate more than 2,200 lbs HW or 2.2 lbs of AHW on your property. If you do, you must meet requirements of the Small Quantity Generators.
Satellite Accumulation	No more than 55 gallons of HW or 1 qt of AHW.	Same as fully regulated generator.	Does not apply.
Labeling	RCRA HW labels. Dept of Transportation labels.	Same as fully regulated generator.	Dept of Transportation labels (if necessary).
Inspections	Storage areas weekly. Tanks daily. Facility for potential HW spills. Emergency prevention/detection equipment.	Same as fully regulated generator.	No federal requirements but check state and local requirements. Strongly recommended for employee and community safety. This is a good pollution prevention strategy.
Transport	Follow DOT regulations for packaging, labeling, marking, and placarding. Use HW manifest system. Use transporters and TSD facilities with state/EPA ID numbers. File any necessary exception reports. Ship or recycle wastes within 90 days. Comply with state regulations.	Same as fully regulated generator, except: ·Letter to EPA in place of exception report. ·Ship or recycle wastes within 180 days (if allowed, 270 days if TSD is more than 200 miles away).	No manifest required by federal regulations. Use regulated HW facility. Use licensed SW landfill with permission, if allowed.

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Pollution Prevention

Helping Your Business and the Environment

Number 5 University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

Material Safety Data Sheets

One important source of information is the Material Safety Data Sheet (MSDS). It lists the ingredients in a hazardous product, the hazards to safety and health, and the precautions to follow when using the product. Employers who use, store, or manufacture hazardous materials are required by law to make the MSDS available to all employees who could be exposed to the material.

The information on the MSDS will help you in determining whether waste containing any of the material is hazardous.

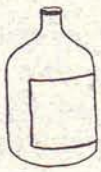
Manufacturers of hazardous materials are required to provide accurate product information, yet the quality of information may vary, depending on the thoroughness of the manufacturer. Do not consider the MSDS to be a complete source of information for a product. Instead, consider it a starting point for learning about the material.

You probably receive the MSDS for any hazardous products you use from the distributor when you receive supplies. If you don't, call or write to the manufacturer or distributor of the product and request a recent copy. Indicate your intended use for the product, so the correct information will be sent. A responsible business should respond to your request.

The MSDS must contain some basic information, although the format may vary from one manufacturer to another. There are eight major sections, described below. In any section, the letters ND means the information has not been determined and NA means not applicable.

Look at an MSDS from your files while reading this tool. Read the brief summary of each of the sections. These should be similar to those on your MSDS, but remember, there will be some variation. Get to know the product you use in your business by answering the questions.

1. Material Manufacturer and Identification



This section gives the name, address, and emergency telephone number of the product's manufacturer. The chemical name or trade name of the product is given. If the product is a mixture of several chemicals, only its trade name will be listed. Is a Chemical Abstract Service number given? This number allows you to find more information from other sources, such as library books. When was the MSDS prepared?

2. Hazardous Ingredients/Identity Information

This section lists the product ingredients which have been determined to be hazardous. The percentage, by weight, of each ingredient is listed, using the chemical or common name. Does your MSDS tell at what concentration the material could produce a health hazard? This information is based on research using test animals in laboratory experiments. One abbreviation you may see in this section or section 6 Health Hazard Data is **TLV**, or Threshold Limit Value. This is the recommended airborne concentration that nearly all workers can be exposed to without adverse effects. In general, the lower the TLV, the greater the potential for adverse health effects.

As you read your MSDS, you may find 3 types of TLVs listed.

Time Weighted Average (TLV/TWA)- the recommended exposure concentration for a normal 8-hour workday, 40-hour workweek. If the MSDS lists only TLV, it usually refers to this value.

Short Term Exposure Limit (TLV/STEL)- the recommended exposure concentration above the TWA for a limited number of 15-minute exposure periods.

Ceiling Exposure Limit (TLV/C)- the recommended exposure concentration that should not be exceeded at any time during the work period.

TLVs are not guarantees.

✓ They do not take into consideration exposure values for children, pregnant women, hypersensitive individuals, or other high risk groups.

✓ They do not apply to shifts longer than 8-hours or to people who live and work in the same environment.

✓ TLVs may be revised as new studies reveal hazards that were previously undetected.

✓ There are some substances known to be toxic that have no TLVs because of insufficient data to measure the risk from exposure.

3. Physical and Chemical Data

This section describes the physical characteristics of the product. Is it a liquid, solid, or gas at room temperature? What is the evaporation rate? Does the vapor rise or settle? Does the product dissolve in water? Information on the odor and appearance can help you to verify that you have the correct MSDS.

4. Fire and Explosion Hazard Data

This section describes the circumstances under which the product may ignite or explode. What is the flash point, the lowest temperature at which the material can release enough flammable vapor to ignite? What are the recommended extinguishing media, materials that should be used to put out a fire? These may include foam, water, carbon dioxide, or dry chemical. Are there special fire fighting procedures to follow? Is special protective equipment needed?

5. Reactivity Data

This section tells how the product will react under particular environmental conditions. Will it decompose over time? Will heat or sunlight cause a dangerous reaction, producing a toxic or flammable substance? This section will also indicate which chemicals are incompatible with the product, and should not come in contact with it. This information is important when choosing safe storage conditions.

6. Health Hazard

This section provides a combined estimate of the total known hazards of the product. It describes routes of exposure and effects of short and long-term exposure. What are the signs, symptoms, or diseases that may result from overexposure? Are any medical conditions generally recognized as being aggravated by exposure to the product? What emergency and first aid procedures should be followed in case of overexposure? This section may also indicate whether the hazardous product is listed in the National Toxicology Program (NTP) Annual Report on Carcinogens or is a potential carcinogen according to the International Agency for Research on Cancer or by Occupational Safety and Health Administration.

Hazardous substances may enter the body through one or more of these routes:

Ingestion - eating or drinking contaminated substances or contaminated food or water.

Inhalation - breathing in hazardous gases, vapors, dusts, and sprays.

Skin contact/absorption - Hazardous products containing corrosives or irritants can injure the skin and may be slowly absorbed into the body tissues and bloodstream. Some hazardous substances, such as solvents, can be absorbed by skin contact without damaging the skin. Many hazardous products may cause eye damage if splashed into the eye, a particularly vulnerable area.

7. Precautions for Safe Handling and Use

This section tells the safest known ways to handle the material. Are there special procedures for cleaning up spills and leaks? How should you dispose of the product? In general, information on disposal is not supplied in detail because local, state, and federal regulations vary. This section also provides information that might not be listed elsewhere, such as storage information and cleaning or disposing of contaminated clothing.

8. Control Measures

This section describes personal protective equipment, work practices, and ventilation procedures to use when working with the product. Are special gloves or respiratory protection recommended? Is eye protection suggested?

Your MSDS may have additional sections, such as **Special Precautions** or **Regulatory Information**.

Now that you've become familiar with the MSDS, find out what some of the terms, like LD50 and vapor density mean. The next tool, Taking a Closer Look at the MSDS, will help you better understand some of the characteristics of the hazardous materials used in your business. Is a material with an LD50 of 500 mg/kg more toxic than one with an LD50 of 400 mg/kg? If a material is heavier than air, does it pose more of a health hazard to children and pets? You can find this in the MSDS if you know where and how to look.

> It is important that you and your employees do not take hazardous materials lightly, for safety and liability reasons. You may decide to look for a less hazardous material to meet your needs.

Adapted from *Identifying Product Hazards: Material Safety Data Sheets,* copyright 1991 by the University of Missouri's Household Hazardous Waste Project, 1031 E. Battlefield, Suite 214, Springfield, MO 68507.

Pollution Prevention

Helping Your Business and the Environment

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Take a Closer Look at the MSDS

■ Some terms and abbreviations you may find in the Hazardous Ingredients/Identity Section include:

Permissible Exposure Limit (PEL)- the amount of an airborne substance that most healthy adult workers can be exposed to at work without adverse effect.

LD50- the lethal dose that will kill 50% of the test animals in laboratory experiments through either skin contact or ingestion. The lab results are used to estimate the toxicity to humans by adjusting the results to human body weight and characteristics. Researchers are usually conservative in their estimates because different species react differently.

LC50- the lethal airborne concentration that will kill 50% of the test animals when administered in a single exposure in a specific time period.

ppm- measure of concentration in parts per million.

mg/m^3- milligrams of chemical substance per cubic meter of air, to measure concentrations for dusts, gases, or mists.

S (skin)- indicates that the substance may be absorbed through the skin, mucous membranes, and eyes.

mg/kg- milligrams of solids or liquids per kilogram of body weight, usually given by ingestion or injection.

■ Some terms you may find in the Physical and Chemical Data section include:

Vapor pressure- indicates how easily a liquid will evaporate. It is measured in millimeters of mercury (mm Hg). Liquids with higher vapor pressures require better ventilation. A liquid is considered volatile when its vapor pressure exceeds 5 or 6 mm Hg.

Vapor density- the weight of a vapor or gas compared to an equal volume of air. Air is rated as 1. Vapors heavier than air have a density greater than 1. They accumulate in low areas where they may pose health hazards to small children and pets, and may create fire hazards. Toluene has a vapor density of 3.2.

Specific gravity- the ratio of the weight of a product's known volume to the weight of an equal volume of water. A specific gravity of greater than 1 means the substance will sink in water; less than 1 means it will float. Most flammable liquids are lighter than water.

Evaporation rate- the rate at which a product will change from a liquid to a gas when compared to the evaporation rate of a known material. Normal butyl acetate, which has an evaporation rate of 1, is commonly used for comparison. A slow evaporation rate is considered less than 0.8. Water has a rate of 0.3. A fast evaporation rate is greater than 3.0. Acetone is 5.6. Fast evaporating solvents can release hazardous amounts of vapors into the air quickly and should only be used in well-ventilated areas with appropriate safety equipment.

Percent volatile- the percentage of a liquid or solid that will evaporate at 70°F (unless another temperature is indicated). If the percentage exceeds 10%, be sure to use the product in a well-ventilated area.

Solubility in water- the quantity of a product that will dissolve in water at room temperature. Gases with low water solubilities are more likely to reach the deep tissues of the lungs. High solubility gases are more likely to dissolve into the moist mucous membranes of the upper airways.

Solubility in water may be expressed as:
Negligible less than 0.1%
Slight 0.1 to 1%
Moderate 1 to 10%
Appreciable more than 10%
Complete 100%.

■ Some terms and abbreviations you may find in the Fire and Explosion Hazard Data Section include:

Flammable limits- the lowest and highest concentrations of vapor or gas in the air that will ignite when exposed to a spark or flame. The lower flammable limit is LFL or LEL and upper is UFL or UEL. Products with a wide flammable limit such as ethyl ether, 1.9-3.6, may ignite either near or far from an ignition source. Products with a narrow flammable limit may ignite only near the ignition source. When considering the explosion hazards, the LFL is the most important. The lower the LFL, the less of a substance needed in the air before it can ignite.

