Ohio Pollution Prevention and Waste Minimization Planning Guidance Manual

State of Ohio Environmental Protection Agency
Office of Pollution Prevention
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Chapter 1
Introduction

"To keep ahead of the many environmental and economic challenges that face us in the 1990s, Ohio must focus on pollution prevention. Global competition and the public's demand for environmental protection require that business be as efficient and produce as little waste as possible."

Donald R. Schregardus, Director, Ohio EPA

Why is pollution prevention planning essential for the State of Ohio? Ohio companies and governments generate large amounts of waste, as illustrated in brief summary below, "Waste Generation in Ohio." These wastes discharged to our air, water or land represent a significant loss of raw materials and a potential threat to human health and the environment. To be responsible guardians of environmental quality, waste generators must review their production processes and operations as well as consider both the economic and the environmental benefits of implementing a pollution prevention program. The public, consumers and employees expect simultaneous attention to both economics and the environment. Pollution prevention is an excellent way to satisfy this demand.

Waste Generation in Ohio
2.9 million tons of hazardous waste generated in 1991
125,500 tons of toxic chemicals released or transferred in 1991
13.9 million tons of residential, industrial and commercial solid waste per year

Adopting a pollution prevention program as a way of doing business can provide a number of significant benefits to a company. By decreasing the amount of waste generated or released, a company can reduce waste disposal costs, improve worker safety, and reduce long-term liability. In addition, pollution prevention methods may increase the efficiency of the production line and decrease costs associated with the purchase of raw materials, inventory control, etc. Any resulting changes in efficiency or expenditures may help the company to retain or improve its competitiveness in the marketplace.

Companies have traditionally evaluated their industrial processes in terms of optimizing their production, but times have changed. Due to increasing environmental concerns associated with industrial waste, companies must now incorporate waste management and prevention strategies into their production lines with the goal of reducing waste generation. By increasing efficiency of operation, companies can see that more of their raw materials go into products rather than ending up as waste.

Donald R. Schregardus, Director of the Ohio EPA, emphasizes that, "To keep ahead of the many

environmental and economic challenges that face us in the 1990's, Ohio must focus on pollution prevention. Global competition and the public's demand for environmental protection require that business be as efficient and produce as little waste as possible." Ohio is also working to reach the national goal for environmental protection - to reduce or eliminate waste at its source - as established by the Pollution Prevention Act of 1990 (see Chapter 4).

Introduction to the Guidance Manual

This guidance manual is a general overview of how Ohio businesses and government facilities can develop and implement a pollution prevention program. The manual uses the pollution prevention program steps (with limited modifications) outlined in U.S. EPA's 1992 publication, *Facility Pollution Prevention Guide* (EPA/600/R-92/088). (Table C-3 in Appendix C compares the elements of U.S. EPA's and the State of Ohio's guidance for developing a program). These steps include planning and organization, assessment, feasibility analysis, implementation, and measuring progress. The manual also uses substantial portions of the text from the Illinois Hazardous Waste Research and Information Center's 1993 publication, *Pollution Prevention: A Guide to Program Implementation*.

On September 1, 1993, Governor George V. Voinovich requested the top 100 Toxic Release Inventory (TRI) reporters in Ohio to work with Ohio EPA on developing comprehensive pollution prevention plans to reduce the various types of waste they generate. As Ohio EPA Director Donald R. Schregardus emphasized, "This is not just a paperwork exercise. The real goal is not the plan, it's the reduction."

This document was prepared under a federal fiscal year 1993 RCRA grant from U.S. EPA to Ohio EPA, Division of Hazardous Waste Management, and the Office of Pollution Prevention, for Great Lakes Basin activities. The original intent of this guidance manual was to provide waste minimization planning guidelines (1) for class I injection well facilities and (2) for hazardous waste treatment, storage, and disposal facilities. Class I injection well facilities have a statutory requirement to prepare and adopt a waste minimization and treatment plan, including several general requirements for plan content. Hazardous waste facilities are required by Ohio permits to submit a report describing their waste minimization program. Specific requirements for these types of facilities are slightly different; however, Ohio EPA does not want to create different pollution prevention and waste minimization planning guidance manuals for each regulated category of business nor for each environmental medium. This general guidance manual provides a common approach for pollution prevention planning in Ohio for all waste generators and for all media. This manual can be used by any organization, including businesses and state and local government organizations. For brevity the words "company" and "business" are used throughout the manual, but any organization's title can be substituted for these terms.

Because this manual is a generalized overview of how to develop and implement a pollution prevention program, you will want to modify the program as needed to fit your facility.

Specific requirements for class I injection well facilities and hazardous waste treatment, storage, and disposal facilities are included as appendices.

For more detailed information about pollution prevention programs, refer to U.S. EPA's *Facility Pollution Prevention Guide* and to the reference section in the appendices of this guidance manual. U.S. EPA's *Facility Pollution Prevention Guide* contains worksheets that may be helpful in implementing and documenting a pollution prevention program. Another general reference document is U.S. EPA's *1993*

Reference Guide to Pollution Prevention Resources (EPA/742/B-93/001). This annual guide contains information about publicly sponsored pollution prevention resources and training opportunities. The document consolidates a wide range of pollution prevention information. Contact the Ohio EPA's Office of Pollution Prevention for copies of these documents and a list of additional references.

Purpose of the Guidance Manual

This guidance manual is intended to increase the amount and improve the quality of activity in pollution prevention planning in Ohio. It will help companies to compare their pollution prevention programs to the State of Ohio's goals. The State of Ohio, including Ohio EPA, does not intend to enforce the letter of this manual to determine what should be included in a pollution prevention plan or program. Ohio EPA does not intend to issue related checklists for inspection and enforcement. However, we do expect that all pollution prevention programs and plans will have significant substantive content, include the general components covered in this manual where appropriate, and clearly meet the spirit of this guidance and any applicable law. We do expect that programs and plans include efforts and substance comparable to the general headings of Table C-3 in Appendix C of this document, e.g., "Establish the pollution prevention program." We do not expect to require subsections, e.g., "Executive level decision; Policy statement;" following the exact content of Table C-3.

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ACRONYMS

CAAA
: Clean Air Act Amendments of 1990

CAMP
: Cleveland Advanced Manufacturing Program

CFC
: Chlorofluorocarbon

HAP
: Hazardous air pollutant (regulated by the CAAA)

HSWA
: Hazardous and Solid Waste Amendments of 1984

HWRIC
: Illinois Hazardous Waste and Research Information Center

IAMS
: Institute of Advance Manufacturing Sciences

MSDS
: Material safety data sheet

NICE3
: National Industrial Competitiveness Through Efficiency: Energy, Environment, and Economics

NPDES
: National Pollutant Discharge Elimination System

OAC
: Ohio Administrative Code

OAQDA
: Ohio Air Quality Development Authority

Ohio DOD
: Ohio Department of Development

Ohio EPA
: Ohio Environmental Protection Agency

Ohio DNR
: Ohio Department of Natural Resources

OPP

Office of Pollution Prevention, Ohio EPA

ORC

Ohio Revised Code

OWDA

Ohio Water Development Authority

PIES

Pollution Prevention Information Exchange System

PMN

Premanufacture Notice

POTW

Publicly owned treatment works

PPDW

Pollution Prevention Development Workgroup

PPIC

Pollution Prevention Information Clearinghouse

RCRA

Resource Conservation and Recovery Act

SARA

Superfund Amendments and Reauthorization Act

SBAP

Small Business Assistance Program, Ohio EPA

SOP

Standard operating procedure

TQM

Total Quality Management

TRI

Toxic Chemical Release Inventory

TSCA

Toxic Substance Control Act

U.S. DOE

United States Department of Energy

U.S. EPA

United States Environmental Protection Agency

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Chapter 2
Benefits and Obstacles of Pollution Prevention

"If you make the commitment to do pollution prevention and that commitment is at every level of the company, you can create a healthier, much cleaner environment."

George Makrauer, Amko Plastics

Pollution prevention is often referred to as business planning with environmental benefits. The most common benefits and incentives for establishing a pollution prevention program are presented here. Some of the obstacles that may hinder implementation or program development are also discussed.

Incentives

Reduced Operating Costs (Economics) Pollution prevention activities usually save a company money in the long term. Many pollution prevention projects have good returns on investment and short payback periods. Money is usually saved in disposal costs, new material costs and improved operating efficiency. Many firms report that the majority of savings comes from the latter.

Improved Worker Safety Reduction of the use of toxins in the workplace is a major aspect of pollution prevention. (However, toxic users who manufacture a toxic substance would not be expected to plan for the reduction in manufacturing of the specific toxic substance as a product.) By reducing or eliminating toxic substance use, the safety of the work environment can be improved and personal protective equipment requirements decreased. Also, reducing the likelihood of leaks, spills and releases can decrease worker, visitor, and contractor exposure. These steps will result in cost savings through preventing the loss of materials and possibly through decreased insurance rates by reducing medical claims and disability leave. Better labor relations can also result from improved worker safety.

Reduced Compliance Costs Undertaking pollution prevention projects can reduce your regulatory exposure and, in some cases, may eliminate the need for permits, manifesting, monitoring and reporting. Keeping up with regulatory requirements and submitting the required reports is an expensive and time consuming process which, if eliminated, saves money.

Increased Productivity Pollution prevention can improve plant productivity through more efficient use of raw materials due to improved processes and operations. Many industrial plants that produce large quantities of wastes may be using old technologies to make their products, or their processes may be poorly controlled and inefficiently operated. Sometimes small improvements can result in increased product yield and better quality.

Increased Environmental Protection Many waste disposal and treatment methods have been shown to be less protective of the environment than previously estimated. These methods may just move environmental contaminants from one medium to another. They may cause future problems that are not yet apparent. Pollution prevention reduces the generation of wastes at the source, or results in less toxic waste, and thus assures improved environmental protection.

Reduced Exposure to Future Liability Costs Reduction of potential long term liability from waste disposal has become an important concern in recent years. Past disposal practices, even though they may have been legal, have often caused environmental damage that has proved to be expense for industrial facilities as well as damaging to their public image. Pollution prevention can help to reduce long term liability by reducing the amount and the hazard of waste generated.

Continuous Improvement Successful implementation of a pollution prevention program can be an integral part of a company's continuous improvement or Total Quality Management program. Reducing wastes and improving efficiency are what both pollution prevention and continuous improvement are all about.

Improved Company Image Society is becoming increasingly aware of the environmental hazards associated with all types of waste. U.S. EPA publishes details of companies' waste and pollution prevention efforts through the Toxic Release Inventory. U.S. EPA also publicly recognizes those companies that make voluntary commitments to pollution prevention. To enhance their public image, companies are implementing and publicizing pollution prevention activities.

Obstacles

Capital Requirements Implementation of many pollution prevention measures often requires capital investment. Such projects may need to be justified on an economic basis.

Specifications Specifications can be both an incentive and an impediment. For instance, government contracts may specify certain materials be used in the manufacture of a product or that virgin materials be used rather than recycled materials. This can lead to the use of materials that are damaging to the environment or the unnecessary use of virgin materials where recycled materials would suffice.

Regulatory Issues It may be necessary to obtain a new or modified permit, or other governmental approval, before implementing a process change or material substitution. This can be time consuming and costly. Companies should contact the appropriate regulatory agency early in the process of making changes to the facility to ensure that all permitting requirements are considered.

Product Quality Issues Companies have great concern for the quality of the products they manufacture. Some pollution prevention projects may change product quality, even when properly implemented, and thus may be regarded with skepticism.

Customers' Acceptance The customer ultimately defines product quality requirements. Anything that affects the quality, or even the perception of its quality, may affect acceptance by the customer.

Immediate Production Concerns Implementation of pollution prevention projects may often require time, money, and personnel, all of which are usually in short supply.

Company Image Concerns Occasionally companies are hesitant to admit that the "old way" may not

have been the best way. Once easy-to-implement pollution prevention practices such as improved operations, for example, are underway, companies may realize that they could have been doing it all along but do not want the fact made public because it may make them look bad. However, many companies do not have this attitude.

Available Time/Technical Expertise Some organizations may lack sufficient time or technical expertise to develop and implement pollution prevention practices.

Inertia Whenever a production system is in place and working with some degree of success, there is a tendency to leave well enough alone. The old adage, "If it ain't broke, don't fix it," applies.

Although there may be many obstacles to implementing pollution prevention, the benefits can be so great as to warrant working through the obstacles. By properly educating and including all employees, as well as customers and suppliers, about the advantages and stages of a pollution prevention program, successful projects and programs can be achieved.

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Chapter 3
Definition of Terms

"Many terms have been used to describe pollution prevention and related activities."

Many terms have been used to describe pollution prevention and related activities. This guidance manual uses the following terms. References for sources of definitions are given in parentheses.

"Pollution prevention" means the use of source reduction techniques in order to reduce risk to public health, safety, welfare and the environment and, as a second preference, the use of environmentally sound recycling to achieve these same goals. Pollution prevention avoids cross-media transfers of wastes and/or pollutants and is multi-media in scope. It addresses all types of waste and environmental releases to the air, water and land. (Note: This is Ohio EPA's working definition of pollution prevention. See Chapter 4 of this manual for U.S. EPA's definition.)

"Source reduction" means any effort to reduce, at the source, the quantity of waste generated, toxic chemical use, or any release into the environment. Source reduction measures include, but are not limited to, process modifications, feedstock purity, good operating and management practices, increases in the efficiency of machinery, and recycling within a waste generating or other production process. (Ohio EPA, Office of Pollution Prevention, Fact Sheet #1, March, 1993)

"Recycle" means to use, reuse or reclaim a material (Ohio Administrative Code (OAC) 3745-50-10). Recycling does not include incineration, burning waste as fuel, or other treatment.

"Reuse" means reutilization of a material in an environmentally sound manner that will not result in a hazard to human health or the environment (OAC 3745-50-10). A material is reused if it is either:

1. employed as an ingredient, including use as an intermediate in an industrial process to make a product, or
2. used in a particular function or application as an effective substitute for a commercial product (OAC 3745-51-01).

"Reclaim" A material is "reclaimed" if it is processed to recover a usable product or if it is regenerated. (OAC 3745-51-01)

"Waste minimization" means any effort to reduce or recycle the quantity of waste generated, and when feasible, to reduce or eliminate toxicity. "Waste minimization" does not include treatment, unless the treatment is part of the recycling process. (Ohio Revised Code (ORC) 6111.045(F)) (Note: Waste minimization for hazardous waste is defined at OAC 3745-50-10)

"Treatment" means any method, technique or process designed to change the physical, chemical or biological characteristics or composition of industrial waste or other waste; to neutralize the waste; to recover energy or material resources from the waste; to render the waste nonhazardous or less hazardous, safer to transport, store, or dispose of, or amenable for recovery, storage, further treatment, or disposal; or to reduce the volume of the waste. (ORC 6111.045(F))

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Chapter 4
Overview of Federal Law, Regulation and Policy

"A strong emphasis on pollution prevention is the most important thing we can do for the future of environmental protection in this country. We have to move our environmental effort 'upstream' to look for opportunities for the use of pollution prevention."

Carol Browner, U.S. EPA Administrator

U.S. EPA is committed to a preventive strategy to reduce or eliminate the generation of environmentally harmful pollutants which may be released to the air, land, and water. The following sections detail some of U.S. EPA's efforts in pollution prevention, hazardous waste minimization, and voluntary pollution prevention programs.

