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## EC95-741 Pollution Prevention: A Tool Kit for Drycleaners

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# Pollution Prevention

*Helping Your Business and the Environment*



## A Tool Kit for Drycleaners



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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These people and agencies helped with this project.



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.

Although information from this document has been funded in part by the US Environmental Protection Agency under assistance agreements R-819653 to the Great Plains-Rocky Mountain Hazardous Substance Research Center headquartered at Kansas State University, it has not been subjected to the agency's peer and administrative review, and therefore may not necessarily reflect the views of the agency. No official endorsement should be inferred. Material in the 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.



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 :

Cooperative Extension Publications Distribution  
Room 105 Agriculture Communications Building  
PO Box 830918  
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# Pollution Prevention

## Helping Your Business and the Environment

Number 1

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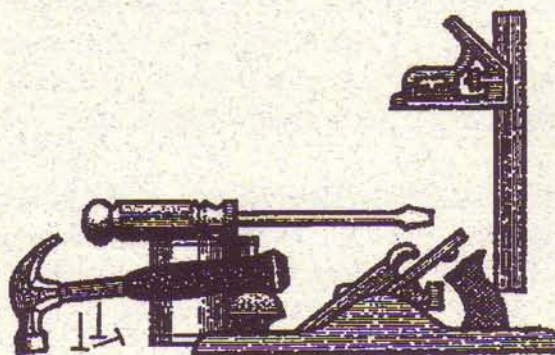
### Would you like to:

- ✓ 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*



# Pollution Prevention

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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.

<b>EPA Region VII</b> Steve Wurtz US EPA Region VII 726 Minnesota Avenue Kansas City, KS 66101 (913) 551-7315		
<b>IA</b>	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
<b>KS</b>	Michelle Feenstra Kansas State University Engineering Extension Manhattan, 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
<b>MO</b>	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
<b>NE</b>	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

<b>CO</b>	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
<b>MT</b>	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
<b>ND</b>	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
<b>SD</b>	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
<b>UT</b>	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
<b>WY</b>	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

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### Why the Concern About Waste?



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

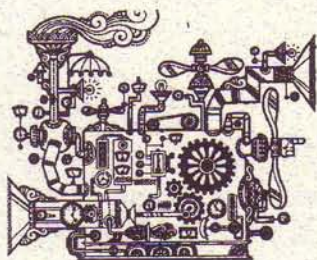
As a business owner, you've noticed waste disposal costs climb year by year. Along with that have come increased regulations from federal, state, and local governments, especially in the area of hazardous waste. How did we get to this point?

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.

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.



As technology has developed, our waste has changed.

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.

**Pollution Prevention:**

Try not to make waste in the first place.

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!

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.





Pollution prevention has increased business profits.

***Pollution prevention benefits include***

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

## And pollution prevention works

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.

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.



# Pollution Prevention

## Helping Your Business and the Environment

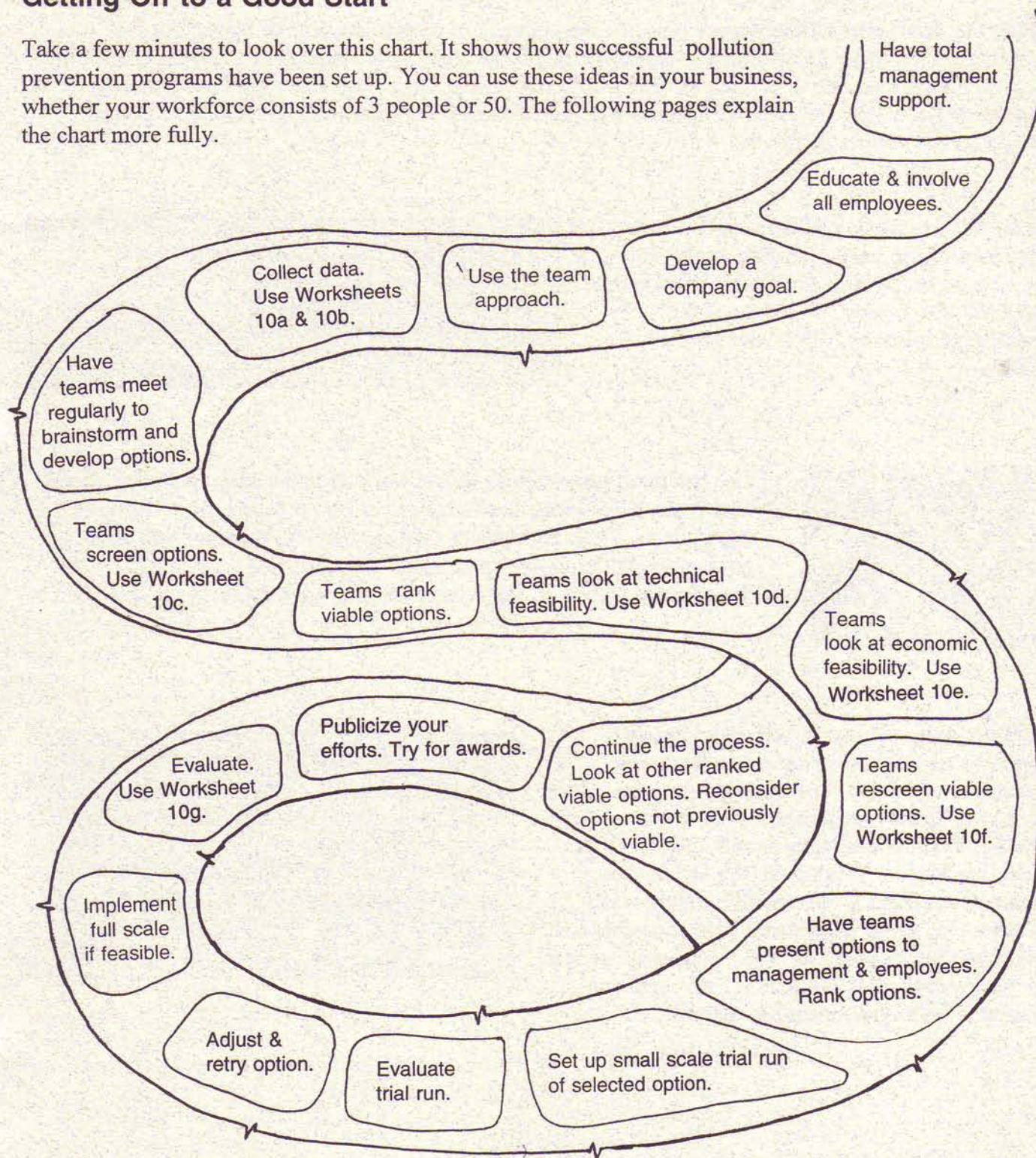
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### Getting Off to a Good Start