Flash point- the lowest temperature at which the liquid gives off enough vapors to form an ignitable mixture with the air above its surface when exposed to an ignition source. A product with a flash point near or below 100°F is particularly dangerous because exposure to any ignition source, such as a spark from static electricity or a burning cigarette, may set off a fire or explosion. Gasoline has a flash point of -50°F.

Unusual fire and explosion hazards- tells what toxic or irritant gases may be released in a fire.

■ Some terms and abbreviations you may find in the Reactivity Data Section include:

Stability- indicates whether the product will decompose over time and the environmental conditions, such as heat or direct sunlight, that may cause a dangerous reaction.

Incompatibility- indicates which chemicals should not come in contact with the product. Any materials that are identified as incompatible should be stored and used separately.

Hazardous decomposition products- indicates which hazardous substances may be released during fires or from decomposition.

Hazardous polymerization- a process by which the molecules of a chemical can combine to form larger molecules, called polymers. If this chemical reaction happens too quickly, it may produce a great amount of heat, which may result in a fire or explosion. This type of reaction, under controlled conditions, is commonly used to produce plastics and usually requires heat or a catalyst. If a polymerization hazard exists, specific storage instructions and the shelf life of the chemical should be listed.

■ Some terms you may find in the Health Hazard Data Section include:

Acute health effects- signs and symptoms such as headaches, dizziness, skin or eye irritation, vomiting, coma, or death, that result from a single exposure. Symptoms usually occur shortly after exposure.

Chronic health effects- gradual and occur through repeated exposure over an extended period of time. Chronic effects include cancer, liver or kidney damage, birth defects, or central nervous system damage.

Acute effects are usually reported in more detail than chronic effects because more research has been conducted on acute effects. Isolating the long-term effects of a single chemical is difficult because individuals are exposed to toxic substances from a variety of sources, there may be a lapse in time between exposure and the development of symptoms, and symptoms may vary from one person to another.

Material in this Pollution Prevention Tool Kit is intended only to provide general information. Contact your state and local officials, local Extension office, and vendors for information specific to your business, location, and equipment. These materials were written by Jan Hygnstrom under the direction of M.F. Dahab and W.E. Woldt, Biological Systems Engineering, LW Chase Hall, University of Nebraska-Lincoln 68583-0726.

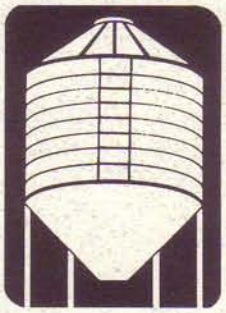
Pollution Prevention

Helping Your Business and the Environment

Number 6a University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

In the Farm Cooperative through Improved Housekeeping, Maintenance, Purchase, and Inventory

Just modifying your general housekeeping and maintenance practices, and how you handle purchases and inventory may reduce the amount of hazardous and nonhazardous waste your business generates. Even the packaging or form that your supplies are purchased in can make a difference. These are some areas where you may see big dollar savings with little, if any, monetary investment.



The following pages deal with pollution prevention techniques relating to fertilizer, pesticide, and petroleum handling and storage in the farm cooperative, as well as commercial application of farm chemicals. A vehicle maintenance pollution prevention tool kit is available if you maintain trucks or cars in your business. That information also may be useful in small engine repair operations.

Take a pencil and check off the practices you already use. Put a question mark near those you want to consider for future pollution prevention efforts. After you finish reading all the options, go back to those with question marks. Rank them according to ease of implementation, and whether they will affect the wastes your business generates in the greatest volume or those that are hazardous.

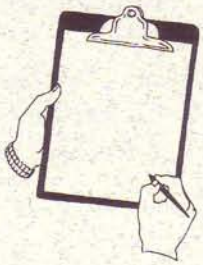
Good Housekeeping

☐ Do you keep storage and work areas clean and well organized?

- Keeping spilled grain to a minimum helps reduce rodent and bird infestations.
- Increases efficiency. Time is not wasted searching for materials and tools.
- Reduces the chance for accidents.
- Saves money. Dollars are not wasted purchasing duplicates.
- Spills and leaks are more noticeable. You'll be able to react quickly, before leaks and spills get out of hand.

☐ Do you keep track of where spills have occurred? Keep a chart handy to mark down this information. Look at the areas and see how to avoid future spills.

- Reduces loss of materials.
- Saves time and money spent on cleanup.



☐ Are all containers properly labeled? This is a regulatory requirement for hazardous materials and hazardous waste.

- Efficiency increases.
- Reduces the chance of using the wrong material. The wrong chemical could ruin a crop and your farm cooperative's reputation.
- Helps reduce hazardous waste generation by preventing accidental incorrect mixtures.

Maintenance

☐ Do you check for leaks regularly? Use your senses to find leaks. You may be able to:

- smell chemical odors
- see pools or droplets
- hear hissing noises.

Find the small leaks before they become large and lead to waste problems and exposures. Ben Franklin said, *"Small leaks sink big ships."* Small expenses, like raw materials lost due to leaks, can add up.

Some areas to inspect for leaks and repairs on a weekly basis include:

- ▫ chemical storage areas
- ▫ solvent tanks or sinks
- ▫ pumps
- ▫ pipes, hoses, and couplings
- ▫ waste storage areas
- ▫ filter gaskets, seatings
- ▫ fittings, valves
- ▫ sprayer tanks

☐ While looking for signs of leaks, do you check that equipment is operating properly? Putting equipment on a good maintenance schedule will help keep them efficient.

Purchase and Inventory

Think about how you purchase materials. A large inventory ties up money that might be needed elsewhere in your business.

☐ Do you have good inventory records? A computerized system telling purchase date, cost, and even location in storage can save you time and money. Knowing what you've sold in the past and what you have on hand allows you to make better purchasing decisions.

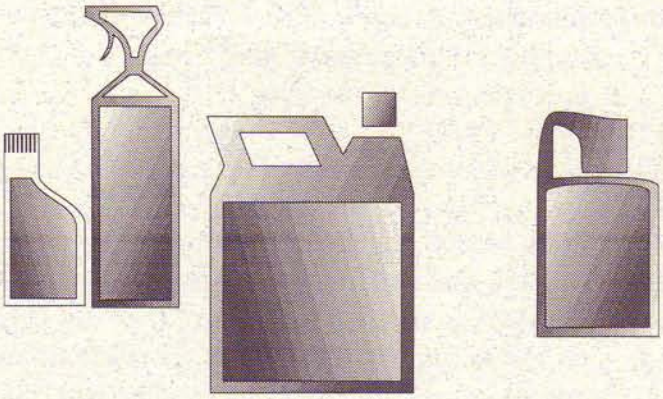
- Reduces overpurchases.
- Reduces chance of having materials exceed expiration date in storage.
- Minimizes customer complaints about out of stock merchandise.

☐ Can you standardize materials, or use the minimum number of material types in your operation?

- Increases the potential for recycling, especially where solvents are concerned..
- Reduces the amount of waste requiring disposal.

☐ Can you use multi-purpose materials, especially for cleaning and maintenance?

- Reduces the number of materials stored and used.



☐ Do you order materials in appropriate unit sizes to reduce your inventory?

- Ordering smaller containers of infrequently used materials reduces the chance that they will become outdated in storage.
- Ordering larger containers of frequently used materials reduces the number of containers that must be managed when empty.

☐ Do you purchase only what you will need in the near future or buy on an as-needed basis? Find out how quickly your supplier can get materials to you, so you don't have to store them. Anticipate your needs and plan, using past years' records combined with business projections.

- Reduces the chance of having expired materials. Be careful when taking advantage of volume discounts. This can lead to stockpiling hazardous materials, which may eventually require disposal as hazardous waste.
- Reduces risks associated with storage, such as leaks, spills, or fires.

☐ Do you factor in waste management costs when purchasing materials?

- Raw materials that generate hazardous waste cost more than just the purchase price.

☐ Can you purchase as well as sell fuel, pesticides, and fertilizers in returnable or refillable bulk containers?

- Eliminates empty container disposal for you and your customers. Any service that you can provide that decreases your customers' waste handling is a feather in your cap.

☐ Have you considered purchasing and selling farm chemicals in more concentrated formulas, or in dissolvable packets?

- Reduces packaging waste for your customers, and for you if you commercially apply chemicals.

☐ Can you purchase bulk liquids instead of aerosol containers?

- Reduces packaging waste.
- Eliminates aerosol propellants, improving working conditions.

☐ Can you reject rail cars contaminated by materials other than feed or grain?

- Avoid having to dispose of potentially hazardous or bulky waste.

A railroad line switched from aerosol lubricants to refillable plastic spray bottles and saved $15,000 per year. In addition to reduced costs, they helped improve air quality by no longer emitting aerosol propellants into the air.

☐ Do you inspect all materials upon delivery?

- Immediately return unacceptable materials to the supplier. Broken packaging or expired materials may increase *your* waste load.

☐ Do you make sure a Material Safety Data Sheet (MSDS) accompanies each hazardous material?

- Each MSDS has valuable information about proper storage and handling of the material.
- Employees should know where they are kept and how to use them. Not only is this good for employee safety, it is required by the Occupational Safety and Health Administration (OSHA).

☐ Do you check that all purchases have legible labels?

- Efficiency increases.
- Reduces the chance of using the wrong material.

☐ Can you return wooden pallets to your supplier or a pallet salvaging operation?

- Eliminates your need to manage them.

☐ Do you rotate stock and use dated materials on a FIFO (first in-first out) basis?

- Reduces the chance that materials will deteriorate in storage.

☐ Can you make arrangements to return expired or unopened chemicals to your supplier?

- If you decide to use old material, test small amounts for effectiveness first. The manufacturer may be able to reprocess unused chemicals.

☐ Do you track amounts of raw materials used by keeping good records?

- Allows you to measure reduction in use.

☐ Do you limit access to storage areas?

- Reduces the chance of accidental spills or leaks.
- Reduces liability due to exposure of unauthorized personnel.