Pollution Prevention

The Pollution Prevention Act of 1990 established a national goal for environmental protection: to reduce or eliminate waste at its source. The Pollution Prevention Act established the following national waste hierarchy policy:

- pollution should be prevented or reduced at the source whenever feasible;
- pollution that cannot be prevented should be recycled in an environmentally safe manner whenever feasible;
- pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and
- disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.

U.S. EPA defines "pollution prevention" to mean "source reduction," as defined under the Pollution Prevention Act, and other practices that reduce or eliminate the creation of pollutants through: increased efficiency in the use of raw materials, energy, water, or other resources; or protection of natural resources by conservation.

The Pollution Prevention Act defines source reduction as any practice which: reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) before recycling, treatment, or disposal; and reduces hazards to public health and the environment associated with the release of such substances, pollutants, or

contaminants. Some practices commonly described as "in-process recycling" may qualify as pollution prevention. Environmentally sound recycling can reduce the need for treatment or disposal, and conserve energy and resources. Pollution prevention addresses solid and hazardous waste and all air and water pollutants, whether regulated or not.

The Pollution Prevention Act also states that each owner or operator of a facility required to file an annual toxic chemical release form under section 313 of the Superfund Amendments and Reauthorization Act (SARA) shall include with each filing a toxic chemical source reduction and recycling report for the preceding calendar year. This requirement became effective in 1992. The reporting requirements include the following:

1. the quantity of the chemical entering any waste stream or otherwise released to the environment;
2. the amount of the chemical which is recycled in a calendar year, including the percentage change from the previous year;
3. source reduction practices used with respect to that chemical during the year (this includes a variety of technologies and techniques such as improvement in management, training, inventory control, materials handling, or other general operational phases of industrial facilities);
4. projections of expected releases for the next two reporting years;
5. a ratio of production in the reporting year to production in the previous year; and,
6. techniques which were used to identify source reduction opportunities (such as employee recommendation, external and internal audits, participative team management, and material balance audits).

Although there are other requirements, these six provide an overview of the scope of information being requested by the Act. Point 6 above lists a number of items that are important components of a pollution prevention plan, and although not required, it is obvious that planning by Ohio businesses and government facilities is desired and will be necessary to fully comply with the regulations.

Hazardous Waste Minimization

With the passage of the Hazardous and Solid Waste Amendments (HSWA) of 1984, amending the 1976 Resource Conservation and Recovery Act (RCRA), Congress established a new policy concerning hazardous waste management. Specifically, Congress declared that the reduction or elimination of hazardous waste generation at the source should take priority over the management of hazardous wastes after they are generated. HSWA contains several specific requirements that promote implementation of waste minimization. Generators of hazardous waste who transport waste off-site are required to certify on each hazardous waste manifest that they have a program in place to reduce the volume and toxicity of such waste to the degree determined by the generator to be economically practicable. Owners and operators of permitted hazardous waste treatment, storage and disposal facilities are also required to provide the same certification annually. Hazardous waste generators and owners/operators of treatment, storage and disposal facilities who manage their own waste on-site, must also identify in a biennial report to U.S. EPA (annual to Ohio EPA): (1) the efforts undertaken during the year to reduce the volume and toxicity of waste generated; and (2) the changes in volume and toxicity actually achieved in comparison to previous years.

With the intent of meeting HSWA's goal, U.S. EPA has published a notice, "Interim Final Guidance:

Guidance to Hazardous Waste Generators on the Elements of a Waste Minimization Program" (Federal Register, volume 58, May 28, 1993). The full text of this notice is included in Appendix C of this guidance manual. The notice is intended to provide guidance to hazardous waste generators and treatment, storage and disposal facilities about what constitutes a waste minimization program in place for certification under HSWA. The elements of a waste minimization program are also important components of a pollution prevention plan. The elements include top management support, characterization of waste generation and waste management costs, periodic waste minimization assessments, developing a cost allocation system, encouraging technology transfer, and program implementation and evaluation. Table C-2 in Appendix C compares U.S. EPA's program to the program outlined in this guidance manual.

On May 18, 1993, U.S. EPA also announced a new Hazardous Waste Reduction and Combustion Strategy. Waste reduction is a key component of the strategy. A state/federal task force has been convened to fully evaluate the role of hazardous waste combustion in the management of hazardous waste.

Ohio EPA is authorized to administer the federal hazardous waste program in Ohio. Appendix C of this document contains information about Ohio Hazardous Waste Facility Installation and Operation Permits and their condition that requires a Waste Minimization Report. The Waste Minimization Report is a written document that the permittee must use to demonstrate compliance with the certification requirement to have a waste minimization program in place.

Voluntary Pollution Prevention Programs

U.S. EPA has developed several programs to encourage the use of pollution prevention techniques, among other methods, to reduce toxic releases. U.S. EPA's 33/50 Program is a voluntary program to reduce national pollution releases and off-site transfers of 17 toxic chemicals by 33 percent by the end of 1992 and by 50 percent by the end of 1995. The Green Lights Program sponsored by U.S. EPA encourages companies to decrease their energy use by using more energy efficient lighting, which in turn reduces the amount of emissions and waste generated through the generation of power. The State of Ohio is a Green Lights Partner and promotes the Green Lights Program to companies in Ohio. Appendix B discusses both of these programs in more detail.

U.S. EPA has proposed the creation of a program that would encourage and publicly recognize environmental leadership. As described in the January 15, 1993 Federal Register, this program would also promote pollution prevention in manufacturing.

As part of the New Chemicals Program under the Toxic Substances Control Act, companies are required to submit Premanufacture Notices (PMNs) before beginning production of new chemicals. The "Optional Pollution Prevention Information" page of the PMN form provides submitters with the opportunity to consider and provide descriptions of pollution prevention and risk reduction options considered by the company in regard to specific new chemical substances. Providing this optional pollution prevention information to U.S. EPA may benefit PMN submitters by reducing regulatory controls and/or testing requirements, if the pollution prevention information sufficiently mitigates U.S. EPA's concerns for the toxicity, human exposure, or environmental releases of the PMN substance.

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Chapter 5
Overview of State of Ohio Law, Regulation and Policy

"Pollution prevention is a priority for this Administration. A strong pollution prevention program minimizes waste and maximizes profits. It's good for business and for the environment - a real win-win."

Governor George V. Voinovich

The State of Ohio's environmental programs are increasingly emphasizing pollution prevention. Ohio is modifying and expanding efforts that will help to redirect attention toward prevention for toxics and other emissions and wastes. These activities are found in the Ohio Environmental Protection Agency, the Ohio Department of Development, and the Ohio Department of Natural Resources. Appendix B, "Sources of pollution prevention information," provides additional information about these activities.

Two Ohio laws are aimed at reducing waste generation in the state. House Bill 147 directs owners and operators of Class I injection well facilities to prepare waste minimization and treatment plans for wastes generated at these facilities. The plans will identify the specific technically and economically feasible measures that will be taken to prevent or reduce releases into the environment. Appendix D of this guidance manual discusses the waste minimization planning requirements for Class I injection well facilities in detail.

The implementation of House Bill 592 has helped to stimulate activity in solid waste reduction and recycling throughout Ohio's solid waste management districts. The major goals of H.B. 592 are to reduce solid waste generation and increase recycling. By 1994, all districts will implement a solid waste management plan which includes strategies for achieving 25 percent waste reduction and/or recycling as a goal. The reduction goal is a planning objective, not an inflexible standard. These plans must be approved by Ohio EPA. Some districts have developed innovative programs including establishing commitments by business to reduce and recycle.

Hazardous waste minimization requirements are detailed in the preceding chapter on overview of federal laws, regulations and policies. Appendix C of this document contains information about Ohio Hazardous Waste Facility Installation and Operation Permits and their condition that requires a Waste Minimization Report. The Waste Minimization Report is a written document that the permittee must use to demonstrate compliance with the certification requirement to have a waste minimization program in place as required by RCRA.

Ohio EPA has general permitting authority for storm water general permits. The objective of the storm water program is to reduce or eliminate illegal, whether intentional or unintentional, dumping of

materials into storm water discharges. The general permit for industrial activity requires preparation and implementation of a storm water pollution prevention plan. Permits also require implementation of best management practices to control the quality of storm water runoff.

The Ohio Environmental Protection Agency (Ohio EPA) strongly supports the move toward more pollution prevention and is involved in a number of specific pollution prevention activities. The Office of Pollution Prevention (OPP) coordinates pollution prevention activities for all of Ohio EPA. The OPP has four main objectives:

1. Facilitate the incorporation of pollution prevention into standard Agency operations and into standard State government operations.
2. Review and develop legislative initiatives for pollution prevention.
3. Increase awareness of pollution prevention opportunities through education, outreach and technical assistance for business, government and the public.
4. Analyze, develop and publicize information and data related to pollution prevention for use by business, government and the public.

The OPP provides on-site, by mail, or over the phone technical assistance; provides literature search information; prepares program and industry specific fact sheets; and makes public presentations regarding pollution prevention.

The OPP is currently coordinating the development of a strategy to integrate pollution prevention into activities at Ohio EPA. This strategy will identify regulatory and non-regulatory options for integrating pollution prevention concepts into existing media programs and propose new pollution prevention activities for consideration by Ohio EPA.

As part of the Agency Pollution Prevention Strategy, Ohio EPA is now incorporating pollution prevention requirements in many environmental enforcement cases. The Agency is pursuing this condition to encourage additional environmental improvements, not just penalties, as a result of enforcement. Some offers of settlement may include reduced monetary penalties in exchange for commitments to develop pollution prevention plans, or for commitments to install source reduction processes.

In 1991, Governor George V. Voinovich announced the formation of the Pollution Prevention Development Workgroup (PPDW), directed by Ohio EPA. The purpose of the Workgroup is to develop and coordinate pollution prevention initiatives throughout state government, business and consumer activities. The goals of the workgroup include the development of a comprehensive Pollution Prevention Strategy for Ohio and increasing communication on pollution prevention efforts between state agencies, business and the public.

Currently, the PPDW is initiating pollution prevention planning for State Agencies by implementing a pilot program which includes the Ohio Department of Administrative Services, the Ohio Department of Natural Resources, the Ohio Environmental Protection Agency, and one facility within the Ohio Department of Rehabilitation and Correction. Results are expected to reveal areas in State government where pollution can be prevented through a variety of means. This effort is expected to be extended to other state agencies based upon the results of this initial effort.

On September 1, 1993, Governor Voinovich requested the top 100 emitters of toxic pollutants in Ohio to

work with the Ohio EPA to develop comprehensive pollution prevention plans to reduce the various types of wastes they generate. The State of Ohio's press release, "Pollution Prevention Planning - The Environmental Strategy for the Future," states that wastes in the plans will include chemicals in the Toxic Release Inventory, hazardous and solid wastes, air emissions, and wastewater discharges. The plans will identify the types of waste generated, evaluate ways to limit the source of the wastes, set forth a written course of action to carry out each facility's commitment to pollution prevention, and establish progress reporting to measure the success of each program.

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Appendix C
Ohio Hazardous Waste Facility Installation and Operation Permit Waste Minimization Report Condition

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This appendix describes the Waste Minimization Report Condition in Ohio Hazardous Waste Facility Installation and Operation Permits and describes references that can be used to complete a Waste Minimization Report. The appendix also compares the elements of a pollution prevention/waste minimization program in this guidance manual, U.S. EPA's interim final guidance to hazardous waste generators, and U.S. EPA's *Facility Pollution Prevention Guide*.

Owners and operators of permitted hazardous waste treatment, storage and disposal facilities are required to certify annually that they have a waste minimization program in place, and are required to include this certification in their operating record. The Ohio Administrative Code (OAC 3745-54-73 (B)(9)) states that the operating record must include:

> "A certification by the permittee, no less often than annually, that the permittee has a program in place to reduce the volume and toxicity of hazardous waste that he generates to the degree determined by the permittee to be economically practicable; and the proposed method of treatment, storage, or disposal is that practicable method currently available to the permittee which minimizes the present and future threat to human health and the environment."

Ohio Hazardous Waste Facility Installation and Operation Permits contain a condition that requires a Waste Minimization Report. The waste minimization report condition is given in Table C-1. The Waste Minimization Report is a written document that the permittee must use to demonstrate compliance with the certification requirement to have a waste minimization program in place.

Ohio EPA is authorized to administer the RCRA program in Ohio, including issuing hazardous waste treatment, storage and disposal facility permits. Ohio EPA's authorized RCRA program operates in lieu of U.S. EPA's program. Ohio EPA's authority includes conditional authority for waste minimization condition in permits. For informational purposes only, facilities should note that U.S. EPA's Region V office has developed RCRA waste minimization permit language, evaluation criteria, and checklists (December, 1992). Region V has also developed two guidance documents related to their permit language. Region V's *Recommended Minimum Standards, Hazardous Waste Reduction Plan/Waste Reduction Implementation Report Evaluation Criteria*, is to be used by Permittees to develop plans and reports, and by permit writers to evaluate the plans and reports. Region V's *Region 5 Hazardous Waste Reduction Plan/Waste Reduction Implementation Report Guidance* is designed to aid the facility in the development of these documents.

Table C-1. Waste Minimization Report Condition

Waste Minimization Report
OAC Rule 3745-54-73 (a) The Permittee shall submit a Waste Minimization Report describing the waste minimization program required by O.A.C. 3745-54-75 (H), (I), and (J); O.A.C. 3745-54-73 (B) (9); and, O.A.C. 3745-52-20 (B) at least once every two years. The provisions of O.A.C. 3745-54-75 (H), (I), and (J); and O.A.C. 3745-54-73 (B) (9) must be satisfied annually. (b) In completing this report, the Permittee shall refer to the following information: instructions prepared by the Ohio EPA for completing the Waste Minimization Annual Report required by O.A.C. 3745-54-75 (H), (I), and (J); the Federal Register notice of May 28, 1993, vol. 58, p. 31114, "Interim Final Guidance: Guidance to Hazardous Waste Generators on the Elements of a Waste Minimization Program"; U.S. EPA's "Facility Pollution Prevention Guide" (EPA/600/R-92/088) May, 1992; Ohio EPA's "Ohio Pollution Prevention and Waste Minimization Planning Guidance Manual"; and any subsequent updates. The Waste Minimization Report prepared by the permittee should incorporate the phases outlined in the "Facility Pollution Prevention Guide" including planning and organization, assessment, feasibility analysis, implementation, measuring progress, and maintaining the program. Similar content and additional discussion are found in Ohio EPA's "Ohio Pollution Prevention and Waste Minimization Planning Guidance Manual." (c) The Permittee shall submit the Waste Minimization Report to the Director within one-hundred and eighty days (180) of journalization of this permit, and shall submit updates to this report biennially thereafter.

Waste Minimization References

The waste minimization permit condition lists four references that permittees shall refer to when completing their waste minimization reports. These references are briefly described here.

a) Instructions prepared by the Ohio EPA for completing the Waste Minimization Annual Report required by OAC 3745-54-75 (H), (I), and (J).

The instructions include definitions for waste minimization, recycling, and source reduction, examples of waste minimization activities, and a general list of waste minimization activities (see activity codes list).

b) Federal Register notice of May 28, 1993, vol. 58, p. 31114, "Interim Final Guidance: Guidance to Hazardous Waste Generators on the Elements of a Waste Minimization Program."

The notice is intended to provide guidance to hazardous waste generators and treatment, storage and disposal facilities about what constitutes a waste minimization program in place for certification under HSWA. An effective waste minimization program should include each of the general elements listed below, although some of these elements may be implemented in different ways depending on the preferences of individual companies. The notice provides specific explanations and examples for each of the elements. The full text of this notice is included as a part of Appendix C.