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.

**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.

**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?

**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.

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

**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.



# Pollution Prevention

## Helping Your Business and the Environment


Number 4

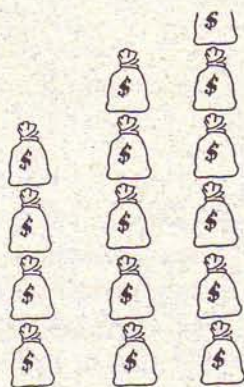
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### Hazardous Waste and Your Business

**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



1991    1993\*    1995\*

\*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).





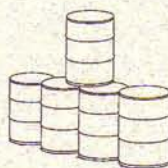
It is your responsibility to determine whether your wastes are hazardous. The **Material Safety Data Sheet (MSDS)** that you receive for each hazardous material you purchase is a good place to look for information. The amount of hazardous waste your business produces will determine the amount of paperwork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

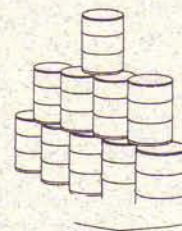
The amount of hazardous waste your business generates and stores determines what category your business falls into: Conditionally Exempt, Small Quantity, or Large Quantity Generator. Each category has certain regulations that the generators must comply with. *These names and amounts may vary by state.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



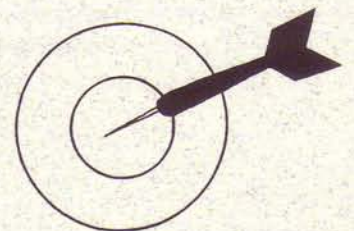
Large Quantity Generators produce 2,200 pounds (about 300 gal) or more of hazardous waste or more than 2.2 lbs of acutely hazardous waste per month.

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.



### 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 $\geq 2,200$ lbs HW or $\geq 2.2$ 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.



Federal Regulation	Fully Regulated Generators- Generate $\geq 2,200$ lbs HW or $\geq 2.2$ 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
Waste minimization	Certify on each manifest that you have a waste minimization program in place, as required by state. Complete annual reports as required by state.	Same as fully regulated generator if required by state. Program strongly recommended to reduce liability, HW disposal costs.	No federal requirement. Check state and local regulations. Strongly recommended. Annual reports if required, with documentation.
Training	Each employee who handles hazardous waste must be thoroughly trained in -regulatory compliance. -emergency response. -emergency equipment.	Employees must be familiar with proper waste handling and emergency procedures.	No federal requirement. Check state, local regulations. Strongly recommended for employee and community safety.
Emergency Response	Contingency plan. Preparedness/prevention requirements. Incident reports to EPA. Emergency procedures.	Preparedness/prevention requirements. Emergency procedures.	No federal requirement. Check state, local regulations. Strongly recommended for employee and community safety, as well as liability concerns.
Reporting	Exception reports (file within 45 days). Quarterly reports (within 45 days of calendar quarter). Expanded fourth quarter report. Periodic survey.	Exception letter (filed within 60 days). Quarterly reports (within 45 days of calendar quarter). Expanded fourth quarter report. Periodic survey.	No federal requirement. Check state, local regulations.
Recordkeeping	Manifests for 3 years. Exception reports for 3 years. Test results/sample analyses (3 yrs) Training documentation. Inspection logs. Biennial reports. Land Disposal Restrictions.	Manifests for 3 years. Exception reports for 3 years. Test results/sample analyses (3 yrs). Inspection logs. Land Disposal Restrictions.	No federal requirement. Check state, local regulations. Records on HW disposal quantities, costs are important for your business to note progress in pollution prevention, waste minimization.

#### Abbreviations

**AHW** Acutely hazardous waste  
**HW** Hazardous waste  
**EPA** Environmental Protection Agency  
**RCRA** Resource Conservation and Recovery Act  
**TSD** Treatment, Storage and Disposal Facility

*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

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### 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

Number 5a

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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.

■ 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.



**mg/m<sup>3</sup>**- 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.

**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.



# Pollution Prevention

## Helping Your Business and the Environment

Number 6a

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### In Your Drycleaning Facility through Improved Housekeeping, Maintenance, Purchase, and Inventory Practices

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 to the air.

Just modifying your general housekeeping and maintenance practices, and even how you handle purchases and inventory may reduce the amount of hazardous and nonhazardous waste your business generates. This is one area where you may see big dollar savings with little, if any, monetary investment.