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Pollution Prevention

Helping Your Business and the Environment

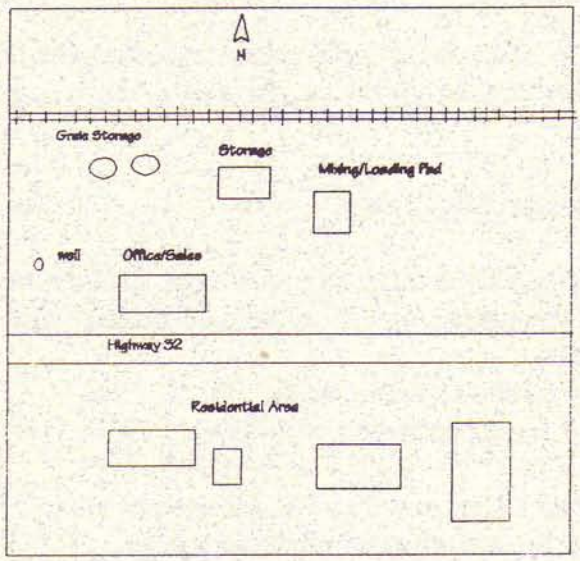
Number 6b University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

Petroleum Product and Farm Chemical Storage

Even your storage methods can affect your waste generation and potential to pollute. Think about how you store both your petroleum products and your farm chemicals, such as fertilizers and pesticides. You may be creating more waste unnecessarily. The cheapest, safest alternative you may have is to cut back on the amounts stored. If that's not practical, consider how you can protect the materials you keep on hand. Proper storage of petroleum products and farm chemicals reduces the risk of harming people and the environment. This tool will help you look at your storage site, the structure, and your storage methods.

Petroleum and Farm Chemical Storage Site

Most farm cooperatives do not have the luxury of choosing new sites for building storage facilities. You can, however, take note of where your storage facilities are and plan to reduce the chance of environmental emergencies. If you are planning to build a new facility, research potential building sites carefully and reduce opportunities for environmental hazards.



☐ Do you have a site plan showing locations of underground fuel tanks, water wells, electrical service lines, and other features?

- Looking at the big picture helps you to anticipate problems.

Make a scale drawing of your site plan, and include:

- ☐ Underground and above-ground fuel storage tanks, propane tanks and pipelines.
- ☐ Water wells.
- ☐ Fire hydrants, water lines, gas lines.
- ☐ Main gas shutoff.
- ☐ Electrical service lines, transformers, disconnect.
- ☐ Ponds, creeks, rivers, lakes.
- ☐ Sewer lines, septic tanks, sewage lagoons.
- ☐ Drainage pattern of site.
- ☐ Pesticide storage containment area.
- ☐ Mixing/loading pad.
- ☐ Fertilizer storage area.
- ☐ Anhydrous storage area.
- ☐ Flammable liquid storage.
- ☐ Roads, driveways.
- ☐ Property lines, easements.
- ☐ Prevailing seasonal wind directions.

☐ Are tanks and storage areas located out of major traffic flow areas for your business, but easy to access for loading or emergencies?

- Allows you to get chemicals out in a hurry if the need arises.
- Reduces the chance for accidents and spills.

☐ Do you know your local or state regulations, and are you in compliance for the minimum distances to:

- ☐ rivers, lakes, ponds, or water wells?
- ☐ residential or business buildings?
- ☐ underground fuel storage tanks?
- ☐ the water table, aquifer, and flood plain?
- ☐ surrounding buildings?

> Some states require that chemical storage areas must be at least 100 feet from a drinking water well. The distance should be greater if the site has sandy soils or fractured bedrock near the soil surface. Check your state well regulations to find the distance required. Your water and your business reputation are at stake if there is a leak.

☐ Are your farm chemical or petroleum storage tanks and buildings isolated from feed, seed, or other storage areas, as well as shop and office buildings?

- Minimizes accidental exposure to workers and customers.
- Reduces the chance for fire to spread.

☐ Is the chemical mixing and loading area close to your storage facility?

- Minimizes the distance that chemicals are carried and reduces the chance for spills.

☐ Do you have an emergency response plan for the site? Know where the runoff water will go, how to handle your particular chemicals, and whom to call for help.

Storage Structures

☐ If you have underground storage tanks, have you considered replacing them with above-ground tanks?

- Easier to detect leaks.
- Fewer corrosion problems.

☐ Are underground and above-ground tanks installed according to manufacturer's specifications?

- Proper installation is one way to reduce the chance of leaks in the tank or connected piping. Even scratches in a metal tank caused by careless installation can increase corrosion and tank deterioration.

☐ Do storage areas have an impermeable floor?

- Reduces the possibility that chemicals will seep into the ground and contaminate soil or water.

> For information on other factors to consider in the design of the farm chemical storage facility-such as ventilation, water access, temperature control and worker safety, contact your local Extension office or the University Engineering Extension Office for plans and recommendations. The Midwest Plan Service has a publication *Designing Facilities for Pesticide and Fertilizer Containment*. Write to them at Midwest Plan Service, Agricultural and Biosystems Engineering Department, 122 Davidson Hall, Iowa State University, Ames, IA 50011-3080 or call (512) 294-4337, A free catalog listing all their publications is available.

☐ Do you have a separate buildings for storing pesticides and fertilizers? Store pesticides separately from fertilizers, and never store any farm chemical inside a wellhouse or a facility containing an abandoned well.

Never store ammonium nitrate fertilizer with pesticides. When contaminated by fats, oils, acids, finely divided metals, or sulfur, ammonium nitrate becomes highly sensitized, flammable, and explosive. Large amounts of oxygen are given off when it burns, increasing the fire's intensity.

☐ Do farm chemical and petroleum storage structures have secondary containment structures such as dikes or curbs? Fertilizer and pesticide storage containment must be separated from each other.

- Prevents spills from entering soil, surface water or groundwater.
- Prevents chemicals from spreading into other areas.
- In case of a fire, water used to put out a fire may be contaminated, and will be confined.

☐ Does your containment area meet local and state requirements? In many states, containment areas for large bulk tanks must be able to confine 125% of the contents of the largest bulk container, plus the displaced volume of any other storage tanks in the area. Contact your Extension office to find out your local requirements.

- Temporarily holds pesticide or fertilizer releases from primary storage tanks, pipes or valves.
- Allows you to recover spilled product.

☐ Is your storage area or building locked?

- Provides security.
- Prevents unauthorized use of pesticides and reduces the chance of accidental spills or theft.

☐ Are windows and doors labeled to alert firefighters that pesticides, fertilizers, and other products are stored in the structure? Maintain a list of the chemicals and the amount stored. Keep a copy of this list away from the storage area.

- Labels on the outside of the building give firefighters and other emergency personnel information about pesticides and fertilizer during an emergency response for fire or a spill.

There are a number of hazards associated with chemical storage fires.
1. Chemicals or solvents may be explosive or flammable.
2. Chemicals may give off toxic fumes, vapors, dusts and liquids.
3. Chemicals or water carrying those chemicals may harm plants, animals, soil, or water supplies.

Storage Practices

☐ Do you store materials on pallets so that you can easily check for leaks?

- Store drums off concrete floors to reduce the chance of corrosion from moisture.

☐ Are shelves made of steel?

- If a spill occurs, steel is easier to clean than wood.

☐ Do you periodically check that shelving is sturdy and hasn't weakened?

☐ Are aisles wide enough for people to maneuver?
- Easier to move containers, reduces chance of accidents.
- Allows easy access for inspections and emergency response.

☐ Are containers stacked according to manufacturer's instruction?
- Avoids damaging the containers on the bottom from improper weight distribution.

☐ Do you store dry products above liquids?
- Prevents wetting from spills.

☐ Are farm chemicals stored so they will be kept dry and out of the way of activities that might knock over a jug or rip open a bag? Short-term storage, such as during seasonal use, poses a lower risk than year-round storage, but any storage, regardless of length of time stored, poses a risk.

☐ Do you keep different types of pesticides separate? Herbicides, insecticides, and fungicides should be kept on separate shelves or areas.
- Avoids cross-contamination.
- Reduces the chance of using the wrong material.
- Reduces the risk associated with fire or accidental spills.
- Prevents cross-contamination and mixing of incompatible materials
- Makes inventory control easier.

☐ Are all materials securely covered?
- Reduces the chance of spills.
- Reduces loss of liquids due to evaporation.

☐ Do you store products in locations that will preserve their shelf life?
- The MSDS tells proper storage conditions for specific materials. For example, some materials should not be exposed to direct sunlight or high temperatures.
- Contact your local fire or county health department for special measures that may be required to safely store waste oil and flammable materials.

☐ Do you store piles of dry bulk fertilizer on an impermeable surface under cover or in a building? Treat dry fertilizer impregnated with pesticides as a pesticide. Store under cover or protected from rain.

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Pollution Prevention

Helping Your Business and the Environment

Number 6c University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

In the Farm Cooperative through Improved Basic Operations

Often, we do things a certain way because that's how we were trained. We may not even know *why* we do it that way. Maybe the real reason for how it was done in the past no longer applies.

Every so often it may be a good idea to step back and look at how we do even simple tasks in a business. Is there a good reason behind it? Is it just a habit?

The following pages have some pollution prevention techniques to consider in the farm cooperative. Use that pencil again and check off the practices you already use. Put a question mark by those you want to consider. After you finish reading all the ideas, go back to those with question marks and rank them according to ease of implementation and those that will affect your largest or most hazardous waste stream.

Ever heard of the man who always cut the ends off the roast prior to baking it? When asked why, he wasn't sure. He had a number of ideas, but realized it was because his mother taught him. When his mother was asked why she did it that way, she also had lots of ideas. All in all, she admitted that was how her mother taught her to bake a roast. The grandmother was questioned. She replied, "I cut off the ends so the roast would fit in the pan."

☐ Do you train employees about safe handling of farm chemicals, equipment, and wastes?
- Reduces the chance for incorrect mixtures.

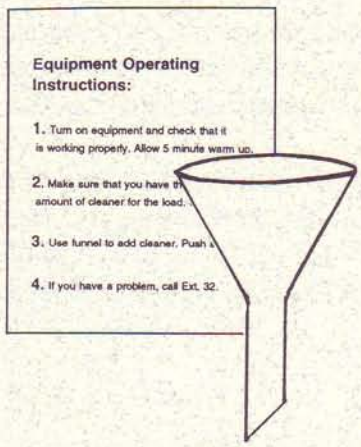
☐ Are procedures for using equipment written in simple form for quick reference?
- Laminate and post for easy reference. This is no substitute for good training, however.

☐ Are containers closed with tight fitting lids and bungs when not in use?
- Reduces evaporation losses.
- Reduces chance of spills.

☐ Do you have spigots and pumps for dispensing new materials?
- More precise dispensing and less waste.

☐ Are there funnels for transferring wastes to storage containers?
- Reduces the possibility of spills.

☐ Do you turn on equipment over a staggered period of time?
- Reduces peak electricity demands.



☐ Can you collect and use spilled grain dust in manufacturing feed pellets?

☐ Can you spray mineral oil on grain as it enters storage?
- Keeps dust on the grain instead of letting it into the air.

☐ Do you use tanks and containers according to manufacturer instructions and only for their intended purpose?

Spills and Leaks

Spills and leaks can occur during storage, while mixing and/or transferring materials, or during application of farm chemicals. Proper storage and handling can reduce the chance of spills and leaks, but accidents happen. Your best defense is to have proper training, secondary containment, know what to do in case of a spill, and who to contact for help.