1) Top management support
2) Characterization of waste generation and waste management costs
3) Periodic waste minimization assessments
4) A cost allocation system
5) Encourage technology transfer
6) Program implementation and evaluation

c) U.S. EPA's *Facility Pollution Prevention Guide* (EPA/600/R-92/088) May, 1992

U.S. EPA's *Facility Pollution Prevention Guide* concentrates on procedures that motivate people to search, screen, and put into practice measures involving administrative, material, or technology changes that result in decreased waste generation. The manual is also a source of concepts and ideas for developing and implementing a pollution prevention program. The manual lists several steps in a program, including planning and organization, assessment, feasibility analysis, implementation, measuring progress, and maintaining the program. The *Ohio Pollution Prevention and Waste Minimization Planning Guidance Manual* uses the pollution prevention program steps (with limited modifications) outlined in U.S. EPA's *Facility Pollution Prevention Guide*.

d) *Ohio Pollution Prevention and Waste Minimization Planning Guidance Manual*

The *Ohio Pollution Prevention and Waste Minimization Planning Guidance Manual* (this document) should also be used as a reference when writing a Waste Minimization Report. Two tables are included in this manual that compare elements of different manuals and guidelines to U.S. EPA's *Facility Pollution Prevention Guide* (refer to Table C-2, Comparison of elements of a pollution prevention program in U.S. EPA's *Facility Pollution Prevention Guide* to elements of a waste minimization program in U.S. EPA's interim final guidance to hazardous waste generators; and to Table C-3, Comparison of elements of a pollution prevention program in U.S. EPA's *Facility Pollution Prevention Guide* to elements of a pollution prevention/waste minimization program in the *Ohio Pollution Prevention and Waste Minimization Planning Guidance Manual*). These comparison tables illustrate that although the names of elements and order of elements may be different, the manuals and guidelines essentially describe the same kind of pollution prevention and waste minimization programs.

General Considerations

The Waste Minimization Report must be specific and should include the phases outlined in U.S. EPA's *Facility Pollution Prevention Guide*. However, operations and processes at different facilities may be quite diverse. Because waste minimization activities are dependent on the operations and processes, waste minimization reports will vary and may be tailored to individual facilities.

Considerations for commercial treatment, storage and disposal facilities and research and development facilities

Commercial treatment, storage and disposal facilities and research and development facilities have different constraints on both the type and amount of material inputs to their facilities that limit their options for pollution prevention. Commercial treatment, storage and disposal facilities are in business to take a variety of wastes from generators. Research and development facilities work with a variety of materials and the types of materials that will be used (and subsequent waste generated) in a specific project are not always identified before a project starts. Some pollution prevention projects may require changes in the facility's hazardous waste permits. The permitting process can be lengthy and may delay implementation of the pollution prevention projects.

While there are numerous pollution prevention opportunities at such facilities, their pollution prevention plans and programs should reflect the above constraints and the nature of materials input. Because of these constraints, pollution prevention plans and programs for these facilities may be less extensive than plans and programs for other business or government facilities. Pollution prevention assessments can still be conducted, giving special consideration to assessing support departments that are common to many facilities (see Chapter 12, Table 2). For

basic concepts on pollution prevention options, research and development facilities can refer to Ohio EPA's Fact Sheet 16, *Research and Educational Laboratory Waste*, and to U.S. EPA's 1990 document *Guides to Pollution Prevention: Research and Educational Institutions*, EPA/625/7-90/010.

Hazardous waste treatment, storage and disposal facilities have many common activities, some required by hazardous waste regulations, that provide the opportunity for implementing and integrating pollution prevention into the operation of the facility. Several activities are listed here with suggestions for pollution prevention options. Any changes implemented as a result of pollution prevention options must be in compliance with the facility's permit and with applicable environmental regulations.

All facilities must evaluate wastes to determine their characteristics. Procedures for sampling and laboratory analysis can be designed to incorporate pollution prevention.

All facilities must train employees about the operation of the facility and hazardous waste management. Pollution prevention and waste minimization should be an integral part of the training. Employees should be encourage to provide suggestions for pollution prevention projects.

Contingency plans can be written to incorporate pollution prevention options. Plans on responding to emergencies and spills should consider responses that will address the situation and at the same time minimize the use of resources and minimize waste generation. Proactive measures against leaks and spill should be incorporated in plans for these facilities.

All facilities have general inspection requirements and emergency preparedness and prevention requirements. Facilities could use these inspections and requirements as opportunities to continually look for pollution prevention aspects of daily operations.

All facilities receive waste and manage waste in containers, tanks, or pipelines. Standardized practices for preventing pollution can be incorporated in loading/unloading procedures, storage procedures, and daily operations of waste management units.

Treatment, storage and disposal activities should be assessed as unit processes by following the steps outlined in Chapter 9 of this manual. Treatment, storage and disposal activities are the "production" processes of a hazardous waste facility and can be evaluated in a similar manner. For example, a different flocculent could be used in a wastewater treatment operation that may result in less solids being generated for later management or disposal.

The following example illustrates some of the challenges facing a commercial solvent reclaimer. The spent solvent waste generators may determine, to a large extent, the amount of waste generated by the solvent reclaimer when processing a given waste stream. The annual volume of hazardous waste generated by the reclaimer is dependent on the percentage of reclaimable material in the hazardous waste and the total hazardous waste received for the year. The reclaimer's annual receipts are dependent on the generators' reduction of generated spent solvent waste and the reclaimer's competitive market position for that business year.

The reclaimer can work to improve operating efficiencies and improve reclamation processes at the reclamation facility as part of a pollution prevention program. For example, the reclaimer could survey the entire process, look for areas and equipment that might have fugitive emissions, and institute equipment and operating practices to reduce or eliminate emissions. The reclaimer could use statistical process control techniques to determine the optimum operating conditions for distillation equipment. The reclaimer might also want to work with the generators to educate them on ways to consolidate waste streams and reduce waste generation in an effort to maximize recovery of spent solvent. Although working with customers to reduce waste at the source might be very desirable from the reclaimer's and customers' points of view and is strongly encouraged by the State of Ohio, this activity is not required for hazardous waste treatment, storage and disposal facilities.

The following example illustrates some of the challenges facing a specialty chemicals research and development facility. The "products" of the research and development facility are knowledge (formulations for new chemical

products) and waste. Experimental products developed during the research process cannot be sold; they must be managed as waste. Research and development of new chemicals is a constantly changing field and highly individualized. Constantly changing experiments make it difficult to define production units. It is also difficult to meaningfully determine a waste per unit product index when the product undergoes frequent changes.

Research and development facilities might define "research" as a process, and concentrate on how to make pollution prevention, particularly source reduction, part of and integrated into the design of research processes. Engineers and chemists can work with statisticians to design experiments to reduce waste. Procedures for procuring raw materials can be established. Information about past experiments can be made easily accessible by computer so that research chemists do not repeat old work. Computer modelling can help to predict experimental outcomes and product performance.

Table C-2
Comparison of Elements of a Pollution Prevention Program in U.S. EPA's *Facility Pollution Prevention Guide* to Elements of a Waste Minimization Program in U.S. EPA's Interim Final Guidance to Hazardous Waste Generators

Facility Pollution Prevention Guide Pollution Prevention Program	Hazardous Waste Generators Waste Minimization Program
Establish the pollution prevention program • Executive level decision • Policy statement • Consensus building	Top management support • Policy statement • Commit to implementing recommendations
Organize the program • Name task force • State goals	Top management support • Designate a waste minimization coordinator • Set specific goals
Do preliminary assessment • Collect data • Review sites • Establish priorities	Characterization of waste generation and waste management costs
Write program plan • Consider external groups • Define objectives • Identify potential obstacles • Develop schedule	"The generator or treatment, storage, or disposal facility should document its program (in writing)..." (see note 3)
Do detailed assessment • Name assessment teams • Review data and sites • Organize and document information	Periodic waste minimization assessments • Identify opportunities for waste minimization
Define pollution prevention options • Propose options • Screen options	Periodic waste minimization assessments

Do feasibility analysis • Technical • Environmental • Economic	Encourage technology transfer Periodic waste minimization assessments • Analyze waste minimization opportunities based on the true costs of the waste Cost allocation system
Write assessment report	"The generator or treatment, storage or disposal facility should document its program (in writing)..." (see note 3)
Implement the plan • Select projects • Obtain funding • Install the selected projects	Top management support • Commit to implementing recommendations Program implementation and evaluation
Measure progress • Acquire data • Analyze results	Program implementation and evaluation
Maintain the pollution prevention program	Top management support • Publicize success stories • Reward employees • Train employees Program implementation and evaluation

Notes:

1. The pollution prevention program elements follow the outline of U.S. EPA's *Facility Pollution Prevention Guide* (EPA/600/R-92/088).
2. The waste minimization program elements follow the outline of U.S. EPA's Interim Final Guidance to Hazardous Waste Generators on the Elements of a Waste Minimization Program (Federal Register, May 28, 1993, vol. 58, p. 31114).
3. This statement is part of the May 28, 1993 Federal Register explanation of the waste minimization program.

Table C-3
Comparison of Elements of a Pollution Prevention Program in U.S. EPA's *Facility Pollution Prevention Guide* to Elements of a Pollution Prevention/Waste Minimization Program in the *Ohio Pollution Prevention and Waste Minimization Planning Guidance Manual*

Facility Pollution Prevention Guide Pollution Prevention Program	State of Ohio Pollution Prevention/Waste Minimization Program
Establish the pollution prevention program • Executive level decision • Policy statement • Consensus building	Establish the pollution prevention program • Executive level decision • Policy statement • Consensus building

Organize the program • Name task force • State goals	Organize the pollution prevention program • Name the pollution prevention task force • State goals • Increase employee awareness and involvement • Train employees • Reward pollution prevention successes
Do preliminary assessment • Collect data • Review sites • Establish priorities	Do a preliminary assessment • Understanding processes and wastes • Gathering background information • Define production units • Characterize general process • Understand unit processes • Outputs • Perform materials balance • Establish priorities
Write program plan • Consider external groups • Define objectives • Identify potential obstacles	Write the pollution prevention program plan • Define objectives • Identify potential obstacles • Develop schedule • Augment the plan
Do detailed assessment • Name assessment teams • Review data and sites • Organize and document information	Do a detailed assessment • Begin assessments
Define pollution prevention options • Propose options • Screen options	Define pollution prevention and waste minimization options • Propose options • Screen options
	Cost considerations • Determine full cost of waste • Develop economics • Establish a cost allocation system
Do feasibility analysis • Technical • Environmental • Economic	Do feasibility analysis • Technical evaluation • Economic evaluation • Environmental evaluation
Write assessment report	Write the assessment report
Implement the plan • Select projects • Obtain funding • Install the selected projects	Implement the pollution prevention plan • Select projects • Obtain Funding • Install the selected projects

Measure progress • Acquire data • Analyze results	Measure progress: Program and project evaluation • Program evaluation • Program modification
Maintain the pollution prevention program	Maintain the pollution prevention program

Notes:

1. The pollution prevention program elements follow the outline of U.S. EPA's *Facility Pollution Prevention Guide* (EPA/600/R-92/088).
2. The pollution prevention/waste minimization program elements follow the outline of the *Ohio Pollution Prevention and Waste Minimization Planning Guidance Manual*.

Federal Register / Vol. 58, No. 102 / Friday, May 28, 1993

Part VII Environmental Protection Agency

Guidance to Hazardous Waste Generators on the Elements of a Waste Minimization Program; Notice

This reference is not included here in this Web version. You may check the U.S. EPA Web site for it.

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Appendix B
Sources of Pollution Prevention Information

Ohio Environmental Protection Agency (Ohio EPA)

Office of Pollution Prevention (OPP)

The Ohio EPA Office of Pollution Prevention is responsible for coordinating pollution prevention activities for all divisions at Ohio EPA. The office is comprised of the Technical Assistance Unit and the Program Management and Evaluation Unit. Both units are responsible for developing criteria for measuring pollution prevention progress, supporting activities relating to the preparation and passage of pollution prevention legislation in Ohio, and supporting the development of a pollution prevention strategy for Ohio. OPP has a total of 10 permanent staff positions. Additional part time staff form a Pollution Prevention Intern Program.

The goal of OPP is to develop and implement pollution prevention initiatives that effectively reduce pollutants and conserve natural resources in Ohio by emphasizing source reduction and environmentally sound recycling. OPP seeks to accomplish this goal through five objectives:

- Facilitate the incorporation of pollution prevention into standard Agency operations and into standard State government operations;
- Review and develop legislative initiatives for pollution prevention;
- Increase awareness of pollution prevention through education, outreach, and technical assistance for business, government, and the public; and
- Analyze, develop, and publicize information and data related to pollution prevention for use by government and the public.

The OPP provides on-site or over the phone technical assistance; provides literature search information; prepares program and industry specific fact sheets; and makes public presentations regarding pollution prevention. OPP maintains a library containing more than 1400 pollution prevention documents such as case studies, fact sheets, manuals, guides, videotapes and more. OPP has access to several databases and information from other agencies. In addition, interested parties can request copies of approximately 75 publications via an information request form.

For more information contact:
Office of Pollution Prevention
Ohio EPA

1800 WaterMark Drive
P.O. Box 1049
Columbus, OH 43216-1049
Phone: 614/644-3469

Small Business Assistance Program

The Clean Air Act Amendments (CAAA) of 1990 require each state to develop a Small Business Stationary Source Technical and Environmental Compliance Assistance Program to help small businesses comply with the Act. This program will consist of two elements, a Small Business Assistance Program (SBAP) and a Small Business Ombudsman. Ohio EPA's Division of Air Pollution Control will administer the SBAP which will provide information to small businesses on compliance, pollution prevention, accidental release prevention and detection, alternative technologies, and other areas. The Ombudsman will represent small businesses with air pollution control concerns before appropriate government offices and aid in the dissemination of information, operate a toll-free hotline, and refer small businesses to specialists, as well as other functions. The Ohio Air Quality Development Authority is proposed as the state's Small Business Ombudsman for CAAA related activities

For more information contact:
Small Business Assistance Program
Division of Air Pollution Control
Ohio EPA
1600 WaterMark Drive
Columbus, OH 43215
Phone: 614/644-2270

Ohio Department of Development (DOD)

Edison Technology Centers

Ohio's Edison Technology Centers are independent not-for-profit organizations funded in part by the Ohio Department of Development and in part by industry. By offering pollution prevention technical assistance to waste generators, these Centers can offer a wealth of good information geared toward cost-effective benefits to businesses which help improve manufacturing bottom lines and protect the environment.

Cleveland Advanced Manufacturing Program (CAMP)

CAMP, northeastern Ohio's Edison Technology Center, plays an active role in helping manufacturers adopt new technologies, integrate new management techniques, and streamline operations to increase productivity. A new goal is to encourage businesses to think in terms of pollution prevention and total quality management. CAMP now offers several environmental services, including pollution prevention assistance. CAMP provides waste reduction assessments and counselling. Technology application engineers develop options, estimate cost savings and project the impact of suggested changes.