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

#### Good Housekeeping

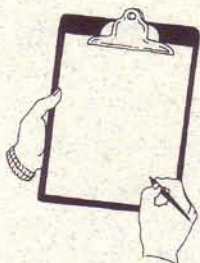


- ☐ Do you keep storage and work areas clean and well organized?
  - Reduces the chance for accidents.
  - Increases efficiency. By knowing where materials and tools are, time is not wasted searching for them.
  - Saves money. Dollars are not wasted purchasing duplicates.
  - Spills and leaks are more noticeable. You'll be able to react quickly, before leaks and spills get out of hand.
- ☐ Are all containers properly labeled?
  - Efficiency increases.
  - Reduces the chance of using the wrong material. The wrong material could ruin a garment or your equipment.
- ☐ Do you keep track of where spills have occurred? Look at the area and see how to avoid future spills.
  - Reduces loss of materials.
  - Saves time and money spent on cleanup.



## Maintenance

Based on drycleaning machine test data, research shows that as much as 25% of perc emissions from a drycleaning facility with no pollution controls are due to leaks from equipment. Not only is this a health hazard, but you're losing solvent that could be used to clean garments. A regular maintenance schedule may help you reduce the amount of waste your business generates.



☐ Do you check for leaks regularly?

Although any drycleaning operation will benefit from inspecting for leaks, operators of perc drycleaning plants may be required by law to check for perceptible leaks. These are any vapor or liquid leaks that are obvious from:

- solvent odor
- visual observation, such as pools or droplets
- detecting gas flow (passing fingers over equipment surface).

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

- |   |   |
|---|---|
| <input type="checkbox"/> exhaust dampers          | <input type="checkbox"/> ducts                    |
| <input type="checkbox"/> solvent tanks            | <input type="checkbox"/> solvent containers       |
| <input type="checkbox"/> cartridge filters        | <input type="checkbox"/> cartridge filter housing |
| <input type="checkbox"/> filter gaskets, seatings | <input type="checkbox"/> pumps                    |
| <input type="checkbox"/> water separators         | <input type="checkbox"/> diverter valves          |
| <input type="checkbox"/> pipes and hoses          | <input type="checkbox"/> fittings, valves         |
| <input type="checkbox"/> pipe and hose couplings  | <input type="checkbox"/> door gaskets, seatings   |
| <input type="checkbox"/> muck cookers             | <input type="checkbox"/> stills                   |
| <input type="checkbox"/> lint baskets and screens |   |

Find the small leaks before they become large and lead to waste problems and exposures. Low-cost hand-held perc detectors are available to detect emissions. Ask your equipment supplier where to obtain one. Remember, solvents lost to the air mean lost dollars.



☐ While looking for signs of leaks, do you check that equipment is operating properly? Consider some of these ideas:

- ☐ Check dampers to make sure that they open and close properly during the aeration cycle.
- ☐ Check the water/solvent separator while the machine is operating to make sure that no solvent is drained off with the water.
- ☐ Clean lint screens regularly to avoid clogging fans and condensers.



## Purchase and Inventory

Think about how you purchase materials. A large inventory ties up money than might be needed elsewhere in your business. A large inventory also increases the chance of leaks, spills, or materials exceeding shelf-life.

- ☐ Can you buy materials on an as-needed basis?
- ☐ Do you order materials in appropriate unit sizes to reduce your inventory?
- ☐ Can you arrange for bulk delivery and storage of cleaning solvent?

One drycleaner has bulk solvent delivered directly to the drycleaning equipment. Detergent is automatically injected from 15-gallon containers into the machines on an as-needed basis. There is no other transfer of materials, so the number of spills has decreased.

Even upon delivery there are some pollution prevention techniques to use.



- ☐ Do you inspect all materials upon delivery?
- ☐ Do you immediately return unacceptable materials to 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? Employees should know where they are 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.  
The wrong material could ruin a garment or equipment.
- ☐ Do you rotate stock and use it on a FIFO (first in-first out) basis?
  - Reduces the chance that materials will pass expiration date.
  - Reduces the chance that materials like paper will become mildewed.
- ☐ Can you make arrangements to return expired material to supplier?
  - If you decide to use old material, test it for effectiveness first.
- ☐ Do you keep track of raw material usage with good records?
  - If you know how many pounds of clothes you clean in a month and the amount of solvent typically used, you have a good gauge for checking equipment efficiency. If solvent use goes up drastically while cleaning the usual amount of clothing, there may be a leak somewhere.



## Raw Material and Waste Storage

Even your storage methods can affect your waste generation. Think about how you store both your raw materials and your waste. You may be creating more waste unnecessarily.

- ☐ Are storage tanks and containers large enough?
  - Reduces the chance for overflows.
- ☐ 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.
- ☐ Do you store products in locations that will preserve their shelf life?
  - The MSDS will help you determine proper storage conditions for hazardous materials. For example, some materials should not be exposed to direct sunlight or high temperatures.
- ☐ Are all materials securely covered?
  - Reduces the chance of spills.
  - Reduces loss of liquids due to evaporation.
- ☐ Do you drain spent cartridges in their housing or a similar closed container for 24 hours?
- ☐ Do you segregate wastes?
  - Mixing wastes may make recycling impossible.
  - Mixing hazardous and nonhazardous wastes increases the volume of hazardous wastes and therefore disposal costs.
- ☐ Do you accumulate waste indoors or in a covered area to prevent moisture from seeping in?
  - Moisture could increase the volume of your hazardous materials, making you pay more for disposal.