> The 3 Cs of spill handling:
> Control it.
> Confine it.
> Clean it up.

☐ Do all employees know who to notify in case of a leak or spill from any tank- whether it is above or below ground, or even a vehicle-mounted tank? Post emergency phone numbers.

☐ Have you checked your state and local regulations to see what types and volume of spills must be reported?

☐ Do you have an emergency response plan for the site? Know where the runoff water will go, how to handle your particular chemicals, and whom to call for help.

☐ Are employees well-trained in handling spill and leaks? If a bag is accidentally ripped open, control the spill, confine it to the immediate area and clean it up promptly. This is easier to do in buildings with solid, impermeable floors. For liquid spills, a curb and sealed impermeable floor will virtually eliminate any seepage of chemicals into the ground. Reuse the pesticide or fertilizer as it was intended. Dry fertilizer impregnated with a pesticide is considered a pesticide and, if spilled, should be recovered and applied to the target crop as it was intended.

☐ Do you have and periodically test overflow alarms on storage tanks?

☐ Do you have a good secondary containment system?
- An impermeable floor and walls around a storage area will minimize the amount of pesticide or fertilizer seeping into the ground if a bulk liquid storage tank should leak.

☐ If you have underground tanks, do you test them periodically for leaks, and constantly monitor them? Be certain that you meet and, if possible, exceed federal, state, and local regulations.
- Detect leaks before major problems develop.
- Cleanup of petroleum leaks is always costly and not always totally effective.

☐ If you plan to install new underground tanks, are you familiar with state and local installation, monitoring, and recordkeeping requirements?

- Contact your state fire marshall, environmental agency, cooperative extension office or local health department.

☐ Do you monitor your tank for leaks, following your state and local requirements? Some methods to monitor tanks include groundwater monitoring wells, vapor monitoring, and automatic tank gauging. Measuring the contents of your tank is an inexpensive and easy way to help detect leaks. When there is any decrease in level over time without any withdrawal of fuel, or if there is an increase in water in the tank, your tank has a leak. While inventory measurement will not detect very small leaks, it will at least provide a warning that further investigation may be necessary.

☐ If you use a measuring stick to measure tank liquid level, are you certain that the stick does not puncture or damage the bottom of the tank?

☐ If your existing tank is near a drinking water well, do you have an adequate leak-detection system in place?

New Twists on Old Ideas: Integrated Pest Management and Sustainable Agriculture

Integrated Pest Management (IPM) uses a combination of cultural, mechanical, biological, and lastly, chemical controls. IPM services have field scouts monitor insects and diseases. They will help determine if treatment is needed, the type of treatment and the proper timing of the treatment.

- Cultural methods provide unfavorable growing conditions for pests and favorable growing conditions for crops. Remove old plant material, rotate crops to prevent disease and insect population buildup, and use disease-resistant varieties.

- Biological methods encourage natural pest enemies like parasites, diseases and predators.

- Mechanical control uses cultivation to reduce weed pressure.

- And lastly, chemicals are used if none of the other options are feasible. Insects and diseases may develop up resistance to chemicals that are used repeatedly. This reduces our choices of effective products we can use when chemicals are really needed.

☐ Will IPM put you out of business? No.

- Unnecessary pesticide sprays have costs to the farmer and the environment. Every time a farmer goes out of business due to high overhead or a low profit margin, you've lost another customer.

As defined by Congress, sustainable agriculture is an integrated system of plant and animal production practices having a site-specific application that will, over the long term:

- ✓ satisfy human food and fiber needs;
- ✓ enhance environmental quality and the natural resource base upon which the agricultural economy depends;
- ✓ make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls;
- ✓ sustain the economic viability of farm operations; and
- ✓ enhance the quality of life for farmers and society as a whole.

Sustainable agriculture is not:

- ✓ a break with modern agriculture.
- ✓ another name for organic farming.
- ✓ only for small farms.
- ✓ only for livestock farms.
- ✓ a step backward.
- ✓ a panacea for all environmental problems.
- ✓ a complete solution to farm profitability problems.
- ✓ a budget-buster for the USDA.

The best results always come from adaptation of techniques to a single farm. Each farm is different, when you consider the soil, climate, labor, equipment, facilities, livestock needs, markets, and the farmer's skills and knowledge.

The above excerpts are from a USDA booklet, *The Basic Principles of Sustainable Agriculture*, which serves as an introduction for farmers, environmentalists, the public, and policy-makers. For copies of this booklet, contact:

Director of Sustainable Agriculture Research and Education Program, Cooperative State Research Service, Aerospace Building, 901 D Street S.W., USDA, Washington, DA 20251
Phone: (202) 401-4860

Cooperative Extension Service, Room 3849 South Building, USDA, Washington, DC 20250, (202) 447-5623.

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Pollution Prevention

Helping Your Business and the Environment

Number 6d University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

In the Farm Cooperative Through Improved Chemical Handling and Application

Mixing, loading, and applying farm chemicals like fertilizers and pesticides present many opportunities to generate waste and pollution. You can use some practices to reduce the risk to people and the environment.

☐ When handling pesticides, do employees wear proper protective clothing at all times? Remember that pesticides are designed to kill pests; some may also harm humans if not handled correctly. Basic protective gear includes a long-sleeved shirt, long pants, sturdy rubber shoes or boots, chemical resistant apron, gloves, and goggles or a face shield. Read the chemical label instructions for any further safety precautions.

☐ Are employees trained in safety measures? Never eat, drink, smoke, or go to the bathroom while working with chemicals until you've washed your face and hands thoroughly with detergent and water.

Chemical Mixing and Loading

Even small spills in the mixing and loading area may contaminate groundwater or the soil. You may not notice small quantities spilled regularly in the same place, but the chemicals can build up in the soil and may eventually reach groundwater.

☐ Do you have an impermeable mixing and loading pad such as sealed, liquid-tight concrete?
- Protects the environment.
- Reduces your potential for liability.

☐ Does your mixing/loading pad have a sloped surface with water-tight walls and curbs? Provide secondary containment while transferring liquids to spraying equipment or nurse tanks. As you know, clean up of liquid spills can be much more difficult than clean up of dry materials.
- Keeps liquids confined.
- Allows you to reclaim product.

☐ Does your mixing and loading pad have independent shallow sumps in each containment area?
- Allows you to handle different pesticides and fertilizers without cross-contamination.
- Be sure to follow local regulations regarding sumps.

☐ Is the pad large enough to contain leaks from bulk tanks, wash water from cleaning equipment, and spills from transferring chemicals to the sprayer or spreader? The size of the pad also depends on the equipment you use. It should provide space around the parked equipment for washing and rinsing.

☐ If you don't have curbs, will liquids from the pad move away from the well or any surface water?
- Construct a diversion so runoff is directed to another area.

☐ Is the pad designed so that storm water will not enter it?
- Reduces the volume of liquids you have to manage.

If you are considering constructing a mixing and loading pad, contact your local Extension office or University Engineering Extension office for more detailed information. If you don't have a pad, there are other opportunities for you to reduce the risk of contaminating water or soil.

☐ Do you avoid mixing and loading pesticides near a well, stream, or wetland? Use a nurse tank to transport water to the mixing and loading site. Move the mixing site each year within the field of application, to prevent chemical buildup.
- Protects surface water.
- Prevents chemical buildup in soil.

☐ Do you avoid mixing and loading on gravel driveways or other surfaces that would allow spills to sink quickly through the soil? A clay surface is better than sand.
- Spills will take longer to seep into soil, giving you more time to react.

☐ Do you avoid mixing incompatible materials? Read product labels carefully when combining two or more pesticides in the same tank. Perform a small-jar compatibility test with the carrier you'll use in the field, and add a compatibility agent to the chemical mixture if recommended.
- Reduces waste if chemicals are not compatible.

☐ Are employees trained in safe handling?
- ✓ Never open a container with your bare hands.
- ✓ Use a screw driver, not a knife that you'll use for cutting your food, to open drums or cans.
- ✓ Hold the container as low as possible when pouring so that it won't splash or give off dust.

☐ Do you make sure that there is backsiphon prevention device on the well or hydrants? Provide an air gap of 6 inches between the hose and top of the sprayer tank. Never put the hose directly into the sprayer tank.
- Prevents reverse flow of liquids into the water supply.

☐ Is there always a trained employee to supervise sprayer filling? For restricted-use pesticides, a trained and certified applicator *must* supervise operations.

☐ Have you considered a closed chemical handling system?
- Transfers the pesticide directly from storage container to applicator equipment through a hose. Humans and the environment are never inadvertently exposed to the pesticide. Remember to leave an air gap between the hose and the top of the sprayer tank to prevent back-siphoning.

☐ Do you have a direct injection system? The chemical concentrate is metered into the boom and mixed with the diluent just before it is sprayed through the nozzle.
- Eliminates leftover premixed pesticide.

☐ Do you use rinse water for mixing subsequent loads of the same chemical? Spray the last rinsate load on the labeled crop.
- Reduces the amount of rinse water that you need to manage.

☐ Do you have several separate rinse water storage tanks?
- Allows you to keep rinsate from different chemicals separate so it can be used as mixing water in subsequent loads.
- Incompatible pesticide rinse water is not accidentally sprayed on crop.

☐ Do you save and reformulate pesticides that have been diluted incorrectly?
- You must know the concentration and be able to calculate the appropriate blending ratios to end up with the correct concentration.

Chemical Application

☐ Do you have accurate figures for the acreage to be sprayed?
- Accurate measurement can reduce the volume of haulback pesticide mix.

☐ Do you schedule the same sprayer unit for similar spray mixtures and plan your spray schedules?
- Reduces the number of times the sprayer must be cleaned.
- Reduces the amount of rinsewater that must be handled.

☐ Is equipment calibrated correctly? Make sure the nozzle size, flow rate, and spray pattern are uniform across the boom. Measure flow rates from each nozzle and replace any tip that varies 10% or more from the manufacturer's specifications. Replace any worn nozzles.
- Minimizes leftover sprays.
- Efficient use of chemicals saves you and your customers time and money.

☐ Is equipment in good running order? Check for wear and tear: Look for damage to frame, running gear, and tank. Check the pump for cracks and leaks. Test throttling valves, pressure gauges, hoses and clamps for leaks. Check nozzle gaskets for a tight fit. Clean line and tip strainers with fresh water and a soft brush.

Inaccurate or sloppy calibration has economic, legal, and environmental costs.

Under-application of pesticides may reduce effectiveness, leading to repeat sprays. This reduces the farmer's profit margin, and casts doubt on your business reputation.

Over-application of pesticides is illegal, could lead to civil and criminal lawsuits, and increases the chance of damage to crops, as well as the environment.