For more information contact:
Cleveland Advanced Manufacturing Program
4600 Prospect Avenue

Cleveland, OH 44103
Phone: 216/432-5300
Outside Cleveland: 800/927-0436
Fax: 216/362-2900

Institute of Advanced Manufacturing Sciences (IAMS)

IAMS' Center for Applied Environmental Technologies (CAET) offers technical assistance in pollution prevention (Ohio Pollution Prevention Technical Assistance, OPPTA), assists companies in applying "clean" technologies, and serves as a an information clearinghouse for pollution prevention methods and technologies. CAET offers industry on-site pollution prevention assessments to quantify wastes, suggest process changes, and identify potential savings. Following an assessment, CAET is available to work with companies to develop and initiate pollution prevention programs. Literature searches and telephone assistance are available as well as training programs and networking opportunities. CAET is also working to help industry reduce solid waste and to develop markets for recycled products.

For more information contact:
Institute of Advanced Manufacturing Sciences, Inc.
1111 Edison Drive
Cincinnati, OH 45216-2265
In Cincinnati call: 513/948-2000
Outside of Cincinnati: 800/345-4482
Fax: 513/948-2109

Ohio Department of Natural Resources (ODNR)

ODNR's Division of Litter Prevention and Recycling is very active in public awareness activities concerning recycling through the "Keep Ohio Beautiful" program and through several grant programs to enhance recycling activities in the State. ODNR works with the Association of Ohio Recyclers and the National Recycling Coalition to promote recycling on both state and national levels.

For more information contact:
Division of Litter Prevention and Recycling
Ohio Department of Natural Resources
Fountain Square
Columbus, OH 43224-1387
614/265-6333

Ohio Air Quality Development Authority (OAQDA)

OAQDA was created in 1970 by the Ohio General Assembly to work in partnership with Ohio's businesses and citizens to promote clean air and economic prosperity. OAQDA helps businesses - large and small - obtain competitive, low cost financing to purchase and install air pollution control equipment to meet clean air standards. OAQDA's responsibilities include:

- Issuing air quality revenue bonds, notes, and refunding bonds;
- Making loans for air quality projects for industry, public utilities, commerce, distribution, or research;

- Making loans and grants to government agencies to acquire and construct air quality facilities;
- Acquiring, constructing, and operating air quality facilities; and
- Conducting research and development on air quality issues

For more information contact:
OAQDA
50 West Broad Street, Suite 1901
Columbus, OH 43215
Phone: 614/224-3383

Ohio Water Development Authority (OWDA)

OWDA was created by the Ohio General Assembly in 1968 to provide financing to Ohio communities for the planning and construction of drinking water, waste water, and solid waste facilities. OWDA also issues private activity bonds for solid waste facilities, facilities which furnish potable water, and facilities for the disposal of hazardous waste. Additionally, OWDA administers a Research and Development Grant Program which provides grants to communities seeking innovate solutions to environmental problems dealing with solid waste, water, waste water, and energy resource development.

For more information contact:
OWDA
50 W. Broad Street, Suite 1425
Columbus, OH 43215
Phone: 614/466-5822

United States Environmental Protection Agency (U.S. EPA)

33/50 Program

The 33/50 Program was initiated in January of 1991 by U.S. EPA to reduce national pollution releases and off-site transfers of 17 toxic chemicals reported under the Toxics Release Inventory (TRI). Reduction goals are 33 percent by the end of 1992 and 50 percent by the end of 1995. Companies are encouraged to examine their industrial processes and establish cost effective pollution prevention practices for these chemicals. Participation in the 33/50 Program is completely voluntary. The TRI will be used to track these reductions using 1988 data as a baseline.

The 17 chemical groups are:

- benzene
- cadmium & cadmium compounds
- carbon tetrachloride
- chloroform
- chromium & chromium compounds
- cyanide & cyanide compounds
- lead & lead compounds
- mercury & mercury compounds

- methylene chloride
- methyl ethyl ketone
- methyl isobutyl ketone
- nickel & nickel compounds
- tetrachloroethylene
- toluene
- 1,1,1-trichloroethane
- trichloroethylene
- xylenes

For more information contact:
The TSCA Hotline: 202/554-1404. All information received by EPA through the 33/50 program is available to the public through the Emergency Planning and Community Right to Know Act (EPCRA) Reporting Center
P.O. Box 23779
Washington, D.C. 20026-3779
Phone: 202/488/1501.

Green Lights Program

Green Lights is a voluntary, non-regulatory program that encourages the widespread use of energy-efficient lighting and the reduction of pollution generated by energy consumption. Green Lights participants agree to survey their facilities and over five years upgrade 90 percent of their square footage. The upgrade must be profitable and the lighting quality must be maintained or enhanced. As of July 1993, over 1000 organizations have joined the program. In addition to saving energy, participants receive positive public recognition.

On July 8, 1993, the State of Ohio officially became a Green Lights Partner. Ohio is the first state in U.S. EPA's Region V to join the program. The Ohio Department of Administrative Services is coordinating all state related projects. Ohio is also promoting Green Lights to other businesses in Ohio through the Ohio EPA, Office of Pollution Prevention.

For more information contact:
Green Lights Program
U.S. EPA
401 M Street, SW
(6202J)
Washington, DC 20460
or call the Green Lights Hotline:
Phone: 202/775-6650
Fax: 202/775-6680

For State of Ohio buildings contact:
Ohio Green Lights Office
Department of Administrative Services

35th Floor, State Office Tower
30 East Broad Street
Columbus, OH 43266
Phone: 614/644-5901

Ohio companies and local governments should contact Ohio EPA, Office of Pollution Prevention.

Pollution Prevention Information Clearinghouse (PPIC) and Pollution Prevention Information Exchange System (PIES)

The PPIC is dedicated to reducing or eliminating industrial pollutants through technology transfer, education, and public awareness. It is a free, nonregulatory service of the U.S. EPA which is operated by the U.S. EPA's Office of Pollution Prevention and Toxics and the Office of Research and Development. PPIC includes the following information exchange mechanisms to ensure efficient and comprehensive support:

- Repository - a hard copy reference library containing up-to-date information on pollution prevention.
- PIES - an interactive, PC-based system designed to provide instant access to data bases, publications, and on-line access to peers.
- Hotline - a free telephone service for those without access to a personal computer. The hotline can answer technical questions, locate and order documents and provide referrals.
- Outreach efforts - general and industry- specific information packets on prevention opportunities as well as workshop training sessions.

PIES is the computerized information network of EPA's PPIC. PIES provides on-line interactive access through modem and PC to a wide range of pollution prevention information. It is open 24 hours a day and requires no user fees. PIES features literature search functions, a national calendar of conferences and workshops relating to pollution prevention, hundreds of case studies of pollution prevention, a message center for interaction and exchange with participants, and direct access to news and documents. The International Cleaner Production Information Clearinghouse (ICPIC) and OzonAction are also available by accessing PIES.

To access PIES, a personal computer, a modem, communications software, and a telephone line are necessary. PIES is accessible through a regular telephone call, and the SprintNet network.

For more information on PPIC contact:
Pollution Prevention Information Clearinghouse
U.S. EPA, PM 211-A
401 M Street, SW
Washington, D.C. 20460
Phone: 202/260-1023
Fax: 202/260-0178

For more information on PIES contact:
Pollution Prevention Information Exchange System c/o SAIC
7600-A Leesburg Pike
Room 369

Falls Church, VA 22043
Phone: 703/821-4800
Fax: 703/821-4775

National Industrial Competitiveness Through Efficiency: Energy, Environment and Economics (NICE3)

A joint project of the U.S. Department of Energy (U.S. DOE) and U.S. EPA's Office of Pollution Prevention and Toxics (OPPT), the NICE3 grant program strives to improve energy efficiency, advance industrial competitiveness, and reduce environmental emissions of industry. Large-scale research and demonstration projects are targeted at industries with the highest energy consumption and greatest levels of toxics and chemicals released.

Eligible industries are in SIC codes 26 (paper), 28 (chemicals), 29 (petroleum and coal products), and 33 (primary metal industries). Projects are expected to use the one-time grant funds as seed money to overcome start-up risks. It is expected that industry will finance continuation of projects past the initial grant funding period. As part of the grant-funded phase, awardees will design, test, demonstrate, and assess the feasibility of new processes and/or equipment which can significantly reduce generation of high-risk pollution.

For more information contact:
David Bassett
Office of Pollution Prevention and Toxics
U.S. EPA
401 M Street, SW (7409)
Washington, D.C. 20460
Phone: 202/260-2720

Waste Exchanges

A waste exchange is a specialized service which provides a network for linking wastes (industrial and municipal) with those who may be able to use the wastes or recycle them. A waste exchange is a medium for finding uses for wastes which otherwise would be discarded. A waste exchange is like a specialized classified advertising system where a third party (the waste exchange) maintains confidentiality of the parties listing available waste or wanting to use recyclable material. Waste exchanges provide information on reuse and recycling opportunities which is not readily available otherwise and typically reach thousands of specialists in waste management with information.

National Materials Exchange Network
(800) 858-6625 modem access line
(509) 325-0551

Northeast Industrial Waste Exchange
90 Presidential Plaza, Suite 122
Syracuse, New York 13202
(315) 422-6572
Fax: (315) 422-9051

Canadian Waste Materials Exchange

ORTECH
Sheridan Park Research Community
2395 Speakman Drive
Mississauga, Ontario, Canada L5K 1B3
(416) 822-4111 Ext. 265
Fax: 416/823-1446

The Indiana Waste Exchange
c/o RTN
P.O. Box 454
Carmel, IN 46032
(317) 574-6505
Fax: (317) 844-8765

Industrial Material Exchange Service
P.O. Box 19276
2200 Churchill Road, #24
Springfield, Illinois 62794-0276
(217) 782-0450
Fax: (217) 782-9142

Kentucky Waste Options
Room 312, Ernst Hall
University of Louisville
Louisville, KY 40292
(502) 588-7260

RENEW, Office of Pollution Prevention
P.O. Box 13087
Austin, Texas 78711-3087
(512) 463-7773
Fax: (512) 463-8317

Southeast Waste Exchange
Urban Institute
Department of Civil Engineering
Univ. of North Carolina at Charlotte
Charlotte, North Carolina 28223
(704) 547-2307

Gene Jones
Southern Waste Information Exchange
P.O. Box 960
Tallahassee, Florida 32302
(800) 441-SWIX
Fax: (904) 574-6704

Waste Net

401 Mazur St.
Cincinnati, Ohio 45219
(513) 421-9768

Waste Reduction Strategies
9060 Outville Road
Pataskala, Ohio 43062
(614) 927-2511
Fax: (614) 927-1147

Merit Environmental Management
781 Beta Drive, Suite G
Cleveland, Ohio 44143
(216) 461-7760
Fax: (216) 461-2873

Tencon/Wastelink
P.O. Box 12
Terrace Park, Ohio 45174-0012
(513) 248-0012

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Chapter 6
Overview of Developing a Pollution Prevention Program

*"A pollution prevention **program** involves developing and implementing a continuous strategy to address all waste generated by a facility and procedures for prioritizing and systematically reducing these wastes."*

There is often general confusion among the terms pollution prevention program, plan and project. Many companies have compiled a list of projects and called the list a plan - such a list is not a plan. A pollution prevention **program** involves developing and implementing a continuous strategy to address all waste generated by a facility and procedures for prioritizing and systematically reducing these wastes. A pollution prevention **plan** is a written guide used to chart the progress of the program. It reiterates management support, lists reasons for the program, identifies the pollution prevention team, describes how waste will be characterized, provides a strategy and schedule for pollution prevention assessments, includes an evaluation of all costs incurred by producing and handling waste, institutes a cost allocation system, indicates how technology transfer will take place, addresses training needs, and discusses how the program and projects will be evaluated and implemented. The plan needs to be periodically updated to reflect the continuous nature of a pollution prevention program. Pollution prevention **projects** are the specific activities undertaken to reduce or eliminate waste.

In the chapters that follow, the steps to establish and maintain a pollution prevention program will be presented. These steps follow the elements (with limited modifications) outlined in U.S. EPA's 1992 publication, *Facility Pollution Prevention Guide* (EPA/600/R-92/088). Figure 1 illustrates the major steps in a pollution prevention program as described in this guidance manual. These steps include:

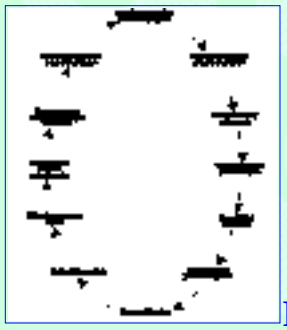

Figure 1: Elements of a Pollution Prevention Program

A. Establishing the pollution prevention program by obtaining support from top management, writing a policy statement, and building consensus within the company or facility.

B. Getting the program started by naming a task force, stating goals, increasing employee awareness and

involvement, and training employees in pollution prevention.

C. Doing a preliminary assessment, including reviewing and describing in detail the manufacturing processes within the facility to determine the sources of waste generation and to define a baseline inventory to be used to set goals and evaluate progress; and establishing priorities for further assessment based on the results.

D. Writing the pollution prevention program plan.

E. Conducting a detailed assessment.

F. Identifying potential pollution prevention opportunities for the facility.

G. Determining all costs of current waste generation, management, and disposal, and establishing a system of proportional waste management charges for those departments that generate waste.

H. Selecting the best pollution prevention options for the company through feasibility analyses of technical, economic, and environmental considerations.

I. Writing an assessment report to describe results of the assessment and including the report in the program plan.

J. Implementing the pollution prevention plan, including selecting projects, obtaining funding, and installing projects

K. Measuring progress by evaluating the pollution prevention program on a company-wide or facility-wide basis as well as evaluating specific pollution prevention projects.

L. Maintaining and sustaining the pollution prevention program for continued growth and continued benefits to the company. Reevaluating the program as economic situations change and/or process equipment require upgrading.

The concepts presented in this manual are applicable to the reduction of all waste regardless of environmental media, quantity or toxicity. Some interpretation may be needed to make the suggestions usable by your specific business and facility.

For more detailed information about pollution prevention programs, refer to U.S. EPA's *Facility Pollution Prevention Guide* and to the reference section in the appendices of this guidance manual. U.S. EPA's *Facility Pollution Prevention Guide* contains worksheets that may be helpful in implementing and documenting a pollution prevention program.

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Chapter 7
Establish the Pollution Prevention Program

"Pollution prevention plans can get people to think about the alternatives, but action requires leadership and incentive."

Tom Zosel, 3M

Executive Level Decision

Top management support is critical to get a pollution prevention program started, to incorporate it into already existing activities, and to sustain it. Specific types of support needed from management include: assigning responsibility for progress evaluation, allocating time and budget, and recognizing achievements. Continuity of the pollution prevention program is important. It should be set up in such a way that one step can flow naturally into the following step in a continuous cycle.

Suggestions on how to garner the support of all levels of management include providing them with information on some of the benefits of implementing a pollution prevention program. Include the following topics:

- cost savings through reduced raw material use and reduced waste, handling, transportation and storage costs
- increased productivity
- improved product quality
- regulatory compliance
- worker health and safety
- reduction of potential long-term liability
- examples of what other similar companies have achieved
- improved public/corporate image

To get all management levels interested in developing a pollution prevention program and to increase their knowledge about the subject, bring to their attention case studies from other successful companies. Bring in outside speakers to talk about benefits of developing pollution prevention programs. If the company or facility already has some exceptional pollution prevention activities underway, consider applying for the State of Ohio Governor's Awards for Outstanding Achievement in Pollution Prevention. Just the act of applying for this or other awards can result in more commitment from all levels of

management.