### Some special points to consider for your hazardous waste:

- ☐ Are wastes labelled and stored according to local, state, and federal regulations?
  - Don't store spent solvent in an underground tank. Regulations require costly monitoring and testing for underground storage tanks.
- ☐ Is it stored in a safe location out of major traffic areas?
  - The less activity the better for preventing accidental spills or leaks.
- ☐ Do you have secondary containment, such as curbing, in case of a leak? Is it coated with some type of epoxy to ensure it is non-porous?
- ☐ Do you have emergency equipment such as dams and pigs in case of spills and leaks? Are employees trained to use them properly?



# Pollution Prevention

## Helping Your Business and the Environment

Number 6b

University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering

January 1995

### In Your Drycleaning Business 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 your basic drycleaning operation. 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 the ideas 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."

- ☐ Are procedures for using equipment written in simple form for employee reference?
- ☐ 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.
- ☐ Are garments prewashed if possible to remove dusts and oils?
  - Increases solvent and filter life.
- ☐ Do you turn on equipment over a staggered period of time?
  - Reduces peak electricity demands.

#### Equipment Operating Instructions:

1. Turn on equipment and check that it is working properly. Allow 5 minute warm up.
2. Make sure that you have the amount of cleaner for the load.
3. Use funnel to add cleaner. Push...
4. If you have a problem, call Ext. 32.





- ☐ Do you monitor solvent mileage? Keep track of the amount of clothes washed per week and the amount of solvent used per week. The pounds of clothes washed per gallon of solvent is the mileage. Much like the mileage of your car tells you about the condition of your engine, solvent mileage tells you about the condition of your equipment. Any changes in mileage can indicate leaks in your equipment. The mileage can also help you estimate the payback period of new equipment.
- ☐ Do you size the garment loads according to machine manufacturer recommendations?
  - Overloading leaves excess solvent in garments.
  - It also reduces the effectiveness of solvent recovery equipment.
  - Underloading the machine decreases the solvent mileage.
- ☐ If your equipment does not automatically dispense detergents or solvents, do you have a convenient chart to indicate the correct amount of material required per garment or load?
- ☐ Do you use low temperature laundering instead of drycleaning when possible?
  - Reduces use of cleaning solvents.
- ☐ Do you dry clothes of all remaining solvent?
- ☐ Do you monitor the drying temperature? Use the temperature to indicate when the clothes are dry. In the lint trap, 135°F generally indicates that the clothes are dry. Drying the garments for a set period of time, instead of monitoring the drying temperature, can waste energy and increase electricity bills. Shut-off could be triggered by temperature rather than by a timer.
- ☐ Do you open the machine only as long as necessary to clean traps?
  - Decreases solvent losses through evaporation when cleaning button and lint traps.
- ☐ Do you monitor the water temperature rise across the condenser coil? The temperature change only needs to be 10°F. If the change is more than that, you are wasting water. Install a valve downstream of the condenser, and adjust the flow of water to obtain a change in temperature of 10°F.
- ☐ Do you filter liquid solvent to allow for extended use?
- ☐ Do you extract as much solvent as possible from filters?
  - Gravity drainage for 24 hours.
  - Filter cookers can extract even more solvent.
- ☐ Do you use cartridge strippers to remove solvent from cartridges?
  - More efficient than draining or drying cartridges in dryer.
- ☐ If you have a solvent still, do you add water to still bottoms following final boil down?
  - Recovers additional solvent
  - Reduces solvent content in the still bottoms.



# Pollution Prevention

## Helping Your Business and the Environment

Number 6c

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### In Your Drycleaning Business through Equipment Changes

Generally, newer equipment is more efficient in terms of energy and solvent use. As you purchase new equipment, consider the cost of waste management when you make your decision.

Closed loop technology can be applied to new equipment or used to retrofit existing equipment. Built-in carbon adsorption or refrigeration units can recover valuable solvent. Equipment can also be modified to conserve heat and water. Check off the options below which you already use. Put a check mark by those you want to consider.

In September 1993 the EPA announced regulations under the Clean Air Act that will require perchloroethylene (perc) drycleaners to use pollution control equipment and prevent leakage of the solvent. Some of the methods described may be valuable to dry cleaners using petroleum solvents. Call EPA Region VII (913) 551-7922 or Region VIII (303) 293-1886 for copies of the regulations.

☐ Do your machines dispense correct amounts of chemicals and soap automatically?

- Reduces handling and potential for spills.

☐ Do your machines monitor the drying temperature?

- Minimizes solvent vapor loss in the plant from incompletely dried clothing.

☐ Do you have solvent-vapor recovery units in transfer machines?

Thinking about buying a new perc transfer machine? Don't bother. New perc transfer machines are effectively banned because they will not meet the EPA requirement prohibiting any perc emissions when transferring clothing from washer to dryer.

☐ For perc operations, have you considered replacing an old transfer machine with a new dry-to-dry machine? It eliminates transferring clothing from a wash unit to a drying unit.

- Less solvent loss through open doors.
- Reduces worker exposure.

☐ Do you use a reclaiming dryer?

- Reduces solvent losses.

☐ Have you considered a cold-dry system, that uses lower temperatures?

- Minimizes solvent loss.
- Prolongs the life of the machine.

☐ Do you have solvent leak detectors to monitor vapor losses?

- These will help you pinpoint where you are losing solvent, and money.



Many drycleaners vent solvent vapors to the atmosphere. Since solvents are expensive, venting them to the atmosphere is not only unacceptable from an environmental and regulatory stance, but is economically unsound. In-process recycling typically includes the use of filters, condensers, and distillation units.