☐ Do you inform customers that you will not apply pesticides on windy days? Drift is minimal when wind velocity is under 10 mph.
- Drift can harm neighboring people, pets, wildlife, and vegetation.

☐ Do you post signs telling re-entry periods?
- Alerts people that pesticides have been sprayed.

☐ Do you have a flush tank? Attach a separate clean water supply tank to your sprayer unit.
- Rinse the inside and outside of the tank in the field and apply the rinsate onto the labeled site.

☐ Do you have a temporary storage set up if equipment failure or bad weather leaves you with unsprayed premixed material?
- A holding tank may be useful to temporarily store haulback pesticide mix.

Farm Chemical Container Handling

Ideally, you won't have any containers to manage because you've been able to use refillable or reusable containers. Until that time comes, there are ways to handle farm chemical containers that reduce the risk to the environment and your business liability.

☐ When you empty a container into the sprayer tank, do you let it drain at least 30 seconds?
- Remove as much of the pesticide as possible.

☐ Are employees trained to handle empty pesticide containers correctly? Properly rinsed pesticide containers are not considered hazardous waste and may be taken to a licensed landfill. Pesticide labels require that empty containers be rinsed at least three times, called triple-rinsing, or else pressure rinsed. Your spray equipment vendor may be able to supply you with a pressure-rinse nozzle.

☐ Are containers triple- or pressure-rinsed immediately after they are emptied? Some pesticides may cake on the sides if you delay rinsing. The two extra rinses remove more than 99% of the pesticide residue from the container. Because many pesticides used today can be costly as well as toxic, rinse containers and pour the rinse water back into the spray tank.
- Makes sense, both for your business and the environment.

To Triple Rinse (for plastic, glass and non-pressurized metal containers)

1. Add water or oil (whichever is specified as the dilutant on the label) until the container is about one-fourth full.
2. Secure the cover on the container and swirl to rinse all inside surfaces.
3. Remove the cover and pour the rinsate into the spray tank. Allow it to drain at least 30 seconds.

Repeat this at least two times.

To Pressure Rinse (for plastic and non-pressurized metal containers)

1. Attach the special nozzle to the end of a hose to force the remaining pesticide from the container.
2. After emptying the pesticide into the spray tank, let the container drain at least 30 seconds.
3. Insert the pressure-rinse nozzle by puncturing through the bottom of the pesticide container.
4. Rinse for length of time recommended by the manufacturer, usually at least 30 seconds.
5. Replace cover.

☐ Do you take special care when rinsing suspension formulas that tend to settle and harden in the container?
- Those types of pesticides may require extra rinsing.

After triple or pressure-rinsing, the empty pesticide containers are no longer considered hazardous waste. Tool 6e, Waste Exchanges, Recycling Options and Waste Disposal, tells how to handle empty containers.

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Pollution Prevention

Helping Your Business and the Environment

Number 6e University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

Waste Exchanges and Recycling Options for the Farm Cooperative

The goal of pollution prevention is to not generate pollution or waste in the first place. Due to old equipment and capital shortages, or lack of substitute raw materials and new technology, however, it may take time to reach that goal. In the meantime, try to find someone who may be able to reuse your waste through an exchange program, or recycle your waste.

Waste Exchanges

Waste exchanges may have names of businesses and industries that can use some of your "waste" as a resource.

☐ If you cannot reuse wooden pallets, can you list them in a waste exchange?

- Reduces your disposal costs.

Refer to **Tool 1a, Pollution Prevention Contacts for EPA Regions VII and VIII,** to find out if your area has a waste exchange. An exchange program could put you in contact with a business in need of a material that you consider a waste. On the flip side, an exchange program may also help you locate another company's "waste" that you can use.

Recycling

Often, rural areas have fewer recycling opportunities than cities. Still, there are a few options that you may want to investigate.

☐ Do you keep wastes segregated to make recycling easy? Mixing wastes may make reusing or recycling difficult, if not impossible. Any nonhazardous waste that is mixed with a hazardous waste must be handled as a hazardous waste. This increases the volume of hazardous wastes and, therefore, your disposal costs.

☐ Do you recycle cardboard? Give small amounts to a business or charity willing to pick it up. Large amounts can be baled and sold.

☐ Can you reuse and/or recycle 55 gallon drums? Return empty drums to the supplier if possible.

☐ Can you recycle empty, rinsed plastic pesticide containers? If the containers cannot be reused, try to find recycling opportunities. In some areas, rinsed plastic pesticide containers are collected, granulated, and used to used to make new chemical containers. Only triple- or pressure-rinsed containers are accepted. To find out if your area has this opportunity, contact your Extension office, your chemical vendors, or your farm cooperative trade association.

☐ Do you use both sides of a sheet of paper prior to recycling or disposal?
- Reduces paper purchase and disposal costs.

Don't forget about recycled content and recyclability when choosing your supplies and suppliers. Here are a few ideas to consider:

☐ Are there reusable or recyclable alternatives for any of your supplies, including paper, envelopes, and office file folders?

☐ Are there recycled content alternatives? These are products that contain recycled material. Those that indicate "post-consumer recycled content" mean that the material has been through the consumer's hands.

☐ Are suppliers willing to expand their use of reusable, recyclable, or recycled content containers?

Waste Disposal

So you've reduced your waste generation, exchanged, reused, and recycled as much waste as possible, and *still* have some left. Proper preparation and disposal can help reduce negative impacts on the environment. After triple or pressure-rinsing, as discussed in Tool 6d, empty pesticide containers are no longer considered hazardous waste, and may be taken to a licensed landfill.

However, because landfill operators are responsible for any environmental or health problems resulting from waste they accept, they may not want your containers if they are not prepared correctly. Landfill operators will be more likely to accept containers that are obviously empty and have been thoroughly rinsed. The next page has some steps to follow when handling empty containers.

Never bury pesticide containers. You could contaminate the environment: your soil or well or your neighbor's. Preventing the pollution is much easier than the clean up and possible legal and health costs.

Proper Management of Metal or Plastic Containers

1. Triple rinse or pressure rinse immediately after emptying container.
2. Puncture the bottom of container.
3. Crush container if possible.
4. Recycle container if possible and allowed by local ordinances.
5. If unable to recycle, take to licensed landfill.
6. If landfill will not accept them, try to return them to supplier. Discuss your disposal problems with your suppliers and try to develop a solution.

Proper Management of Glass Containers

1. Triple rinse immediately after emptying container. *Do not crush glass containers.* Crushed glass is difficult to recycle and dangerous to handle.
2. Recycle the container if possible, and allowed by local ordinances.
3. If unable to recycle, take to licensed sanitary landfill.
4. If the landfill operator will not accept them, try to return them to supplier. Discuss your disposal problems with your suppliers and see if they have a solution.

Proper Management of Dry Formulation Bags or Boxes

1. Empty completely.
2. Open both ends of bag or box.
3. Take to licensed landfill.
4. If the landfill operator will not accept them, try to return them to supplier. Discuss your disposal problems and see if your supplier has a solution.

And now about burning....

Burning pesticide containers at open burning sites, burn barrels, and domestic incinerators is dangerous and, in some areas, illegal. Pesticide residues in the container may produce toxic fumes when burned. While burning may destroy some toxic substances, others will become concentrated in the smoke and ash. Burning bags and boxes in the same location may cause toxic substances in smoke to build up in a concentrated area around the burn site. These substances, as well as the toxic substances in ash, could contaminate the soil and groundwater. Also, some toxic substances may be carried great distances in the smoke. Switching pollution from one form, solid waste on the land, to another, toxic fumes in the air, or toxics in groundwater is not pollution prevention.

Check your local and state ordinances to see if you can legally burn bags or boxes. If it is legal and they must be burned because you have no other options, burn them well away from people, pets, and farm stock. The air will carry pesticide particles from the fire. Burn in small quantities and only on the field where the pesticide was applied.

Hazardous waste

Contract with qualified and licensed hazardous waste handlers to properly dispose of your hazardous wastes. Many of the same common sense precautions for handling and storing pesticides apply to hazardous waste.

☐ Do you make sure that all containers that held hazardous materials such as pesticides or solvents are completely drained so that they are legally empty and therefore not a hazardous waste?

- Product containers should not be reused unless they have been adequately rinsed and are used to store the same or other compatible materials. See if your supplier will accept and reuse empty containers.

☐ Are hazardous wastes labeled and stored:

✓according to state and federal regulations?

- Check with your local fire department about storage of flammable materials.

✓ in a location where accidental spills or leaks will not contaminate storm and sewer drains?
✓ in a safe location out of major traffic areas?
✓ with secondary containment, such as curbing, in case of a leak?
✓ on sealed concrete to reduce the chance of seepage into the soil if a leak or spill should occur?
✓ indoors or in a covered area to prevent moisture from seeping in?

- Moisture could increase the volume of your hazardous waste, resulting in increased disposal costs.

So What's Next?

Hopefully, you have discovered some new ideas to help prevent pollution in your business. Hang on to this set of sheets for the time being. They'll be helpful when you are considering and prioritizing pollution prevention options.

But first, it's important to know what wastes and what quantities of those wastes your business generates. The next tool will help you assess your wastes. Think twice if you're tempted to skip that tool. A waste assessment can provide valuable information for you.

A waste assessment will help you:

✓ identify what wastes your business produces.
✓ establish a baseline for measuring progress and evaluating your pollution prevention program.
✓ decide which wastes to target for pollution prevention first. You will know what wastes are produced in the greatest volumes, and those that have the greatest toxicity.

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Pollution Prevention

Helping Your Business and the Environment

Number 7 University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

Ready to Begin Preventing Pollution?

First, find out what types and quantities of wastes your business is producing. This is important, as it helps you pinpoint where you can prevent pollution, and gives you a baseline for evaluating progress.

Remember that wastes started out as raw materials somewhere in your business. Not only are you paying for waste disposal, you are paying for raw materials that weren't fully used.

This tool will help you collect and analyze information for pollution prevention. If you want a more in-depth assessment and analysis of options, see Tools 10a-g.

One way to look at how much waste your business generates is to look at each process within your company. Some processes in farm cooperatives include:

Purchasing
Shipping and receiving
Storage and inventory
Office/recordkeeping
Vehicle maintenance
Chemical mixing
Chemical application
Equipment repair
Janitorial

Cost Identification

Realizing what waste is costing your business will make pollution prevention more valuable to you. To determine whether a pollution prevention option is economically favorable, you have to know what processes within your business cost at present.

Record the estimated annual capital, operational, and disposal costs associated with each process. This will help when evaluating the cost effectiveness of possible pollution prevention options.

Process: _____

1. Annual operating costs (including labor, materials, maintenance) $_____
2. Annual capital costs (includes equipment, planning, installation) $_____
3. Annual disposal costs (transportation, fees, regulatory compliance) $_____

Total Annual costs $_____

Next, check the types of wastes generated by the processes you identified. Copy this form as needed. Record the estimated quantity of waste generated by each process.