Policy Statement

To begin a successful pollution prevention program, draft a brief written policy statement in support of a pollution prevention program. Obtain endorsement of the policy by all management levels and then distribute to all employees. In some cases, developing a corporate-wide policy statement can be a lengthy process. Rather than allow this procedure to delay proceeding with the program, an interim policy or area-specific policy can be developed. This can get the program started; the corporate policy can follow later.

As with other policy statements your company develops, your pollution prevention policy statement should state why a program is being established, what is to be accomplished in qualitative terms, and who will do it. Two example policy statements are given in Figure 2. They differ in level of detail, but both answer these key questions:

Why are we implementing pollution prevention?

We want to protect the environment while saving money.
We want to save money while protecting the environment.

What will be done to implement pollution prevention?

We will reduce or eliminate the amounts of all types of waste, and we will improve energy efficiency.

Who will implement pollution prevention?

Everyone will be involved.

Figure 2. Policy Statement Examples

- **POLICY STATEMENT EXAMPLE 1** --- "(Your Company or Facility Name) is committed to excellence and leadership in protecting the environment. In keeping with this policy, our objective is to reduce waste and emissions. We strive to minimize adverse impact on the air, water, and land through pollution prevention and energy conservation. By successfully preventing pollution at its source, we can achieve cost savings, increase operational efficiencies, improve the quality of our products and services, maintain a safe and healthy workplace for our employees, and improve the environment. (Your Company or Facility Name)'s environmental guidelines include the following:

  --- Environmental protection is everyone's responsibility. It is valued and displays commitment to (Your Company or Facility Name).

  --- We will commit to including pollution prevention and energy conservation in the design of all new products and services.

  --- Preventing pollution by reducing and eliminating the generation of waste and emissions at the source is a prime consideration in research, process design, and plant operations. (Your Company or Facility Name) is committed to identifying and implementing pollution prevention opportunities through encouraging and involving all employees.

  --- Technologies and methods which substitute nonhazardous materials and utilize other source

reduction approaches will be given top priority in addressing all environmental issues.

--- (Your Company or Facility Name) seeks to demonstrate its responsible corporate citizenship by adhering to all environmental regulations. We promote cooperation and coordination between business, government, and the public toward the shared goal of preventing pollution at its source."

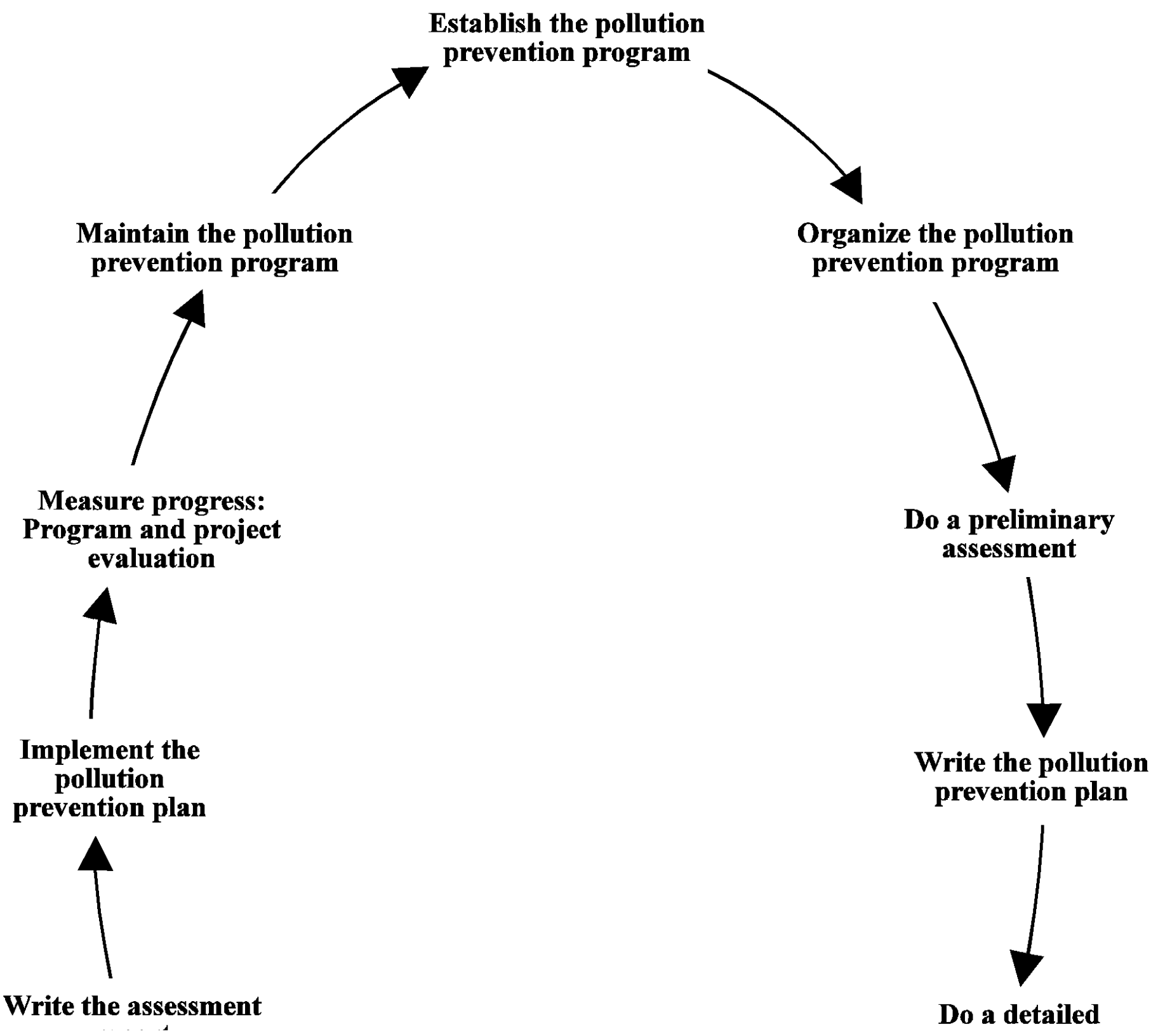
- **POLICY STATEMENT EXAMPLE 2** --- "At (Your Company or Facility Name), protecting the environment is a high priority. We are pledged to eliminate or reduce our use of toxic substances and to minimize our use of energy and generation of all wastes, whenever possible. Prevention of pollution at the source is the preferred alternative. When waste cannot be avoided, we are committed to recycling, treatment, and disposal in ways that minimize undesirable effects on air, water, and land."

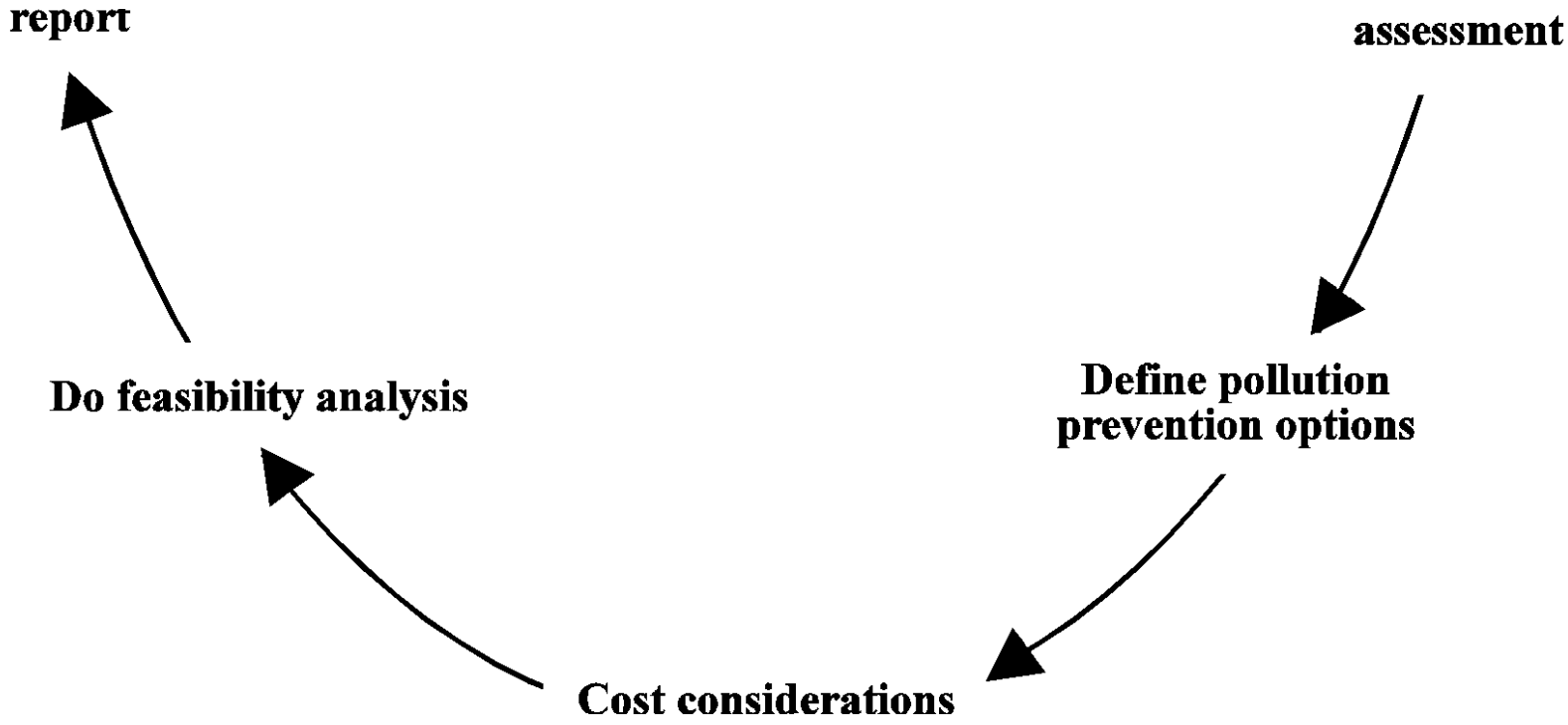
  (Adapted from: Waste Reduction Institute for Training and Applications Research, Inc. (WRITAR), 1991, *Survey and Summaries*, and Minnesota Office of Waste Management, Feb. 1991, *Minnesota Guide to Pollution Prevention Planning*)

Consensus Building

A pollution prevention program needs to be viewed by all personnel in the facility as a way of doing business. It can be incorporated within a total quality management (TQM) program because it focuses on increasing efficiencies and more effectively utilizing raw materials. It also builds nicely on a health or environmental safety program because it can do the following: reduce the amount/toxicity of chemicals in the workplace; reduce short and long-term exposure of employees, visitors, and contractors; reduce or eliminate monitoring requirements; reduce air handling equipment requirements; and, reduce or eliminate the need for personal protective equipment.

The commitment from all employees to implement a pollution prevention program starts before any assessment or evaluations have been performed. It is measured as the time and effort needed to raise employee awareness, establish a cohesive pollution prevention team, and begin to incorporate pollution prevention ideas into the day-to-day operations of the company. Pollution prevention is a team effort. The people who enter the facility every day are the most valuable assets to ensure a pollution prevention program works well.


Establish the pollution prevention program
Organize the pollution prevention program
Do a preliminary assessment
Write the pollution prevention plan
Do a detailed
Write the assessment
Implement the pollution prevention plan
Measure progress: Program and project evaluation
Maintain the pollution prevention program


report
assessment
Do feasibility analysis
Define pollution prevention options
Cost considerations

Ohio Pollution Prevention and Waste Minimization Planning Guidance Manual

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Appendix D
Class I Injection Well Facility
Ohio Revised Code Requirements for Waste Minimization and Treatment Plans

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Effective May 28, 1992, Ohio House Bill 147 amended sections of the Ohio Revised Code (ORC) regarding the regulation of Class I injection wells for the disposal of sewage, industrial wastes, hazardous wastes and other wastes. Pursuant to these amendments, each owner or operator of a Class I injection well facility must prepare and adopt a waste minimization and treatment plan by May 28, 1994. The plan will identify the specific technically and economically feasible measures that will be taken to prevent or reduce releases into the environment. Elements that must be included in a waste minimization and treatment plan are listed on pages D-2 to D-4. Note also that this section of the Ohio Revised Code contains several definitions of terms. These definitions are similar to definitions given in this guidance manual; however, there are some differences in definitions.

Table D-1 is included to show the similarities between a pollution prevention program as outlined in U.S. EPA's *Facility Pollution Prevention Guide* and a waste minimization and treatment plan for a Class I injection well facility. This comparison table illustrates that although the names of elements and order of elements may be different, the guide and the Class I injection well facility requirements essentially describe the same kind of pollution prevention and waste minimization programs.

Owners and operators of Class I injection well facilities may use this guidance manual and U.S. EPA's *Facility Pollution Prevention Guide* as a reference for preparing a waste minimization and treatment plan. These manuals concentrate on pollution prevention and waste minimization. Facilities can use the elements in these manuals for developing plans. However, the manuals do not discuss treatment options.

Treatment technologies are commonly broken down into several categories: physical, thermal, chemical, and biological. Table D-2 lists classes of treatment technologies and gives examples of each class. Facilities should consider all treatment technologies when choosing treatment options, and should also consider innovative technologies.

Ohio Revised Code, Section 6111.045
Injection of waste into wells
Waste minimization and treatment plans

Ohio Revised Code , Section 6111.045

(A) Not later than twenty-four months after the effective date of this section, each owner or operator of a class I injection well facility shall prepare and adopt a waste minimization and treatment plan to identify the specific technically and economically feasible measures that will be taken to prevent or reduce releases into the environment of the industrial waste and other wastes generated at the facility and, in the case of such an injection well facility that is located on the premises of the industrial facility, the industrial waste and other wastes generated at that industrial facility. The waste minimization and treatment plan shall cover a three-year planning period and shall include all of the following:

(1) The name, address, and, if applicable, standard industrial classification code of the facility;

(2) A summary of the industrial wastes and other wastes generated at the facility, including supporting data and calculations;

(3) A description of the facility's historic efforts at waste minimization and treatment and of existing waste minimization and treatment, source reduction, and recycling practices undertaken at the facility in 1987 and subsequent years;

(4) An assessment of the technically and economically feasible options for the further elimination or reduction of such wastes that considers the impacts of cross-media transfers and gives preference to source reduction over the recycling, treatment or disposal of the wastes;

(5) The identification of specific objectives to prevent, reduce, or recycle releases of such wastes when technically and economically feasible options exist;

(6) An explanation of the rationale for the objectives identified under division (A)(5) of this section;

(7) A signed policy statement articulating the commitment of upper management and the corporation to implement the waste minimization and treatment plan and its objectives.

(B) Each waste minimization and treatment plan prepared and

adopted under division (A) of this section shall be retained at the facility to which it applies and shall be made available for inspection and review by the director of environmental protection or his authorized representative. The disclosure of any trade secret information contained in any such plan is subject to section 1333.51 of the Revised Code.

(C) Every three years after the adoption of a waste minimization and treatment plan under division (A) of this section, the owner or operator of the facility to which the plan applies, on or before the anniversary of the date of the adoption of the plan, shall do all of the following:

(1) Review the operation of the facility for any changes in the type and amount of industrial waste or other wastes generated at the facility that have occurred since the adoption of the plan or the most recent revision of the plan;

(2) If necessary or appropriate, reevaluate the technically and economically feasible options for reducing or eliminating the generation of industrial waste or other wastes at the facility;

(3) If any changes in the type or amount of wastes generated at the facility are identified under division (C)(1) of this section or if, after a reevaluation conducted under division (C)(2) of this section, the owner or operator of the facility determines that the waste minimization and treatment options in the plan or most recent revision of the plan should be updated, amend the plan to update the information contained in it and include in the amendment an explanation of the need for the amendment.