☐ Do you have a filter cooker? Even after draining, cartridge filters still contain a significant amount of solvent. Filter cookers usually use steam to strip the solvent out of the filter. The solvent passes through a water separator and can be reused.

☐ Do you use spin disc filters?

- Last longer than cartridge filters.

Most disc filtration systems consist of a series of finely woven polyester discs mounted on a hollow shaft. Solvent passes through the walls of the discs and into the mounting shaft, depositing soil on the outside surface of the disc. The discs are periodically rotated or spun to remove the soil. A valve opens, allowing soil from the filter vessel to drop into the still.

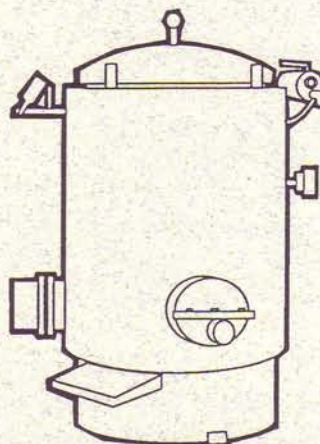
Disc filtration systems are available for use with or without filter powder, such as diatomaceous earth. Systems using discs with openings of about 30 microns or smaller can be used without powder, while systems using discs with larger openings generally use a powder. The powder is added following the spinning, and builds a 5 micron filter over the discs.

☐ Do you have a distillation unit to recover dirty solvent? Steam is used to heat spent solvent to its boiling point. The solvent/water vapors rise to the top of the still and are cooled back into a liquid. This liquid goes to a separator which separates the solvent from the water; the solvent goes to the drycleaning tank for reuse. The residue left in the still, called sludge or still bottoms, must be disposed of as hazardous waste.

Many drycleaners feel the powder type spin disc filter removes the most soil and produces the highest quality solvent. This type of filter requires less frequent distillation to maintain a quality solvent. Consider, however, that the powder generates about 1 pound of hazardous waste per 500 pounds of cleaning.

To install a spin disc filter, remove the existing cartridge filter canisters. The new filter should be mounted on the drycleaning machine directly over the still. If this is not possible, make a steel stand behind and to the side of the still.

All pipes should drain away from the filter and toward the machine. This allows the soil-contaminated solvent to drain into the still during filter renewal. Your equipment supplier will have more specific information on proper installation.





The still bottoms are often contaminated with a great deal of perc; estimates range from 50% to 70%. To extract even more solvent from the sludge, add water to the still or cooker following the final boil down or cook down. Talk to your equipment supplier for more information on how to do this for your specific type of still.

According to the International Fabricare Institute, the average perc content in still bottom residues is about 54.7%. After one extra water addition and boil down, perc content was reduced to 3.36 %. After the second, the perc level was lowered to 0.36%.

Here is the basic procedure for reducing perc in still bottoms. *Contact your equipment supplier for specifics regarding your particular still!*

- Distill and boil down as usual.
- Let the still cool at least 15 minutes.
- Note volume of still residue and add an equal amount of water.
- Turn on steam. Raise temperature slowly to avoid boil over. Continue to boil down at 25-30 psi until the water from the water separator and from the solvent line stops flowing.
- Cool still 10-15 minutes.
- Note volume of still residue and add half as much water to the still.
- Continue boil down as before.

In stills with an automatic shut-off valve, this process will raise the temperature high enough so that the valve closes, causing interruptions and delays.

You may be able to eliminate this problem by adjusting the sensor to a higher temperature, or by removing the probe and temporarily putting a stopper in the opening. This process also requires careful monitoring of distilled solvent coming from the water separator. Too much flow will force the solvent out of the water line in U-tube type separators.

#### **Distillation tip**

The steam pressure going into a still is very important because it regulates the amount of heat going to the solvent. The ideal steam pressure gauge setting is around 35-45 psi. If the perc does not boil at this setting, you may have a faulty steam trap or gauge, or an inefficient still.

☐ Do you use carbon adsorption units to recover exhausted solvent vapor from solvent storage tanks, distillation units, muck cookers, dryer condensers, and plant ventilators? Steam regenerates the solvent from the carbon bed. The steam-solvent vapor mixture condenses, and the solvent and water are separated. Such a system typically recovers more than 95% of the solvent from the air. The separated water may be reused; consider using some as a pre-spotter. Otherwise, it must be disposed of in an acceptable manner.

- Reduces air emissions and loss of perc.



☐ Do you have a refrigeration/condensation unit?

Condensers are equipped with a refrigeration unit to increase the condensation efficiency. Air containing solvent from the drycleaning machine is fed into the unit and forced over a series of very cold baffles. The solvent/water vapor in the air condenses onto the cold metal of the baffle surface. The stripped air is returned to the dryer, while the condensed vapor drains to a water separator. Recovered solvent is returned to the storage tank for future use. The water may be reused. Otherwise, it must be disposed of in an acceptable manner.

Retrofitting an existing dry-to-dry vented machine with a refrigerated condenser unit satisfies EPA air quality requirements, and will ultimately save money on lost solvent and hazardous waste shipping costs.

- Recovers solvent vapors; it may be over 90% efficient in solvent vapor recovery.
- Reduces air emissions.

Refrigerator/condenser units come in many shapes and sizes. A machine sized for a 45-pound load will take up about one square yard of floor space. Some are designed to hang from the ceiling. If you have the room, however, a floor model is much easier to service. In a plant with more than one drycleaning machine, multiple-machine refrigeration units can be used.