Process: _____

Waste type	Amount/month	Waste type	Amount/month
Air emissions	_____	Spoiled batches	_____
Evaporation losses	_____	Wastewater	_____
Maintenance losses	_____	Corrosive waste	_____
Solid waste	_____	Reactive waste	_____
Out-dated stock	_____	Ignitable waste	_____
Overspray	_____	Toxic waste	_____
Spills	_____	Other	_____

Process: _____

Waste type	Amount/month	Waste type	Amount/month
Air emissions	_____	Spoiled batches	_____
Evaporation losses	_____	Wastewater	_____
Maintenance losses	_____	Corrosive waste	_____
Solid waste	_____	Reactive waste	_____
Out-dated stock	_____	Ignitable waste	_____
Overspray	_____	Toxic waste	_____
Spills	_____	Other	_____

Now that you have a handle on what wastes your business produces, try to target some for pollution prevention. You'll probably want to work on those that are the most hazardous, or produced in the largest quantities.

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Analyzing Pollution Prevention Options

Look at your list of wastes, and then go back to waste prevention options listed in Tool 6. Here are some points to consider as you note feasible options. Check those that apply, and put a question mark by those you need to look into further.

Pollution prevention option: _____

☐ Will the option affect your most hazardous or largest waste streams?

☐ Is the option easy to implement?

☐ Does the technology have a track record?

☐ Are there case studies describing the application of the option in the industry?

☐ Do you know if the option requires different raw materials than previously used? What types and amounts?

_____

_____

☐ Will those different raw materials be less hazardous?

☐ Can you determine annual operating costs and capital costs of the option?

Operating cost estimate $_____

Capital cost estimate $_____

☐ Do you know if the option will produce waste? What types and how much?

_____

_____

☐ Will the waste be less hazardous than that produced before implementing the option?

☐ Are you sure that the option does not shift waste to a different form, or to a different process within your business?

Don't exclude any option until it has been analyzed completely. High tech options are not always the best, especially at first. If you're just beginning a pollution prevention program, you'll see positive results quickly if you select an option that is easy to implement. This will give everyone incentive to continue. Many businesses first prevent pollution through simple changes in business procedures such as improved housekeeping and waste segregation. As they gain experience, they move on to more challenging options.

Take a closer look at those options to see if they are economically and technically feasible. Again, check those that apply. Put a question mark by those you're unsure of, and try to find the answer.

Pollution prevention option: _____

Economic Evaluation

☐ Is this option within your price range, considering both capital and ongoing operation costs?

☐ Does this option have an acceptable payback period?

☐ Does this option reduce your raw material costs?

☐ Does this option reduce your utilities costs?

☐ Does this option reduce material and waste storage costs?

☐ Does this option reduce regulatory compliance costs?

☐ Will this option reduce the costs associated with worker injury or illness?

☐ Will this option reduce your insurance premiums?

☐ Will this option reduce your waste disposal costs?

Technical Evaluation

☐ Does this option have a proven track record?

☐ Will this option maintain product quality?

☐ Are you ready to handle new training procedures and expertise if required?

☐ Can you add additional staff if required?

☐ Will this option create less waste?

☐ Are you certain this option will not simply shift waste to another form?

☐ Is your plant layout and design capable of incorporating this option?

☐ Do you know if this option will require any down time for implementation?
How much? _____

☐ Will the vendor guarantee this option?

☐ Will this option improve or maintain worker safety and health?

☐ Are new material handling, storage or disposal techniques required?

☐ Are materials and parts readily available?

☐ Can this option be easily serviced?

☐ Are other businesses using this option?

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Pollution Prevention Program Review

An effective pollution prevention program is ongoing. It is important to step back and evaluate what you've accomplished, and set new goals. The following questions will help keep you on track. Place a check by those you've done, and a question mark by those that need further attention.

☐ Have you implemented all the previously defined options?

☐ Does pollution prevention remain a priority for workers and management?

Have your pollution prevention efforts reduced costs through:

☐ Reduction of raw material costs?

☐ Savings on pollution control equipment?

☐ Reduced compliance costs?

☐ Reduced disposal costs?

☐ Improved worker safety and health?

☐ Reduced insurance costs?

☐ Other _____

How effective have your efforts been at reducing the following types of wastes?

	Amount per year		Amount per year
Air emissions	_____	Solid wastes	_____
Evaporative wastes	_____	Spills/container leaks	_____
Hazardous waste	_____	Spoiled production runs	_____
Heat/energy losses	_____	System leaks	_____
Maintenance waste	_____	Wastewater	_____
Out-dated stock	_____	Other _____	_____
Overspray	_____	Other _____	_____

☐ Do you have an ongoing education plan to keep pollution prevention in employee's minds?

☐ Have you recognized employees or management for efforts?

☐ Have you publicized your efforts within the community, in your industry?

☐ Have you applied for awards?

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Pollution Prevention

Helping Your Business and the Environment

Number 8 University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

Yard Waste, A Growing Concern

Nearly 20% (by weight, 10% by volume) of the solid waste from our homes and businesses consists of yard trimmings - grass clippings, leaves, brush, and tree prunings. The amount of yard trimmings generated varies considerably by region, season, and even from year to year.

During peak months, primarily summer and fall, yard trimmings can represent as much as 25 to 50% of the municipal solid waste. Grass clippings account for over half of all the yard trimmings generated.

If your business maintains a yard, here are a few ideas you can use to reduce the waste it causes. Think about recycling grass clippings back to your lawn, composting leaves, and using water wisely.

Your Cooperative Extension office may have more detailed information specific to your area.

Returning Grass Clippings to the Turf Will Save You Time and Money

In a Fort Worth, Texas pilot project, participants found that since bagging clippings was no longer necessary, they spent an average of 38% less time on each mowing.

✓ Because it is not necessary to stop every 10 minutes to empty the mower bag or rake the lawn after you finish mowing, you can mow a lawn in 1/3 less time. Although you'll mow more frequently, the time spent on each mowing session and the overall mowing time will be reduced.

✓ Grass clippings contain about 3-4% nitrogen by weight, about 25% of the lawn's fertilizer needs. This can save about one fertilizer application every year.

✓ If you leave lawn clippings on the lawn, you no longer need to purchase plastic bags for lawn clippings. This saves money over a year's time.

✓ Grass clippings increase the amount of organic matter found in the soil. This increases the soil's ability to hold moisture and nutrients in sandy soils, and improves drainage in heavy soils. All in all, your lawn will be healthier.

If you need to redo your lawn, consider planting a grass or perennial that fits your site and climate conditions. Some are more heat and drought tolerant than others. Plants native to your area usually fare best.

Recycling Grass Clippings Back to Your Lawn Makes Good Sense for Many Reasons

✓ Yard trimmings take up valuable landfill space, about 3.5 cubic yards per ton.

✓ Yard trimmings are banned from landfills in some areas. By mid 1995, 20 states will have landfill bans on yard trimmings, the second largest component of the solid waste stream.

✓ Yard trimmings are expensive to transport and bury. For example, in Omaha, Nebraska, taxpayers pay $48 per ton to collect, haul, and landfill waste.

✓ Yard trimmings contribute to explosive methane production in the landfill. Although organic materials in a landfill breakdown or decompose very slowly, decomposition does occur. One of the by-products of decomposition is methane gas.

✓ Because lawn clippings are made of up to 90% water, grass clippings can contribute to leachate problems in the landfill, potentially causing groundwater contamination.

Making the Switch

To help your grass stay healthy, or to get it in better shape, do not remove more than one third of the blade, and no more than one inch total height at any one time. For example, if your lawn is 3 inches from soil to the tip of the grass blade, you can remove 1/3 of it, or 1 inch. If your mower doesn't allow you to return clippings to the lawn, put the clippings on a compost pile.

Fertilization Plan

The rate of fertilizer application, the frequency of application, and the source of nitrogen will determine how fast the lawn grows. For slow, even growth, use a fertilizer containing either sulfur-coated urea or urea formaldehyde as a nitrogen source rather than those such as ammonium sulfate, urea or ammonium nitrate that tend to produce a very fast growth for short periods. This is important for early summer applications. Check the fertilizer label to determine the specific nitrogen source.

Water Use

In the summer, a great deal of water is used on lawns. Make every drop count.

• Place your sprinklers so that you are watering lawn, not driveways, sidewalks, or gutters.

• Avoid watering on windy days when sprinkler coverage is difficult to predict. More water is probably carried off into the atmosphere than reaches the lawn.

• Water early in the morning so less water is lost to evaporation. Don't water in the evening; you'll just encourage plant diseases.

• Turn sprinklers off if water is running off the lawn and onto the sidewalk or road. Let the moisture soak in, and begin watering in an hour if more is needed.

• Water deeply and less frequently. Lawns watered too frequently develop shallow root systems, making them more susceptible to grub damage and heat or drought stress.

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Blow Your Horn! Publicize Your Pollution Prevention Efforts

Pollution prevention helps your business by reducing waste collection and disposal costs. Your customers and your community also benefit by having a cleaner environment.

You can help develop your image as a business that cares about the environment by telling the public about your efforts. Concern for the environment and its quality ranks high in national surveys. Your ability to compete in the marketplace may improve if you use pollution prevention methods. Let the public know what you are doing.

✓ Document your waste reduction successes in annual reports, company brochures, advertizing, and press releases. And show that you hold true to your commitment. Print documents on both sides of the paper. Use paper made from post-consumer recycled materials, material that has been used by the consumer and then recycled. Try to use paper that is easily recycled. Also, request inks that don't contain heavy metals.

✓ Share your successes with trade associations, local government, local environmental organizations, and other community groups.

✓ Identify your products that are made from recycled materials. Indicate what percentage of post-consumer recycled material was used to make the product.

✓ Of course, minimal packaging is appreciated. Try to avoid excessive packaging so your customers aren't stuck with a lot of waste. If you need packaging, try to use materials that can be recycled in your area. Again, let the public know that you're trying to reduce waste.

✓ Promote the use of environmentally friendly materials. Let your customers know that you choose to avoid the use of hazardous or toxic substances in your business.

✓ Contact your local newspaper, as well as TV and radio stations to find out if they have an "Environmental Hero" spot, telling of local efforts to help the environment.

Invite a news reporter to see what you've accomplished in pollution prevention. You may want to submit your own article. Remember those important W's: *Who, What, Where, When* and *Why*. A sample news release appears below.

Local Printing Business Prevents Pollution

The ACME Printing Company has embarked on a pollution prevention project, reducing the amount of waste produced. They recently switched from petroleum-based to soy-based inks in their printing processes. By doing so, the presses can be cleaned with water-soluble solutions instead of traditional solvents that the oil-based inks require.