(D)(1) Not later than two years after the effective date of this section, each owner or operator of a class I injection well facility shall submit to the director of environmental protection an executive summary of the waste minimization and treatment plan adopted by the owner or operator under division (A) of this section. The executive summary shall include a synopsis of each of the elements required to be included in the plan under divisions (A)(2) to (6) of this section and shall include a signed policy statement articulating the commitment of upper management and the corporation to implement the

plan and its objectives.

(2) Every three years after the adoption of a waste minimization and treatment plan under division (A) of this section, the owner or operator of a class I injection well facility, on or before the anniversary of the date of the adoption of the plan, shall submit to the director a revised executive summary of the plan that meets the requirements of division (D)(1) of this section and contains revisions to the amendments to the plan made by the most recent review of the plan required under division (C) of this section.

(E) No person shall fail to comply with this section.

(F) As used in this section:

(1) "Disposal" means the discharge, deposit, injection, dumping, spilling, leaking, emitting, or placing of any industrial waste or other wastes into or on any land or ground or surface water or into the air, except if the disposition constitutes storage or treatment.

(2) "Recycling" means to use, reuse, or reclaim a material.

(3) "Release" means any spilling, leaking, pumping, pouring, emitting, emptying, injecting, escaping, leaching, dumping, or discharging into the environment of any industrial waste or other wastes, including the abandonment or discarding of barrels, containers, or other closed receptacles that contained an industrial waste or other waste.

(4) "Source reduction" means any practice that reduces the amount of any industrial waste or other wastes entering any waste stream or otherwise released into the environment, including fugitive emissions, prior to recycling, treatment, or disposal and that reduces the hazards to public health and the environment associated with the release of such wastes. "Source reduction" includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control. "Source reduction" does not include any practice that alters the physical, chemical, or

biological characteristics or the volume of an industrial waste or other wastes through a process or activity that is not integral to and necessary for the production of a product or the providing of a service.

(5) "Treatment" means any method, technique, or process designed to change the physical, chemical, or biological characteristics or composition of any industrial waste or other wastes; to neutralize the waste; to recover energy or material resources from the waste; to render the waste nonhazardous or less hazardous, safer to transport, store or dispose of, or amenable for recovery, storage, further treatment, or disposal; or to reduce the volume of the waste.

(6) "Waste minimization" means any effort to reduce or recycle the quantity of waste generated and, when feasible, to reduce or eliminate toxicity. "Waste minimization" does not include treatment unless the treatment is part of the recycling process.

HISTORY: 144 v H 147. Eff 5-28-92

Table D-1
Comparison of Elements of a Pollution Prevention Program in U.S. EPA's *Facility Pollution Prevention Guide* to Elements of a Waste Minimization and Treatment Plan for a Class I Injection Well Facility

Facility Pollution Prevention Guide Pollution Prevention Program	Class I Injection Well Facility Waste Minimization and Treatment Plan
Establish the pollution prevention program ● Executive level decision ● Policy statement ● Consensus building	ORC 6111.045(A)(7) - A signed policy statement articulating the commitment of upper management and the corporation to implement the waste minimization and treatment plan and its objectives
Organize the program ● Name task force ● State goals	ORC 6111.045(A)(7) - (same as above)

Do preliminary assessment • Collect data • Review sites • Establish priorities	ORC 6111.045(A)(2) - A summary of the industrial wastes and other wastes generated at the facility, including supporting data and calculations ORC 6111.045(A)(3) - A description of the facility's historic efforts at waste minimization and treatment and of the existing waste minimization and treatment, source reduction, and recycling practices undertaken at the facility in 1987 and subsequent years
Write program plan • Consider external groups • Define objectives • Identify potential obstacles • Develop schedule	
Do detailed assessment • Name assessment teams • Review data and sites • Organize and document information	ORC 6111.045(A)(4) - An assessment of the technically and economically feasible options for the further elimination or reduction of such wastes that considers the impacts of cross-media transfers and gives preference to source reduction over the recycling, treatment or disposal of the wastes
Define pollution prevention options • Propose options • Screen options	ORC 6111.045(A)(4) - (same as above)
Do feasibility analysis • Technical • Environmental • Economic	ORC 6111.045(A)(4) - (same as above)
Write assessment report	ORC 6111.045(A) - ... prepare and adopt a waste minimization and treatment plan ... ORC 6111.045(A)(5) - The identification of specific objectives to prevent, reduce, or recycle releases of such wastes when technically and economically feasible options exist ORC 6111.045(A)(6) - An explanation of the rationale for the objectives identified under division (A)(5) of this section
Implement the plan • Select projects • Obtain funding • Install the selected projects	ORC 6111.045(A)(7) - A signed policy statement articulating the commitment of upper management and the corporation to implement the waste minimization and treatment plan and its objectives

Measure progress • Acquire data • Analyze results	
Maintain the pollution prevention program	ORC 6111.045(C) - Periodic review (every three years) of waste minimization and treatment plan

Notes:

1. The pollution prevention program elements follow the outline of U.S. EPA's Facility Pollution Prevention Guide (EPA/600/R-92/088).
2. The waste minimization and treatment plan elements for Class I injection well facilities are listed in the Ohio Revised Code, Section 6111.045.

Table D-2. Classes of treatment technologies and examples

(from Appendix to OAC 3745-65-73, Table 2)

Thermal treatment	**Physical treatment Separation of components**	**Physical treatment Removal of specific components**
Liquid injection incinerator	Centrifugation	Absorption-molecular sieve
Rotary kiln incinerator	Clarification	Activated carbon
Fluidized bed incinerator	Coagulation	Blending
Multiple hearth incinerator	Decanting	Catalysis
Infrared furnace incinerator	Encapsulation	Crystallization
Molten salt destructor	Filtration	Dialysis
Pyrolysis	Flocculation	Distillation
Wet air oxidation	Flotation	Electrodialysis
Calcination	Foaming	Electrolysis
Microwave discharge	Sedimentation	Evaporation
Cement kiln	Thickening	High gradient magnetic separation
Lime kiln	Ultrafiltration	Leaching
		Liquid ion exchange
		Liquid-liquid extraction
		Reverse osmosis
		Solvent recovery
		Stripping
		Sand filter
Chemical treatment	**Biological treatment**	

Absorption mound	Activated sludge
Absorption field	Aerobic lagoon
Chemical fixation	Aerobic tank
Chemical oxidation	Anaerobic lagoon
Chemical precipitation	Composting
Chemical reduction	Septic tank
Chlorination	Spray irrigation
Chlorinolysis	Thickening filter
Cyanide destruction	Trickling filter
Degradation	Waste stabilization pond
Detoxification	
Ion exchange	
Neutralization	
Ozonation	
Photolysis	

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page last updated: October 30, 2000

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Chapter 12
Define Pollution Prevention Options

"The diversity of potential strategies for reducing wastes at the source parallels the diversity of pollution sources and opportunities for prevention."

Christine Ervin, World Wildlife Fund

Propose Options

A productive way to generate ideas is to conduct an informal meeting in which team members are encouraged to "brainstorm" and discuss options. The team members should also solicit ideas from other personnel at all levels, not only in their department but from the entire facility. Many times these personnel already have ideas for reducing waste but have never had the opportunity to express them. All options should be written down and given serious consideration.

Some of the options may be simple to identify and implement such as:

- Ship/receive materials in bulk to eliminate drum disposal if large quantities are used
- Reuse containers where possible
- Order materials "just in time" to avoid expiration
- Establish a central stockroom/inventory control system
- Investigate solvent/cleaner alternatives or reducing the total number of different solvents used
- Reuse solvents where possible
- Segregate waste streams

Other options that may not be as easily identified but must definitely be considered involve source reduction. Table 3 provides some examples. Generator checklists for identifying waste reduction opportunities developed by the Minnesota Technical Assistance Program (MnTAP) can also be used to help identify pollution prevention options (MnTAP, various dates).

Table 3. Source Reduction Options

Source Reduction

Substituting less toxic or less hazardous alternatives for raw materials
Using raw materials that generate less waste
Using raw materials that require less frequent cleaning of equipment
Modifying products to eliminate the need for hazardous or toxic materials
Making process modifications and/or operating conditions that improve efficiency
Improving preventive maintenance and operating procedures

(adapted from *Pollution Prevention: A Guide to Program Implementation*, Illinois Hazardous Waste Research and Information Center, 1993)

Once these options have been applied to specific wastes/processes, further investigation or changes in product composition may be required. For example, it may be necessary to implement new or existing techniques/technologies or to identify raw material alternatives. At this point it may be helpful to contact other facilities, vendors, trade associations, state and local environmental assistance agencies, and publications for ideas. These groups may be aware of material alternatives or similar pollution prevention technologies that have been successfully implemented. Further pollution prevention opportunities may be identified through "upstream" suppliers and "downstream" consumers. These individuals should also be allowed input into the company's program.

Another way to identify pollution prevention opportunities is through benchmarking. In the benchmarking process, a company selects an area for improvement and identifies other companies who have similar practices that they consider to be the best in class. They then compare their own practices to those companies' processes to determine where differences exist. The company using benchmarking then implements measures to make their practices more like those of "best in class." A nine step benchmarking program developed by AT&T is described in detail in *Benchmarking: Focus on World Practices* (AT&T Quality Steering Committee, 1992). Working together, AT&T and Intel applied the benchmarking process to develop a pollution prevention program. Benchmarking teams from both companies followed the nine-step process to compare their own pollution prevention programs to the best in class programs of six other companies (Klafter, 1992).

Other waste management options may be considered after pollution prevention strategies have been exhausted. These include, in order of U.S. EPA's priority, recycling on-site to other processes, reclamation, recycling off-site or using material exchanges, on-site treatment (physical, chemical, or biological process that renders a waste less toxic, produces a byproduct that is recyclable or reduces the volume of the waste stream for disposal), treatment off-site; and lastly, proper disposal. These alternative waste management options are discussed in more detail in Chapter 19. For additional sources of technical assistance, refer to Appendix B.

Screen Options

A priority approach in selecting options may be developed. Ranking options on a high, moderate, or low continuum helps to ensure that pollution prevention is not a "one-shot" approach. Moderate and low priority options should still be considered since circumstances such as a change in raw materials, regulations or technology could occur.

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Chapter 9
Do a Preliminary Assessment

"Pollution is nothing but the resources we are not harvesting. We allow them to disperse because we are ignorant of their value."

Buckminster Fuller

Understanding Processes and Wastes

To effectively implement a pollution prevention program, it is important to understand the various unit processes and where in these processes waste is being produced. This chapter will explain how to determine the various unit process steps in materials use and will present methods to determine where wastes are being generated. An extensive amount of data gathering may be necessary in this step in order to achieve a complete process characterization.

Two general approaches characterizing processes and waste generation can be used. One method begins with gathering information on total multi-media (air, land, and water) waste releases at the end of each process, and then backtracks to determine waste sources. Another method tracks materials from the point at which they enter the plant until they exit as wastes or products. Both methods provide a baseline for understanding where and why wastes are generated and a basis to measure waste reduced after implementation of pollution prevention projects. The steps involved in these characterizations include gathering background information, defining a production unit, general process characterization, understanding unit processes, and completing a materials balance.

Gathering Background Information

The first step toward understanding processes and waste generation is gathering background information on the facility. This allows for the accurate determination of the type and quantity of raw materials used, the type and quantity of wastes generated, the individual production mechanisms, and the interrelationships between the unit processes. The pollution prevention team should divide up the responsibilities for obtaining this information. A time frame should be established for assembling the data and presenting it to the group. Table 1 provides suggestions on data that should be assembled and where this information might be found.

In addition to these data, useful information can be obtained from line workers, maintenance staff, process engineers, purchasing, inventory, shipping and receiving; and accounting personnel. These employees can be interviewed to determine how the processes are run; what types of raw materials,

cleaning agents, lubricants, etc. are used; what types of waste are generated and how they are handled; what other types of records are kept; and what information is not recorded on a regular basis. When gathering this information, begin to track wastes to determine if there are seasonal or shift variations in wastes generated. Once this information is assembled, the general process can be characterized.

Table 1. Possible Sources of Background Information

INFORMATION ON:	INFORMATION GATHERED FROM:
Raw Materials Use	Purchasing records Inventory records MSDSs Vendor information Production logs Packaging material discarded Shipping and receiving logs Annual report
Waste Generated	Waste manifests TRI data Sewer records (POTWs) Permits/applications Flow diagrams Annual report Rejected product Environmental reporting Waste collection and storage Production logs Environmental violations Laboratory analyses Obsolete expired stock Spill and leak reports
Production Mechanisms	Operations manuals (SOPs) Vendor information Control diagrams Quality control guidebook Production logs Flow diagrams Product specifications
Process Interrelationships	Product-to-raw material data Flow diagrams Quality control data Production logs Product specifications Facility layout

Economic Information	Cost accounting reports Operating costs for waste handling and disposal Pollution control costs Costs for products, utilities, raw materials, and labor

(adapted from *Pollution Prevention: A Guide to Program Implementation*, Illinois Hazardous Waste Research and Information Center, 1993)

Define Production Units

To compare the amounts of waste generated during different time periods, and subsequently measure relative waste reductions, a production unit should be defined for each process - either the unit process or the overall process depending on the nature of the facility. A production unit is simply a set quantity of product that is characteristic of the process - tons of plastic, gallons of acid, number of copies, etc. Try to choose a production unit that can be related to later waste generation. Once the production unit is defined, wastes generated can be quantified as waste per production unit. Since total production can vary, comparing the total amounts of waste generated for different time periods will not reflect the reductions achieved due to pollution prevention activities (i.e., waste will increase or decrease with production changes). For example, a printing press may use 1000 copies for a production unit and might then define wastes as "waste per 1000 copies." Alternatively, a company might consider the unit of product per unit of raw material. This measure would be an indicator of yield and process efficiency.

By assembling background information, process flow diagrams for both the general process and individual processes can be developed. These diagrams, along with the materials balance, help provide an understanding of the processes and the wastes generated. The production unit can be used for waste reduction comparisons throughout the pollution prevention program.

Characterize General Process

A typical process has raw material inputs, product outputs, and waste generation. It can be represented by a general process flow diagram. This diagram may not physically resemble the process but will show the movement of raw material through the process as well as the generation of final product and waste. A simple diagram (Figure 3) of a metal parts fabrication facility illustrates this.

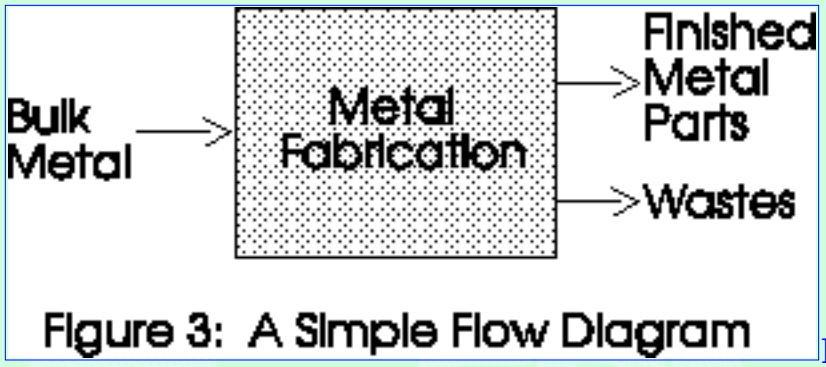

Figure 3: A Simple Flow Diagram

In addition to the raw material, final product, and waste flows, other inputs can be represented on the general flow diagram such as lubrication fluids, cleaning agents, cooling water, etc. This will provide an understanding of the overall process and the associated wastes. The general process can then be separated into individual or unit processes.