Some basics to consider when retrofitting existing dry-to-dry equipment with a refrigeration unit:

- ✓ Your plant must have a large enough electrical circuit and fusible disconnect to power the compressor and fan.
- ✓ Use plastic piping to duct solvent-laden air from the exhaust of drycleaning machine to the intake side of the refrigeration/condenser unit. Another pipe moves the treated air from the unit into the dampered air intake on the cleaning machine. This closes the loop on a vented machine.
- ✓ A small tube moves the reclaimed solvent from the refrigeration/condenser unit to a base tank in the cleaning machine.

Information on spin disc filters, distillation units, and refrigeration/condensation units was adapted from material in *Pollution Prevention in the Drycleaning Business* developed by the Montana State University Extension Service, Solid Waste/Pollution Prevention Program, Bozeman, MT 59717.



# Pollution Prevention

*Helping Your Business and the Environment*

Number 6d

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## In Your Drycleaning Business through Raw Material Substitution and Changes in Process Technology

In September 1993 the EPA announced regulations under the Clean Air Act that require perc drycleaners to use pollution control equipment and prevent perc leakage. You can get a copy of these regulations in the September 22, 1993 Federal Register, 40 CFR Parts 9 and 63 at your library, or by calling EPA Region VII at (913) 551-7922 or EPA Region VIII at (303) 293-1886.

### Raw Material Substitution

Perchloroethylene (perc) is the most widely used drycleaning solvent in the US. It has chemical and physical properties that make it the most desirable solvent available. Unfortunately, perc has drawbacks; it is a hazardous air pollutant and is associated with environmental and human health risks.

Petroleum solvents are used much less. Due to flammability, many local fire regulations restrict their use. Another option, CFCs such as Valclene®, will no longer be viable. Because it contributes to ozone depletion, CFC production is scheduled to be stopped on January 1, 1996.

Although there are no viable alternatives to perc at present, you may want to consider some strategies listed below. Again, 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 by their ease of implementation.

- ☐ Do you use less hazardous or less toxic pre-spotters as much as possible?
  - Use aqueous-type pre-spotters that work.
- ☐ Do you try to standardize material use?
  - Using a few basic products may decrease employee confusion.
  - Reduces the number of rarely-used products that are often stored beyond expiration dates.
- ☐ Can you use higher gauge hangers that will still satisfy customers?
- ☐ Can you replace disposable garment bags with reusable ones?
- ☐ Have you considered replacing paper towels with reusable cloth?





## Changes in Process Technology

In 1992, a major battery manufacturer instituted a change in their anode production process, allowing for a 29% decrease in hazardous waste generation. Two other process changes reduced waste by another 75,000 pounds annually, resulting in an annual savings of about \$40,000.

A change in technology can be one of the most expensive pollution prevention strategies to implement, but the benefits can also be big. As your business becomes more involved in preventing pollution, you may think of new production methods that warrant testing. Obviously, there are risks in changing processes, so ideas must be tested thoroughly to see if they are economically and environmentally satisfactory. Above all, the customer has to be happy with the result. Some of this testing can require a great deal of time and money. There are programs, such as the EPA's Design for the Environment, to help.

For the drycleaning industry, an alternative cleaning process, called multiprocess wet cleaning, is already used on a small scale. It relies on controlled application of heat, steam, and soaps to clean clothes that are typically drycleaned.

Multiprocess wet cleaning is more labor intensive, requiring better trained operators. They look at each garment and select among steam cleaning, spot removing, hand or machine washing, tumble drying, and vacuuming. Their choice depends on the garment type, fabric, and type of soil. Although this process requires more skilled labor, the cost is offset by lower costs for equipment, hazardous waste disposal, electricity, and supplies.

### What is Design for the Environment (DfE)?

This EPA program has a goal of facilitating information exchange and research on pollution prevention efforts. It works with businesses and trade associations to evaluate the risks, performance, and costs of alternative chemicals, processes, and technologies.

**For more information, contact DfE at (202) 260-1023.**



**Customers were satisfied with multiprocess wet cleaning.**

In late 1992, the EPA *Design for the Environment* program tested multiprocess wet cleaning in collaboration with the Neighborhood Cleaners Association, the International Fabricare Institute, and ECOCLEAN International. During the test, nearly 1500 garments were cleaned, about half with multiprocess wet cleaning and half with conventional drycleaning. In the end, the costs for wet cleaning were slightly lower than for drycleaning.

But were the customers satisfied?

Preliminary surveys showed little statistical difference between the two processes when customer satisfaction was measured. Factors such as shrinkage, stretching, and colors were considered. However, consumers had a statistically significant preference for the reduced odor of multiprocess wet cleaning. The EPA will now go on to examine the full range of health and ecological risks associated with the wet cleaning process to determine whether it is a viable pollution prevention option for the fabric cleaning industry.



# Pollution Prevention

## Helping Your Business and the Environment

Number 6e

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### Waste Exchanges and Recycling

The goal of pollution prevention is to not generate pollution or waste in the first place. Due to old equipment and capital shortages, 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.

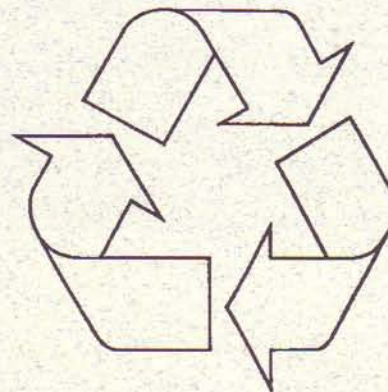
#### Waste Exchanges

- ☐ Waste exchanges may have names of manufacturers that can use the spent solvent as feedstock.
  - They may be able to clean them and offer them for use by business again.