In addition, soybean oil is a renewable product, raised right here in the U.S. This type of ink reduces our dependence on foreign petroleum products.

PRINTED WITH SOY INK™

Acme Printing company also announces a new line of recycled paper stock available for printing. The paper has 100% post-consumer content, meaning all the fiber used to make it has been through the hands of the public. This new line allows the community to complete the recycling loop; people have more opportunities to purchase recycled paper locally.

Awards and Grants

There are grants and awards for pollution prevention efforts. Consider applying for a grant if you want to try a pollution prevention idea but just can't find the money for it. Awards are available to recognize successes. There may be stiff competition for these, but that makes them all the more prestigious. Just the process of applying for grants and awards can help pull members of your business together as a team, and can be a useful enterprise in itself.

Grants and awards may be available on the local level in your area. Contact your city or county health department, public utilities, Cooperative Extension office, or local citizen environmental groups. If they have no grants or awards to offer, they may be able to point you in the right direction.

The following page lists some grants and awards available. Incidentally, many states were developing recognition programs for pollution prevention efforts when this publication went to press. Write or call those contacts listed in Tool 1a to learn if more awards or grants are available.

Remember to Reward Your Employees

Do you have in-house recognition for good ideas, great efforts, and dedication to the pollution prevention cause? A certificate of recognition, a party, a meal out, a reserved parking space, or even free movie passes are a few ideas to consider. Let people know you appreciate their help in preventing pollution. Some businesses feel that involvement in pollution prevention ranks high enough to be used as criteria when raises and promotions are considered.

State Pollution Prevention Awards and Grants

Iowa Landfill Alternatives Grant Program. Grants from the Waste Management Authority Division of the Department of Natural Resources provide assistance in initiating or expanding solid waste management projects that are innovative and offer alternatives to landfilling. Application deadlines are the first Monday in June and the first Monday in December. For more information, contact:

Tom Anderson (515) 281-8623 or Jeff Geerts (515) 281-8176
Iowa Department of Natural Resources
Waste Management Assistance Division
Wallace State Office Building
900 East Grand Avenue
Des Moines, Iowa 50319

Iowa Governor's Waste Reduction Award. This is granted to Iowa businesses or industries that have implemented a waste reduction project with the best demonstrated environmental, economic, and safety benefits. Awards are given in three categories: large manufacturing facility, small manufacturing facility, and non-manufacturing business. The deadline for nominations is in June. Contact the Waste Management Assistance Division at (800) 367-1025 or Iowa's Waste Reduction Center at (800) 422-3109 for more information.

Kansas Pollution Prevention Award Program. The Kansas Department of Health and Environment invites all sectors of society to participate in the Kansas Pollution Prevention Award Program. This annual state-wide program recognizes excellence in efforts to work toward a cleaner environment. The following levels of activity are recognized:
Pledge- Participants pledge to practice pollution prevention.
Shareholder- Participants prepare a pollution prevention plan and establish reduction goals.
Pacesetter- The organization implements their pollution prevention plan and documents the reduction of pollutants or conservation of resources.
Trendsetter- The organization has demonstrated pollution prevention measures that are easily shared with similar organizations.
Innovator- The highest level of participation, the organization receiving this award has continued pollution prevention activities within and also promotes pollution prevention in the community.
Pledge cards, summaries or reports of Pollution prevention activities must be received in the Office of Pollution Prevention by July 1. For more information, contact:

Director, Office of Pollution Prevention
Kansas Department of Health and Environment
Office of Science and Support
Forbes Field, Building 740
Topeka, KS 66620.

National Awards, Grants and Programs

NICE^3 Does your company have a technology idea that could save energy, prevent pollution, and improve your industry's bottom line? If so, you may be able to apply for assistance through a program cosponsored by the US Department of Energy (DOE) and the US EPA. This program, known as the National Industrial Competitiveness through Efficiency: Energy, Environment, and Economics encourages industry to reduce industrial waste at its source or use waste productively. To request a brochure or project proposal solicitation packet (#DE-PS49-94R90001), call Eric Hass, DOE, Denver, CO (303) 275-4728 or Sharon Riegel, EPA, Denver, CO (303) 293-1471.

33/50 Corporations involved with this voluntary EPA program pledge to reduce their emissions of 17 high-priority toxic chemicals by 33% at the end of 1992 and 50% by 1995. All of the targeted chemicals are on the EPA Toxic Release Inventory. Don't hesitate to become involved; the 1992 goal was an interim target and data on the 1995 goal will not be released until 1997. There is plenty of time for your business to get involved. For more information, call Carl Walter, EPA Region VII (913) 551-7600, or Kerry Whitford, EPA Region VIII (303) 294-7684.

Green Lights This voluntary US EPA program encourages the use of energy-efficient lighting to reduce pollution. Green Lights provides informational tools to help corporations make informed upgrade decisions. It has developed a registry of financing resources available to all Green Lights participants. For more information, contact US EPA, Green Lights 6202J, 401 M Street, SW, Washington, DC 20460 (202) 775-6650.

SBIR The Small Business Innovation Research Program is a highly competitive 3-phase award system that provides qualified small businesses with opportunities to propose innovative ideas that meet the specific research needs of the Federal Government. US-owned and based firms with less than 500 employees are eligible to compete. To get on the SBIR mailing list for announcements, call (202) 205-7777 or write to:

Small Business Administration
409 3rd Street SE
Washington DC 20416

Waste Wi$e is a voluntary program sponsored by the EPA. Companies that become members commit to making significant progress in the areas of waste prevention, recycling, and buying or manufacturing recycled products. For more information, call 1-800-EPAWISE and ask for the brochure *Waste Wi$e: EPA's Voluntary Program for Reducing Business Solid Waste.*

Consider these ideas as you apply for awards or grants:

✓ Be sure you read the criteria carefully. Some pollution prevention programs may consider only source reduction, which are methods of eliminating the generation of pollution. Some may also consider waste exchanges and recycling. Make sure you understand what the grants and awards are offered for.
✓ Follow directions. If the form asks for 1 page of double-spaced, typed information, don't submit 2 pages of handwritten material.
✓ Be clear and concise. Put yourself in the grantor's shoes.
✓ Meet all deadlines. Start early so you have time to fill out applications and check them over.

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Number 10a University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

Farm Cooperative Hazardous and Non-hazardous Waste Assessment

Copy this form and use a separate one for each process or area in your business. Some processes typically associated with hazardous waste include storage, shipping and receiving, chemical mixing, chemical application and facility maintenance. Don't forget to look at the nonhazardous waste your business generates when considering waste reduction opportunities. Check out your office and break areas.

Process or area: _____

Date: _____

Write down all hazardous materials used in the process or area identified above. Include amounts of materials used per month for future reference. Consider replacing these with non-hazardous substitutes as they become available. Refer to your MSDS for help.

Hazardous materials	Amount used (lbs or gal/month)	Where does it go? (product, waste)

Wastes

Hazardous Wastes: These wastes may cause or significantly contribute to serious illness or death, or pose a substantial threat to human health or the environment when managed improperly.

Hazardous wastes ag cooperatives may generate include:
expired chemicals, petroleum products, spent solvents, excess chemicals from spray applications, and sprayer tank rinse water.

Hazardous waste	Amount used/month

Non-hazardous wastes: These are wastes that typically are sent to a licensed sanitary landfill. You may be able to reduce the amount of waste produced, recycle it, or find another business or institution that could reuse it. Check the box if it is present in your business waste stream. Those in **bold** are typically easy to find recycling outlets for.

Material	Estimated % in waste stream
PAPER	
☐ **green bar computer**	_____
☐ **white form feed**	_____
☐ **white letterhead**	_____
☐ **white copy**	_____
☐ **white ledger pads**	_____
☐ **cash register receipts**	_____
☐ **adding machine tape**	_____
☐ **white envelopes**	_____
☐ colored copy paper	_____
☐ yellow legal pads	_____
☐ colored letterhead	_____
☐ message pads	_____
☐ **newsprint**	_____
☐ junk mail	_____
☐ magazines	_____
☐ window envelopes	_____
☐ stick-on notes	_____
☐ cardboard	_____
☐ paper plates/cups	_____
☐ paper napkins/towels	_____
☐ tissue	_____
☐ wax-coated paper	_____
☐ plastic-coated paper	_____
☐ carbon paper	_____
☐ **OTHER**	_____
☐ **OTHER**	_____
☐ **OTHER**	_____

Material	Estimated % in waste stream
PLASTICS	
☐ **PETE (#1)**	_____
☐ HDPE pigmented (#2)	_____
☐ **HDPE transparent (#2)**	_____
☐ HDPE film (#2)	_____
☐ LDPE film (#4)	_____
☐ vinyl bottles (#3)	_____
☐ polypropylene bottles (#5)	_____
☐ polystyrene foam (#6)	_____
☐ rigid polystyrene (#6)	_____
☐ other plastics (#7)	_____
ALUMINUM	
☐ **cans**	_____
☐ foil	_____
☐ other (rain gutters)	_____
STEEL	
☐ **steel cans**	_____
☐ other	_____
GLASS	
☐ **clear**	_____
☐ **brown**	_____
☐ **green**	_____
YARD WASTE	
☐ grass clippings	_____
☐ leaves and brush	_____

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Costs of Processes

Copy this form and use a separate one for each process or area in your business. Use estimates where actual costs are not available. This information is important for determining economic feasibility of pollution prevention options, and for measuring the success of your efforts.

Process or Area: _____

Date: _____

Operating Costs

Hazardous materials (See MSDS)	Cost per month
	Subtotal

Labor and equipment	Cost per month
	Subtotal

Utilities	Cost per month
	Subtotal

Hazardous waste handling and storage	Cost per month
	Subtotal

Hazardous waste treatment	Cost per month
	Subtotal

Hazardous waste disposal	Cost per month
	Subtotal

Non-hazardous waste handling and storage	Cost per month
_____	_____
_____	_____
	Subtotal _____

Non-hazardous waste disposal	Cost per month
_____	_____
_____	_____
	Subtotal _____

Other costs	Cost per month
_____	_____
_____	_____
_____	_____
_____	_____
	Subtotal _____

Total monthly operating costs (add all subtotals) _____

x 12 months per year

Annual operating costs _____

Capital and Additional Costs

This section summarizes your annual capital and miscellaneous costs for each process as it presently exists.

Equipment purchase	$_____	Permitting	$_____
Construction/installation	$_____	Contracting	$_____
Connections to utilities	$_____	Training	$_____
Engineering	$_____	Start-up	$_____
Other	$_____	Other	$_____

Total annual capital and additional costs $_____

Total Costs for Process

Annual operating costs	$_____
Annual capital costs	$_____
Total costs	$_____

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Pollution Prevention

Helping Your Business and the Environment

Number 10c University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

Screening Pollution Prevention Options

Copy this form and use a separate one for each pollution prevention option you are considering for your business.