Understand Unit Processes

Most production operations can be subdivided into a series of unit processes. For example, the general process of metal parts fabrication can be represented by at least seven individual processes.

1. Receiving and storing bulk metal
2. Cutting, bending, or shaping metal
3. Cleaning metal
4. Painting or coating metal
5. Assembling parts
6. Packaging
7. Shipping of assembled parts

Each unit process has its own inputs and outputs. The product from one step becomes the input material for the following step. The raw materials, products, and wastes for each unit process can be shown on a more detailed flow diagram. This diagram should contain the type/composition and quantity of raw materials, products, and wastes to all media. The diagram should also include other inputs (lubrication fluids, tooling water, cleaning agents, etc.) along with the quantities used. The background information obtained previously will be helpful to determine the types/compositions and quantities of these streams. The subdivision of the general process of metal parts fabrication is illustrated in Figure 4.

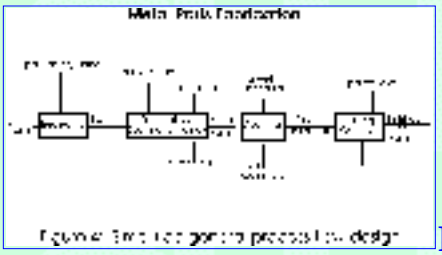

Figure 4: Simplified general process flow design

The flow diagrams for the unit processes (and in some cases the general process) can be completed using either of two approaches: 1) start with the wastes and products generated and then determine the sources of the waste by going backwards through each of the unit processes, or 2) start with the raw materials and track them through each of the unit processes until products and wastes are generated. For cases where waste streams are not separated but rather are combined prior to handling, the second method may be the preferred initial approach. The two methods may also be combined to complete the unit process flow diagrams and thus a detailed overall process diagram.

Outputs

It is critical to determine the types/compositions and quantities of raw materials consumed, product yield, and wastes generated as accurately as possible for each unit process. All wastes released to the environment (gas, liquid, and solid) should be characterized. These wastes can include: emissions from stacks; vent emissions from process areas; fugitive emissions from pipes, tanks, or vessels and leaking equipment; spent wash waters/cleaning solvents; cooling water; over spray from painting operations; cleaning rags; material scrap (e.g., metal, packaging, etc.); and other wastes. By subdividing the process into individual components, these types of wastes become more evident. With this information, a

materials balance can be performed for the unit processes and then for the overall facility.

Perform Materials Balance

A materials balance accounts for all inputs and outputs into a process; in other words, what goes in must come out. A materials balance should be performed for each unit process and for the overall production line. Although this typically is a very involved procedure, and while it is usually possible to identify sources of waste without having completed a materials balance, there are long term benefits to having done a materials balance. However, because a materials balance can be very involved, your facility may want to consider this an optional step, especially if you operate a small business. You may want to concentrate on developing process flow charts. Companies may also prefer to develop process flow charts in the preliminary assessment and complete a materials balance later in the pollution prevention program.

A materials balance can help determine if fugitive losses are occurring in the process (e.g., fugitive loss from a solvent tank = difference between solvent in and solvent out). In a physical process, one in which there is no chemical change of materials, the raw materials that are not converted to product generally end up as waste. For example, a materials balance can be performed on the metal parts fabrication process as shown in Figure 4. For a chemical process, the materials balance becomes more complicated as raw material inputs are converted to products through one or more chemical reactions. Some unreacted raw materials may also end up as waste along with reaction by-products.

For these processes, a standard materials balance may already be available as part of the daily production log or cycle. Where possible, however, actual measurements of the amounts of materials used and generated should be used to produce the materials balance. The reason for this is that manufacturing processes can change over a period of time to a point where the actual materials balance would differ from that derived from the standard operating procedures.

Once the materials balance has been performed, the actual amount of each waste generated by a process and the source becomes apparent if not already known. These numbers are the baseline amounts of total waste generated at the start of the pollution prevention assessment and can be used for comparison throughout the implementation of the program.

Table 5. Materials Balance

Key Elements of a Materials Balance
Quantity of raw material brought on-site
Quantity produced on-site including amounts produced as production by-product
Quantity consumed on-site
Quantity shipped off-site as, or in, product
Total waste generation (before recycling and treatment) and waste characteristics
Amount of raw material in beginning and ending inventory
An indicator of production levels involving the chemical
Release and transfer rate

(adapted from *Pollution Prevention: A Guide to Program Implementation*, Illinois Hazardous Waste Research and Information Center, 1993)

Establish Priorities

Before conducting an assessment to identify what pollution prevention opportunities are present, wastes and unit processes should be prioritized to determine which should be examined first. The flow diagrams prepared in this chapter provide a good starting point for prioritization because they show all of the input and output streams for each unit process. Both the pollution prevention team and top management should be involved in this decision-making process since each will have their own ideas of what areas should be addressed initially.

When establishing priorities for pollution prevention, all of the input and output streams should be ranked - beginning with those which require immediate attention, followed by those which are less urgent. Each company will have their own procedures for establishing priorities. Companies should estimate the risks posed each stream and consider the risks in the ranking process. These factors should be considered when ranking the streams:

- U.S. EPA's 17 target chemicals from the 33/50 program (see Appendix B)
- Toxic Release Inventory (TRI) waste
- High purchase, disposal and other costs
- High potential cost savings
- Highly toxic
- Hazardous waste
- Particular regulatory concerns
- High use and/or release rate
- Potential for removing bottlenecks in production or waste treatment
- Potential liability due to endangerment of employees, environment or the pubic
- Potential for successful implementation
- High volume waste (may include tonnage)
- Carcinogens
- Hazardous Air Pollutants (HAPs)
- Chlorofluorocarbons (CFCs) and other ozone-depleting or future banned materials
- Local citizens' concerns

Once the streams are ranked, candidate input and output streams (especially wastes) can be identified for the initial pollution prevention assessment, keeping in mind the goals set at the beginning of the program. As the assessment proceeds, these priorities may change.

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Chapter 11
Do a Detailed Assessment

"To investigate opportunities for pollution prevention within your company, you need to assess your current operations."

This chapter provides guidelines for beginning pollution prevention assessments in the facility, starting with the highest priority and/or targeted wastes. The pollution prevention team should name assessment teams, review wastes and processes, and organize and document information before and after the assessments.

When the candidate wastes are established, the assessment for identifying specific pollution prevention opportunities can begin. This procedure involves first looking at the processes associated with the candidate streams and then expanding the assessment to the entire facility so that all potential opportunities are addressed. The pollution prevention team should discuss the potential wastes and the staffing of the overall facility to determine who should conduct the initial process assessment. Typically a team of two to three people is effective.

The assessment team should first become familiar with the targeted processes. The flow diagrams developed in Chapter 9 provide an understanding of the process but may not explain why certain materials are used and why wastes are generated. For this information, the team must go into the facility and study the processes in detail. This study should be conducted while the process is in operation (ideally during all shifts) and, if possible, during a shut-down/clean-out/start-up period to identify what materials are used and wastes are generated by this procedure. When studying the process, the team should note any potential pollution prevention opportunities and should pay particular attention to the following:

- Observe procedures of operation by line workers
- Quantities and concentrations of materials (especially wastes)
- Collection (including exact sources) and handling of waste (note if wastes are mixed)
- Any record keeping - and obtain copies of these if not already done
- Flow diagram - follow through actual process
- Leaking lines or poorly operating equipment
- Any spill residue
- Damaged containers
- Physical and chemical characteristics of the waste or release

It may also be helpful to photograph the process to recall specific details later. Often, details can be better captured visually than with words. However, this should be cleared with the appropriate personnel first.

The assessment team should talk with the line personnel, including operators, supervisors, and foremen, as much as possible. In doing so, they should determine the required operating conditions, product specifications, and equipment specifications for the process. They should discuss the points previously listed as well as the daily routine the workers follow. Specifically, the team should try to identify when waste is generated, not just by the regular process, but by upsets, off-spec products, spills, etc. The team should also talk with the maintenance and housekeeping personnel who service the process to determine when, why, and how the process is serviced. Is preventive maintenance being done or are maintenance people always responding to breakdowns? It is important to talk with these individuals as they generally have the best working knowledge of the processes. The team should also compare written operating procedures for various unit operations to actual in-plant practices.

After examining the targeted processes, the assessment team should set a schedule for looking at the other processes in a similar manner. Assessment for non-targeted sources should be thorough, but it may take more time to completely assess these. Implementing pollution prevention projects on targeted processes can begin before assessments are completed for every process. This will help build momentum and corporate support for a sustained program.

The team should also conduct an overall survey of the facility. This survey consists of investigating supplemental operations such as shipping/receiving, purchasing, inventory, vehicle maintenance, waste handling/storage, laboratories, powerhouses/boilers, cooling towers, and maintenance. Again, the team should discuss daily routine with the personnel in these departments and should note potential opportunities for pollution prevention. Some specific topics to cover in these departments are listed in Table 2.

Once the process assessments and plant survey are completed, the data obtained should be reviewed for thoroughness by all of the pollution prevention team members. This review will also initiate the brainstorming process for ideas to reduce waste at the source.

Table 2. Topics to Cover in Assessing Support Departments

Shipping/receiving	Packaging materials - what is done with waste? How are materials shipped/received - drums, bulk? Can containers be returned/recycled? Are you required to return empty containers to vendor? What happens to pallets?
Purchasing	Who orders materials? How far in advance are materials ordered? Can materials be ordered as needed (just-in-time)? Is the minimum amount ordered?

Inventory	What is the shelf-life of all materials? Is there an inventory control system? Bar coding? Is there a central stockroom (no individual orders)? Do you operate by "just-in-time" philosophy? Do you operate by "first in, first out" principle?
Vehicle maintenance	Are solvents used for parts cleaning? Are solvents recycled and have solvent alternatives been tested? Do you recycle batteries, used oil, or antifreeze? How are used oil filters/carburetor cleaners handled?
Waste handling and storage	Are waste streams segregated? Do you know the sources of all waste? Do you have a "waste inventory" control system? How often is waste shipped off-site? Treated on-site? How is waste handled once shipped off-site?
Laboratories	How are chemicals ordered? In what quantities? What is the shelf life of all chemicals? How are expired chemicals handled? Are solvents recycled/reused (e.g., first rinse)? How are gases stored? How are laboratory wastes handled? Are laboratory wastes segregated?
Powerhouse/boiler	How is fly ash/slag handled? How is tube clean-out material handled? What type of fuel is used? Are alternatives used? What type of boiler water treatment chemicals are used? How is boiler blow-down handled?
Cooling towers	What type of chemical additives are used? How is bottom sediment handled? What is your water source? Is water recycled?
Maintenance	What types of cleaners are used? Are solvents used? Are they recycled/reused? Have solvent/cleaner alternatives been tested? How are waste oil/greases handled? How are other wastes generated and handled?

(adapted from *Pollution Prevention: A Guide to Program Implementation*, Illinois Hazardous Waste Research and Information Center, 1993)

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Chapter 13
Cost Considerations

"In order to receive funding, it is essential that pollution prevention projects successfully compete in the company's capital funding sequence or before the bank's loan committee."

American Institute for Pollution Prevention

Before pollution prevention projects are evaluated for economic feasibility, the full cost of waste generation must be determined. This full cost is necessary to develop the economics of pollution prevention techniques/technologies, including calculating the cost savings and payback periods. Methods for true cost determination and economic analysis are presented in this chapter. A cost accounting system for all wastes generated in the facility will also be described.

Determine Full Cost of Waste

The full cost of waste generation includes more than just treatment or disposal costs; it includes all the costs incurred by producing and handling waste. All of the expenditures associated with the waste, both direct and indirect, should be identified. These include, but are not limited to, the following: purchasing, storage and inventory, and in-process use of materials; air and water emissions, solid waste collection, waste storage, on-site treatment or recycling; waste disposal; waste transportation; lost raw materials; labor costs; and capital depreciation. Often, wasted raw material costs are three fourths of the full cost of generating waste. Waste disposal costs are typically less than half the total costs (Selman and Czarnecki, 1988). Many pollution prevention options will not appear to be justified if only half, or less, of the likely savings are considered. Some examples of waste associated costs to consider are presented in Table 4.

TABLE 4. Costs to Consider Determining Full Costs of a Waste Stream

RAW MATERIAL AND HAZARDOUS SUBSTANCE USE	
Purchasing	Taxes on hazardous and other products Safety training MSDS filing Safety equipment Extra insurance premiums Labor

Storage and Inventory	Special storage facilities Safety equipment Storage area inspection and monitoring Storage container labeling Safety training Emergency response planning Spill containment equipment Lost product from spills, evaporation, etc. Labor SARA Title III (TRI) reporting
In-Process Use	Safety training Safety equipment Containment facilities and equipment Clean-up supplies Labor
Lost Raw Materials	Labor for handling Equipment for clean-up Reporting
WASTE GENERATION	
Air and Water Emissions	Air emission permits and controls TRI measurements/estimates TRI reporting TRI fees Worker health monitoring Sewer discharge fees NPDES permits Water quality monitoring Sampling training Pretreatment equipment Pretreatment system operation
Solid Waste Collection	Safety training Safety equipment Collection supplies Container labels Container labeling Recordkeeping Truck maintenance (for in-house fleet)
Waste Storage	Storage permits Special storage facilities Spill containment equipment Emergency response planning Safety training Storage area inspection and monitoring

On-Site Treatment or Recycling	Capital and operating costs Depreciation Utilities Operator training Safety equipment Emergency response planning Permits Inspection and monitoring Insurance
Disposal	Sewer fees Container manifesting Disposal vendor fees Preparation for transportation Transportation Insurance and liability Disposal site monitoring

(adapted from *Pollution Prevention Planning*, Washington State Department of Ecology, January, 1992)

Develop Economics

Once the full costs of the waste streams are determined, an economic analysis of each specific pollution prevention project can be conducted. This analysis will provide management information on the costs and benefits associated with the techniques/technologies so they can decide whether it is economically feasible to proceed with implementation. Certain benefits, such as reduced long-term liability, reduced worker exposure to toxic chemicals, and improved community relations, will be difficult to quantify.

There are essentially two steps in an economic analysis after the true costs of waste generation have been determined: calculate the initial cost of implementing the pollution prevention strategy, and determine the annual cost savings and payback period (if applicable) for the project. In some cases, the total capital and operating costs (including the waste handling costs) for the existing process and the "new" process must be considered if they are substantially different. For example, some pollution prevention options involve increased use of utilities which must be taken into account.

The initial cost of the implemented technique/technology should include capital requirements for new equipment, start-up costs, training costs for new equipment or procedures, and any costs for regulatory compliance. The full cost for waste generation should also be calculated for the new option using the procedure described previously in this chapter. The strategy in question may have only limited initial costs associated with it, such as capital and start-up expenditures, since it may be as simple as a raw material substitution or making a minor process modification. In these cases, the annual waste cost savings may be the principle factor considered. However, there may be costs associated with implementation of the pollution prevention project such as process down-time or upsets.