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

- ☐ Do you use both sides of a sheet of paper before recycling or disposal?
- ☐ Do you reuse or recycle:
  - ☐ hangers?
  - ☐ plastic bags?
    - Reduces the amount of waste requiring disposal.
    - Reduces the need to purchase materials as often.
- ☐ Do you encourage customers to bring back hangers for reuse?
- ☐ Do you encourage customers to bring back plastic bags for recycling?
  - Make sure you have an outlet for the bags!
- ☐ Do you reclaim solvent through distillation?
- ☐ If not, does your hazardous waste handler reclaim solvent?
- ☐ Do you strip filter cartridges to reclaim solvent?





Don't forget about considering 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

- ☐ Contract with qualified and licensed hazardous waste handlers to properly dispose of your hazardous wastes.

## 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.



# Pollution Prevention

## Helping Your Business and the Environment

Number 7

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### 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 the drycleaning business include:

Purchasing  
Shipping and receiving  
Storage and inventory  
Customer service

Office/recordkeeping  
Pressing  
Clothing pretreatment  
Drycleaning

Laundering  
Equipment Repair  
Janitorial  
Packaging

### 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 business process. This will help when you are 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.



# Pollution Prevention

## Helping Your Business and the Environment

Number 7a

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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?

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

☐ Is the option easy to implement?

Operating cost estimate      \$ \_\_\_\_\_

☐ Does the technology have a track record?

Capital cost estimate      \$ \_\_\_\_\_

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

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

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

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

☐ Will those different raw materials be less hazardous?

☐ 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**

- |  |  |
|--|--|
| <input type="checkbox"/> Is this option within your price range, considering both capital and ongoing operation costs? | <input type="checkbox"/> Does this option reduce regulatory compliance costs?                        |
| <input type="checkbox"/> Does this option have an acceptable payback period?   | <input type="checkbox"/> Will this option reduce the costs associated with worker injury or illness? |
| <input type="checkbox"/> Does this option reduce your raw material costs?  | <input type="checkbox"/> Will this option reduce your insurance premiums?                            |
| <input type="checkbox"/> Does this option reduce your utilities costs?   | <input type="checkbox"/> Will this option reduce your waste disposal costs?                          |
| <input type="checkbox"/> Does this option reduce material and waste storage costs?                                     |  |

### **Technical Evaluation**

- |   |   |
|---|---|
| <input type="checkbox"/> Does this option have a proven track record?                               | <input type="checkbox"/> Do you know if this option will require any down time for implementation?<br>How much? _____ |
| <input type="checkbox"/> Will this option maintain product quality?                                 | <input type="checkbox"/> Will the vendor guarantee this option?   |
| <input type="checkbox"/> Are you ready to handle new training procedures and expertise if required? | <input type="checkbox"/> Will this option improve or maintain worker safety and health?                               |
| <input type="checkbox"/> Can you add additional staff if required?                                  | <input type="checkbox"/> Are new material handling, storage or disposal techniques required?                          |
| <input type="checkbox"/> Will this option create less waste?  | <input type="checkbox"/> Are materials and parts readily available?   |
| <input type="checkbox"/> Are you certain this option will not simply shift waste to another form?   | <input type="checkbox"/> Can this option be easily serviced?  |
| <input type="checkbox"/> Is your plant layout and design capable of incorporating this option?      | <input type="checkbox"/> Are other businesses using this option?  |



# Pollution Prevention

## Helping Your Business and the Environment

Number 7b

University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering

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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?



# Pollution Prevention

## Helping Your Business and the Environment

Number 8

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### 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.



# Pollution Prevention

## Helping Your Business and the Environment

Number 9

University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering

January 1995

### 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.

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## 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.



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**<sup>3</sup> 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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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 10a

University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering

January 1995

### Drycleaning Hazardous and Non-hazardous Waste Assessment

Copy this form and use a separate one for each process or area in your drycleaning business. Some processes typically associated with hazardous waste include chemical storage, clothing pretreatment, the drycleaning process, 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 the 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 drycleaners may generate in**

*Valclene or perc plants:* spent filter cartridges, still residues, cooked powder, spotting board residues, and spent solvent.

*Petroleum plants:* spent petroleum solvents or distillation residues with a flash point of less than 140°F; possibly drained filter cartridges or powder residues.