Pollution Prevention Option:

_____

Proposed by: _____ **Date:**____

Briefly describe the option:

What will be affected by the option?	Estimated impact
☐ Hazardous material (name)	
_____	_____
_____	_____
☐ Hazardous waste	
_____	_____
_____	_____
☐ Non-hazardous waste	
_____	_____
_____	_____
☐ Product	
_____	_____
_____	_____

What type of option is this?

- ☐ Change in housekeeping or maintenance
- ☐ Inventory change
- ☐ Equipment change
- ☐ Raw material change
- ☐ Process change

Although recycling and waste exchanges mean that you haven't eliminated waste generation, these options are preferable to disposal.

- ☐ Recycling
- ☐ Reuse off-site

Has this option been tried before in a similar workplace setting? ☐ Yes ☐ No ☐ Uncertain

Is this a policy change? ☐ Yes ☐ No

Are there equipment/material requirements? ☐ Yes ☐ No

Are there any other requirements?

- ☐ Facility modifications
- ☐ Utility requirements
- ☐ Special storage or handling
- ☐ Testing requirements
- ☐ Regulatory impacts

Option approved for further evaluation: ☐ Yes ☐ No Date: _____

Reason for acceptance or non-acceptance:

Reconsider at later date? ☐ Yes ☐ No

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Pollution Prevention

Helping Your Business and the Environment

Number 10d University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

Technical Feasibility

Here are questions to help you determine if those pollution prevention options that passed the initial screening phase are technically feasible. Copy this form and use a separate one for each pollution prevention option that has passed the screening phase.

Pollution Prevention Option:

_____

Proposed by: _____ **Date:**_____

Briefly describe the option:

Type of option: ☐ Equipment related ☐ Process related

☐ Raw material related ☐ Personnel related

Why do you think this option is feasible?

What areas and personnel are affected?

Are required space and utilities available? ☐ No ☐ Yes ☐ Uncertain

Will production quality or services be affected? ☐ No ☐ Yes ☐ Uncertain

If yes, how much? ☐ Low impact ☐ Medium impact ☐ High impact

Will production or services be stopped to modify or install a new system?
☐ No ☐ Yes ☐ Uncertain

If yes, how much? ☐ Hour ☐ Day ☐ Week

Describe any new training procedures or special expertise required to operate or maintain the new system:

Are new material handling, storage, or disposal techniques required?
☐ No ☐ Yes ☐ Uncertain

If yes, explain briefly.

Does the system create other environmental or health and safety problems?
☐ No ☐ Yes ☐ Uncertain

If yes, explain briefly.

Other considerations or limitations:

Option approved for further evaluation: ☐ Yes ☐ No Date: _____

Reason for acceptance or non-acceptance:

Reconsider at later date? ☐ Yes ☐ No

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Pollution Prevention

Helping Your Business and the Environment

Number 10e University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

Economic Feasibility

Here are questions to help you determine if those pollution prevention options that passed the initial screening phase are economically feasible. Copy this form and use a separate one for each pollution prevention option that has passed the screening phase.

Pollution Prevention Option:

_____

Proposed by:_____ **Date:**_____

Briefly describe the option:

Operating Costs and Savings

Estimate monthly increases or decreases in operating costs attributable to the option.

	Increase	Decrease
Hazardous material purchase	$ _____	$ _____
Non-hazardous raw material purchase	$ _____	$ _____
Labor and equipment	$ _____	$ _____
Health and safety	$ _____	$ _____
Quality assurance	$ _____	$ _____
Insurance	$ _____	$ _____
Liability	$ _____	$ _____
Training	$ _____	$ _____
Utilities	$ _____	$ _____
Hazardous waste handling and storage	$ _____	$ _____
Hazardous waste treatment	$ _____	$ _____
Hazardous waste disposal	$ _____	$ _____
Non-hazardous waste handling and storage	$ _____	$ _____
Non-hazardous waste disposal	$ _____	$ _____
Other	$ _____	$ _____
Totals	$ _____	$ _____

Capital Costs

Estimate capital costs of implementing the option.

	Cost
Equipment purchase	$ _____
Construction/installation	$ _____
Connections to utilities	$ _____
Engineering	$ _____
Permitting	$ _____
Contracting	$ _____
Training	$ _____
Start-up	$ _____
Other	$ _____
Total capital costs	$ _____

New revenues

Estimate all new revenues that would result from implementing the option. Potential revenue sources include recovered products from recycling, usable by-products, and increased sales of products.

Source of revenue	Revenue per month
_____	$ _____
_____	$ _____
_____	$ _____
_____	$ _____
Total revenues	$ _____

Option approved for further evaluation: ☐ Yes ☐ No Date: _____

Reason for acceptance or non-acceptance:

Reconsider at later date? ☐ Yes ☐ No

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Pollution Prevention

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Pollution Prevention Option Summary

Copy this form and use a separate one for each pollution prevention option in your business. Keep a copy in your files for future reference. You may choose to use an option at a later date, or you may think of modifications.

Pollution Prevention Option:

_____

Proposed by: _____ **Date:** _____

Briefly describe the option:

Why did you select or not select this option?

Is this option technically feasible at this time? ☐ Yes ☐ No

In the future? ☐ Yes ☐ No

Is this option economically feasible? ☐ Yes ☐ No

In the future? ☐ Yes ☐ No

Estimate the reduction that will be achieved. Choose the measurement that is easiest.

☐ Hazardous material	_____ pounds	_____ gallons	_____ %
☐ Hazardous waste	_____ pounds	_____ gallons	_____ %
☐ Non-hazardous waste	_____ pounds	_____ gallons	_____ %

If you decided not to implement change, did you still provide positive feedback for the idea, and relate that the idea was worth looking into? ☐ Yes ☐ No

Additional notes:

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Pollution Prevention

Helping Your Business and the Environment

Number 10g University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering January 1995

Evaluation of Pollution Prevention Project

This sheet will help you evaluate each pollution prevention project your business undertakes. Make copies of this blank form to use with each one. Keep this on file to monitor the progress your business is making in preventing pollution.

Pollution Prevention Option Implemented:

_____

Proposed by:_____ **Date:**_____

What waste stream or hazardous material was targeted? _____

Why? ☐ Regulated as hazardous waste ☐ Largest volume ☐ Most costly

☐ Affected employee health ☐ Waste reduction method was easy to implement

What change was implemented?

Pollution Prevention Technique Involved:

☐ General housekeeping
☐ Maintenance
☐ Storage
☐ Inventory
☐ Basic operations
☐ Equipment modification
☐ New equipment purchase
☐ Raw material substitution
☐ Process modification
☐ In-house reuse
☐ Off-site recycling
☐ Waste exchange

Were difficulties encountered during trial implementation? Explain.

Were these overcome? ☐ Yes ☐ No

How?

The Bottom Line

	Cost of waste disposal	Amount of waste
Prior to change	$_____	_____
— After change	$_____	_____
Net change	$_____	_____

Cost of implementation _____

How were the following affected?

Product quality/customer satisfaction	☐ Increase	☐ Decrease	☐ No change
Production	☐ Increase	☐ Decrease	☐ No change
Worker/workplace safety	☐ Increase	☐ Decrease	☐ No change
Waste generation	☐ Increase	☐ Decrease	☐ No change
Business liability for pollution	☐ Increase	☐ Decrease	☐ No change
Business image within the community	☐ Improve	☐ Decrease	☐ No change
Worker morale	☐ Increase	☐ Decrease	☐ No change
Costs of handling waste	☐ Increase	☐ Decrease	☐ No change

Did you feel project was successful? ☐ Yes ☐ No Why or why not?

Did you publicize the pollution prevention project within the following:
☐ Business ☐ Trade Association ☐ Community

How? ☐ Newspaper article ☐ TV spot ☐ Radio spot ☐ Trade association meeting
☐ Trade magazine ☐ Other

Was recognition given to the person who generated the idea? ☐ Yes ☐ No

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Evaluation of Pollution Prevention Tool Kit

Your feedback is important to us! Please take a minute to answer the following questions on both sides of this sheet. Then fold, secure with tape, and mail. Thanks!

1. The materials in the tool kit:	No		Some		Yes
were helpful in understanding pollution prevention.	1	2	3	4	5
helped me incorporate pollution prevention into my business.	1	2	3	4	5
helped me reduce the amount of waste produced at my business.	1	2	3	4	5

By how much? _____ pounds per month.
_____ gallons per month.

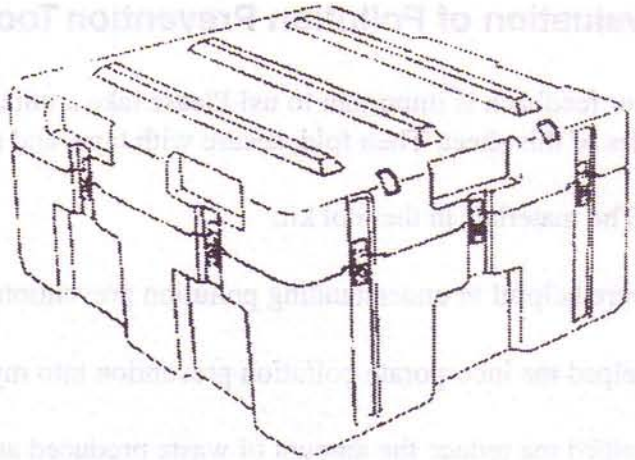
2. Read each of the statements below and rank yourself at the present time. Next, think back to your understanding about each statement before using the tool kit. Circle the appropriate numbers using the following key:

1 = no understanding/involvement
2 = little understanding/involvement
3 = moderate understanding/involvement
4 = good understanding/involvement
5 = excellent understanding/involvement

How would you describe your understanding of:

	After using materials					Before using materials				
the concept of pollution prevention?	1	2	3	4	5	1	2	3	4	5
pollution prevention methods: including good housekeeping, purchase and inventory, changes in equipment, raw material substitution, changes in technology?	1	2	3	4	5	1	2	3	4	5
economic benefits of pollution prevention?	1	2	3	4	5	1	2	3	4	5
environmental benefits of pollution prevention?	1	2	3	4	5	1	2	3	4	5
implementing pollution prevention in a business?	1	2	3	4	5	1	2	3	4	5

3. What Tool Kit did you receive?



- ☐ Drycleaning
- ☐ Metal finishing
- ☐ Autobody repair
- ☐ Vehicle maintenance
- ☐ Farm Cooperative

4. In what state are you located? _____

5. How many people does your business employ full-time? _____ part-time? _____

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Dr. Wayne E. Woldt
Biological Systems Engineering Department
University of Nebraska-Lincoln
P.O. Box 830726
Lincoln, NE 68501-9988