Hazardous waste

Amount per month

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



**Non-hazardous wastes:** These are wastes that often 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 % of waste stream	Material	Estimated % of waste stream
<b>PAPER</b>		<b>PLASTICS</b>	
<input type="checkbox"/> green bar computer	_____	<input type="checkbox"/> PETE (#1)	_____
<input type="checkbox"/> white form feed	_____	<input type="checkbox"/> HDPE pigmented (#2)	_____
<input type="checkbox"/> white letterhead	_____	<input type="checkbox"/> <b>HDPE transparent (#2)</b>	_____
<input type="checkbox"/> white copy	_____	<input type="checkbox"/> HDPE film (#2)	_____
<input type="checkbox"/> white ledger pads	_____	<input type="checkbox"/> LDPE film (#4)	_____
<input type="checkbox"/> cash register receipts	_____	<input type="checkbox"/> vinyl bottles (#3)	_____
<input type="checkbox"/> adding machine tape	_____	<input type="checkbox"/> polypropylene bottles (#5)	_____
<input type="checkbox"/> white envelopes	_____	<input type="checkbox"/> polystyrene foam (#6)	_____
<input type="checkbox"/> colored copy paper	_____	<input type="checkbox"/> rigid polystyrene (#6)	_____
<input type="checkbox"/> yellow legal pads	_____	<input type="checkbox"/> other plastics (#7)	_____
<input type="checkbox"/> colored letterhead	_____	<b>ALUMINUM</b>	
<input type="checkbox"/> message pads	_____	<input type="checkbox"/> cans	_____
<input type="checkbox"/> <b>newsprint</b>	_____	<input type="checkbox"/> foil	_____
<input type="checkbox"/> junk mail	_____	<input type="checkbox"/> other (rain gutters)	_____
<input type="checkbox"/> magazines	_____	<b>STEEL</b>	
<input type="checkbox"/> window envelopes	_____	<input type="checkbox"/> steel cans	_____
<input type="checkbox"/> stick-on notes	_____	<input type="checkbox"/> clothes hangers	_____
<input type="checkbox"/> cardboard	_____	<input type="checkbox"/> other steel (strapping)	_____
<input type="checkbox"/> paper plates/cups	_____	<b>GLASS</b>	
<input type="checkbox"/> paper napkins/towels	_____	<input type="checkbox"/> clear	_____
<input type="checkbox"/> tissue	_____		_____
<input type="checkbox"/> wax-coated paper	_____	<input type="checkbox"/> brown	_____
<input type="checkbox"/> plastic-coated paper	_____	<input type="checkbox"/> green	_____
<input type="checkbox"/> carbon paper	_____	<b>YARD WASTE</b>	
<input type="checkbox"/> UNCLAIMED CLOTHING	_____	<input type="checkbox"/> grass clippings	_____
		<input type="checkbox"/> leaves and brush	_____
		<b>OTHER</b>	_____



# Pollution Prevention

## Helping Your Business and the Environment

Number 10b

University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering

January 1995

### 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	\$ _____
<b>Total costs</b>	<b>\$ _____</b>



# 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



# 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



# 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	\$ _____	\$ _____
<b>Totals</b>	\$ _____	\$ _____



## Capital Costs

Estimate capital costs of implementing the option.

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

## 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
_____	\$ _____
_____	\$ _____
_____	\$ _____
_____	\$ _____
<b>Total revenues</b>	<b>\$ _____</b>

Option approved for further evaluation: ☐ Yes ☐ No Date: \_\_\_\_\_

Reason for acceptance or non-acceptance:

Reconsider at later date? ☐ Yes ☐ No

*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 10f

University of Nebraska-Lincoln Cooperative Extension & Biological Systems Engineering

January 1995

### 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 \_\_\_\_\_ %

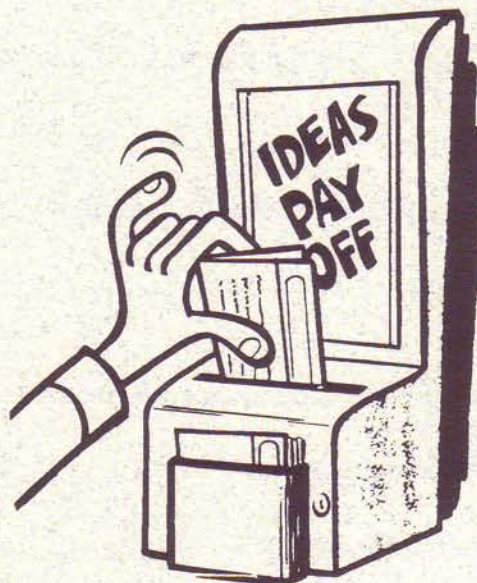
☐ Hazardous waste \_\_\_\_\_ pounds \_\_\_\_\_ gallons \_\_\_\_\_ %

☐ 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:**





# 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	<input type="checkbox"/> Increase	<input type="checkbox"/> Decrease	<input type="checkbox"/> No change
Production	<input type="checkbox"/> Increase	<input type="checkbox"/> Decrease	<input type="checkbox"/> No change
Worker/workplace safety	<input type="checkbox"/> Increase	<input type="checkbox"/> Decrease	<input type="checkbox"/> No change
Waste generation	<input type="checkbox"/> Increase	<input type="checkbox"/> Decrease	<input type="checkbox"/> No change
Business liability for pollution	<input type="checkbox"/> Increase	<input type="checkbox"/> Decrease	<input type="checkbox"/> No change
Business image within the community	<input type="checkbox"/> Improve	<input type="checkbox"/> Decrease	<input type="checkbox"/> No change
Worker morale	<input type="checkbox"/> Increase	<input type="checkbox"/> Decrease	<input type="checkbox"/> No change
Costs of handling waste	<input type="checkbox"/> Increase	<input type="checkbox"/> Decrease	<input type="checkbox"/> 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



## 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

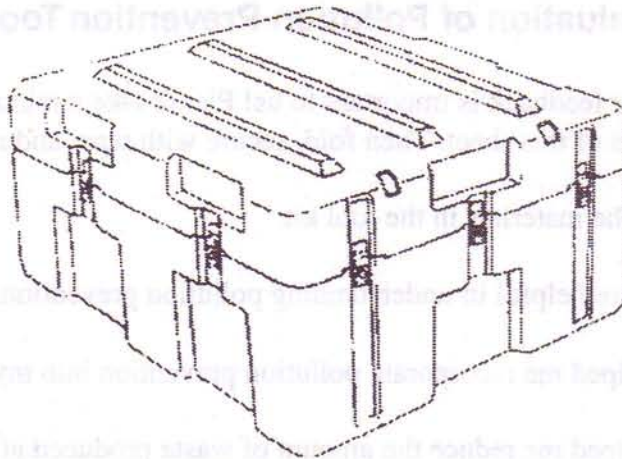
How would you describe your understanding of:

	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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UNITED STATES

## BUSINESS REPLY MAIL

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