A good general reference for cost considerations in pollution prevention is the American Institute for Pollution Prevention's 1993 document, *A Primer for Financial Analysis of Pollution Prevention Projects*. An additional source to consult for in-depth coverage, worksheets, and resources on pollution prevention is U.S. EPA's *Facility Pollution Prevention Guide*.

Once the total initial cost for implementing the pollution prevention strategy is determined, the cost savings should be determined. To calculate this, the following equation may be used:

Cost savings = (Existing full cost of waste) minus (Projected full costs of waste after implementation)

For options which do not involve capital investments or other initial expenditures, waste handling cost savings may be the primary consideration for economic feasibility. For most pollution prevention options, some projected costs will be reduced if the existing full costs for waste generation are identified.

For strategies that involve initial expenditures, such as capital investments and startup costs, each company will have its own criteria of feasibility to consider. It will usually be necessary to calculate the economics of a project by methods specifically determined and approved by the company.

A quick test for initial feasibility is the payback period. Additional methods of determining long-term costs include net present value, internal rate of return, and profitability index. Further information on applying these methods can be found in U.S. EPA's *Total Cost Assessment: Accelerating Industrial Pollution Prevention through Innovative Project Financial Analysis* (1992). The payback period is defined as the amount of time (generally expressed in years) it takes to recover the initial investment through annual cost savings. The following equation can be used as a simple calculation of the payback period. Note that this equation does not account for depreciation, interest, etc. A very thorough and in-depth examination of full cost accounting can be found in Appendix F of U.S. EPA's *Facility Pollution Prevention Guide*.

Simplified Payback Period = (initial investment (capital + start-up + other costs)) divided by (annual full waste handling cost savings)

In options where there is a substantial difference in the total operating costs of the existing process and the "new" process (e.g., use of utilities increases significantly), the total annual operating cost savings (including waste handling cost savings) should be used in place of the annual true waste handling when calculating the payback period.

Establish a Cost Allocation System

A cost allocation system is an important element of a pollution prevention program. A cost allocation system charges each department or process for the total waste management costs for the wastes they generate. The charges should cover the full cost of the waste as explained previously in this chapter. This cost allocation system should lower the total overhead cost because most companies charge waste disposal costs to overhead (i.e., the environmental department). It will also provide incentives for employees associated with the departments/processes that are charged for the waste handling to reduce their waste generation and subsequently their costs.

By calculating the full cost of waste generation, the parameters for determining the economic feasibility of pollution prevention strategies (annual cost savings and payback period) can be developed. These will be used in the following chapter to evaluate the pollution prevention options and to decide which option could be implemented first. Establishing a cost allocation system will provide employees, including management, with a better awareness of the costs associated with waste generation in their department/process.

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Chapter 19
Other Waste Management Options

"Pollution prevention is not the only strategy for reducing risk but is the preferred one. Where prevention or recycling are not feasible, treatment followed by safe disposal as a last resort will play an important role in achieving environmental goals."

Carol Browner, U.S. EPA Administrator

As described in Chapters 4 and 5, it is national and Ohio EPA policy that pollution be prevented or reduced at the source whenever feasible. Despite the tremendous progress some have made in preventing wastes, it is often not economically or technically feasible to eliminate all wastes from industrial processes. For any remaining wastes the preferred management options in order of preference are on-site recycling or reuse, off-site recycling or reuse, treatment, and disposal in landfills. This is commonly referred to as the waste management hierarchy. U.S. EPA and Ohio EPA have taken the position that the hierarchy should be viewed as establishing a set of preferences, rather than an absolute judgment that prevention is always the most feasible option.

For safety or economy-of-scale reasons in some specific situations recycling or treatment may be more feasible than source reduction or in-process recycling. Environmentally sound recycling can have many of the advantages of source reduction because it achieves reduction in the amount of wastes needing treatment or disposal and conserves energy and other resources. However, on-site recycling and treatment are generally preferred over off-site processing because releases often occur during transport and handling and the chances for spills increase.

Some companies lack the skills to operate recycling or treatment equipment properly. The permitting process required for an on-site waste treatment facility is both time consuming and expensive and may require a public hearing. Other companies do not generate a large enough quantity of waste for economic operation of recycling equipment. In those cases, off-site recycling or treatment where wastes from multiple facilities are combined can be an excellent waste management approach.

Other technologies that do not in themselves reduce the mass of contaminants produced also may be beneficial. For example, more efficient use of water in plating by rinsing through use of counter-current flow or spray rinse systems increases the cost effectiveness of in-process metal recovery and reuse. More energy efficient lighting can bring substantial savings.

The emphasis in managing waste should be to continually try to move up the hierarchy toward source reduction. Although a company may have an environmentally sound recycling program for certain

wastes, the generation of these wastes may reflect inefficiencies in operation. Recycling is often much more expensive than source reduction, especially when the cost of scrap and other excess materials are completely determined. Obviously, if more of these wastes can be turned into product, the company will decrease its costs and should increase profits.

In summary, source reduction techniques and in-process recycling which prevent and reduce waste generation are preferred over recycling, treatment, and disposal options that deal with wastes after they are produced. Once pollution prevention options have been fully considered, additional methods of handling and controlling wastes should be evaluated according to the waste management hierarchy. Often these approaches need to be used in combination to be most effective. Technical advancements in production processes and waste management technologies make it desirable for each company to routinely review and improve its pollution prevention and waste management practices.

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Chapter 8
Organize the Pollution Prevention Program

"Plasticolors (Ashtabula) reduced waste, lowered operating costs and used its saving to reward employees. It's a good example of how pollution prevention pays off for everyone."

Governor George V. Voinovich

This chapter outlines a method to incorporate a pollution prevention program into daily company activities. The steps involved include: designating a pollution prevention coordinator, developing a pollution prevention team, setting goals, increasing employee awareness and involvement, and rewarding and training employees.

Name the Pollution Prevention Task Force

Designate a Pollution Prevention Coordinator

While a pollution prevention program needs top down support and commitment, it also needs bottom up input and implementation. This means teamwork and participation from all levels within the company are essential. A key element for success is to find a good advocate and leader for the pollution prevention program.

The pollution prevention coordinator will be responsible for establishing the pollution prevention team(s), conducting meetings, and making sure the company is working toward its pollution prevention goals. The coordinator can come from any level in the company. He or she needs to be well organized, an advocate for the program, a cheerleader, and a motivator of people. If the coordinator has top management support and the confidence of supervisors and others on the team, he or she will likely develop a very successful program.

The coordinator will act as the key liaison to top management. This helps to ensure that the best pollution prevention ideas in terms of need, feasibility, and benefit to the company are delivered to top management for consideration. Also, the coordinator will need to obtain interdepartmental cooperation and resources on a continuing basis.

Develop a Pollution Prevention Team

A pollution prevention team needs to be organized prior to beginning the assessment process. These responsibilities should not be assigned to any one department. Some suggested key personnel to consider

including are: representatives (both supervisors and line workers) from maintenance, production, environmental, health and safety, purchasing, accounting, shipping and receiving, legal and engineering departments, research and development, and plant and executive managers. Not every company will have these designations, and other personnel may be more appropriate. The final composition of the team should be based on what is most appropriate for your company. It is important to include those individuals knowledgeable about the processes generating wastes and involve them from the beginning.

In addition to those individuals assigned duties on the pollution prevention team, others may wish to help. Do not turn away volunteers - everyone should be encouraged to participate in the pollution prevention program. All volunteers should be commended in some way (the in-house newsletter, etc.) for their interest in helping the company, their co-workers, and the environment. One important point to continually stress throughout the development and implementation of the pollution prevention program is the need to work together. Employee suggestions should continually be encouraged - supervisors need to listen carefully because innovative ideas can come from any employee. Pollution prevention must continue for the life of the facility; establishing a sound, cooperative program from the start will be beneficial in future years.

The initial pollution prevention team meeting should be an informal session to discuss what pollution prevention is, why the company should do it, and where and how to begin. General information about the company's processes and operational procedures should be reviewed. The team will be responsible for developing a formal pollution prevention plan as outlined in the next chapter. This is also a good time for the company to emphasize top management support for the pollution prevention program and for the team's planning process.

State Goals

There are different types of goals a company should set when beginning their pollution prevention program. Some goals will be waste specific, while others will be activity oriented. The team should discuss what types of goals are appropriate for the company. For example, a company may want to set an ultimate goal of zero percent waste generation to acknowledge the fact that pollution prevention is a continuing challenge. This is very similar to company goals like "zero product defects" or "zero lost workdays". Another goal may be to replace some or all of the toxic substances used with non-toxic substances and thus reduce risk to employees, the public, and the environment. Numerical goals for waste reduction may be established once the wastes are characterized. Goals may consider economic and technical feasibility.

In addition to specific goals targeted at source reduction, more general goals should also be set. These could include improving worker health and safety in the facility or improving the company image and attractiveness to investors. Activity goals could include incorporating pollution prevention into performance evaluations of all management staff, installing a revised accounting system that charges the cost back to the production line generating the waste, training all employees in pollution prevention, or holding monthly team meetings.

Goals should be continually updated as they are achieved. This emphasizes the concept of continuous quality improvement and is an important component of a pollution prevention program. Do not remain static. Build on the successes achieved. Specific goals will vary over time and should be based on the size of the facility and the type of production processes undergoing change. It is a good idea to set a

number of measurable goals to track progress within a given period.

Increase Employee Awareness and Involvement

One method of increasing pollution prevention knowledge is through a corporate/facility awareness program. Supervisors should discuss the status of the pollution prevention program at weekly meetings. They should encourage the employees to bring pollution prevention ideas to them so they can forward them on for the facility pollution prevention team meetings, or encourage employees to submit ideas directly to the team. Some companies may already have "quality circles" in place to improve product quality and production efficiency. The team should work with these groups to develop ideas for pollution prevention initiatives. The pollution prevention team should include the following aspects in developing their awareness program:

- provide a definition and explanation of the primary components of pollution prevention
- state company policies and guidelines clearly
- identify company goals to reduce waste generation and to improve operations
- stress that pollution prevention is not only essential but also beneficial
- encourage employee participation as extremely important to improve facility and environmental conditions
- make management and pollution prevention team members available to employee suggestions and new ideas
- present facts on safety improvements that occur when a pollution prevention program is implemented
- stress the relationship between the cost of generating waste to company competitiveness
- equate savings from pollution prevention with the company's fiscal health (i.e., increasing job security to encourage employee involvement).

Train Employees

Specialized pollution prevention training programs tailored for management, line, and maintenance staff should be incorporated into company procedures. Consolidated training for different groups can also stimulate discussion between employees who would not interact otherwise. Additional personnel training may be needed if materials handling or accounting changes are made. The facility or company may want to include a pollution prevention orientation program for all new employees, regardless of their job function. Employees will need thorough training on any new technologies or techniques added to unit processes. Depending upon the size of the facility, this may require training on more than one shift.

Another option is to have performance evaluation systems reflect pollution prevention responsibilities. As pollution prevention strategies are identified, the training requirements must be considered by the pollution prevention team prior to implementation.

Reward Pollution Prevention Successes

To stimulate additional interest and participation in pollution prevention, establish an employee incentive award or recognition program for the facility or company. Competition in larger plants may motivate

participation. Shifts, departments, or even individuals can be encouraged to compete against their own past year's performance. Recognition in the form of an awards ceremony, a bonus, a special parking place, or added vacation time, provides a tangible reward to individuals and departments who have achieved their pollution prevention goals. Further recognition may be promoted in a regular pollution prevention column in the company newsletter which recognizes pollution prevention efforts and successes. When a company newsletter is not available, a short one page fact sheet on pollution prevention could be started that acknowledges employee participation and accomplishments.

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Chapter 10
Write the Pollution Prevention Program Plan

"Pollution prevention plans should be a practical business plan for attacking today's environmental concerns through the reduction or elimination of waste at its source of generation."

Dennis G. Willis, Capsule Environmental Engineering

After the pollution prevention team has been organized and the preliminary assessment has been completed, the pollution prevention team should write the pollution prevention plan. This plan should include all the ideas developed by the team such as the statement of support from management, the pollution prevention team's structure, organizational guidelines, and statement of purpose; the methods for fostering participation by all employees; the company's general goals; the structure of an incentive/reward program; the procedures, criteria and schedule for implementing pollution prevention projects; and the provisions for employee training.

The formal written pollution prevention plan should include the following elements:

- Corporate policy statement of support for pollution prevention
- The company's general goals
- Description of your pollution prevention planning team(s) makeup, authority, and responsibility
- Description of how all of the groups (production, laboratory, maintenance, shipping, marketing, engineering, and others) will work together to reduce waste generation and energy consumption
- Plan for publicizing and gaining company-wide support for the pollution prevention program
- Plan for communicating the successes and failures of pollution prevention programs within your company
- Description of the processes that produce, use, or release wastes, including clear definition of the amounts and types of substances, materials, and products under consideration
- List of treatment, disposal, and recycling facilities and transporters currently used
- Preliminary review of the cost of pollution control and waste disposal
- Description of current and past pollution prevention activities at your facility
- Evaluation of the effectiveness of past and ongoing pollution prevention activities
- Criteria and schedule for prioritizing candidate facilities, processes, and wastes for pollution prevention projects
- Provisions for employee training

Define Objectives

During the preliminary assessment phase, the program team will have identified opportunities for pollution prevention and will have worked with the executive group to establish priorities. These will be the starting point for defining short- and long-range objectives.

Objectives are the specific tasks that will be necessary to achieve goals. For example, in order to reach a goal of reducing waste, the objectives might be defined as reducing solvent, paper, and packaging wastes by specific amounts over a stated period of time.

Objectives can be defined at the facility- or the department-level, depending on the size and diversity of your company. A small company could decide to develop a single set of objectives to cover all of its operations. A larger company with many facilities or products might develop an overall corporate plan describing goals and objectives, supplemented by facility- or product-specific goals. In any case, the management at each location must understand and support its objectives if the pollution prevention program is to be successful.

Objectives should be stated in quantitative terms and should have target dates. These two attributes make objectives effective tools for directing effort and measuring progress.

Identify Potential Obstacles

During the development of the pollution prevention program and plan, the team may have encountered a number of factors that could complicate the process. These factors need to be recognized, and the means for overcoming them need to be defined. The team should list economic, technical, regulatory, and institutional obstacles and define procedures for addressing them. Apparent obstacles will be less likely to impede the process if everyone understands that there is a mechanism for addressing them in a later stage.

Develop Schedule

The final aspect of planning your pollution prevention program is to list the milestones within each of the stages from detailed assessment through implementation and assign realistic target dates. The execution of these stages (described in the following chapters) should follow this schedule closely. Significant deviations may cause the program to falter because certain steps are not completed. Adherence to the schedule will also help control the startup or implementation costs of the program.

The pollution prevention program plan should be presented and agreed to by management so that they understand how the pollution prevention team will proceed and what resources/support will be required from them. The plan should be modified on an annual basis as pollution prevention experience is gained and goals are reached. A company should strive to continually improve the entire program.

Augment the Plan

After the facility has completed each of the later steps in the pollution prevention program, results and a written summary of each step should be added to the pollution prevention plan. Writing summaries and adding them to the pollution prevention plan will provide a record of all pollution prevention activities in

the program. The compilation of reports will be a good reference for anyone who is interested in reviewing your facility's entire pollution prevention program, including implementation, measuring progress, and maintaining the program.

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Figure 3: A Simple flow Diagram

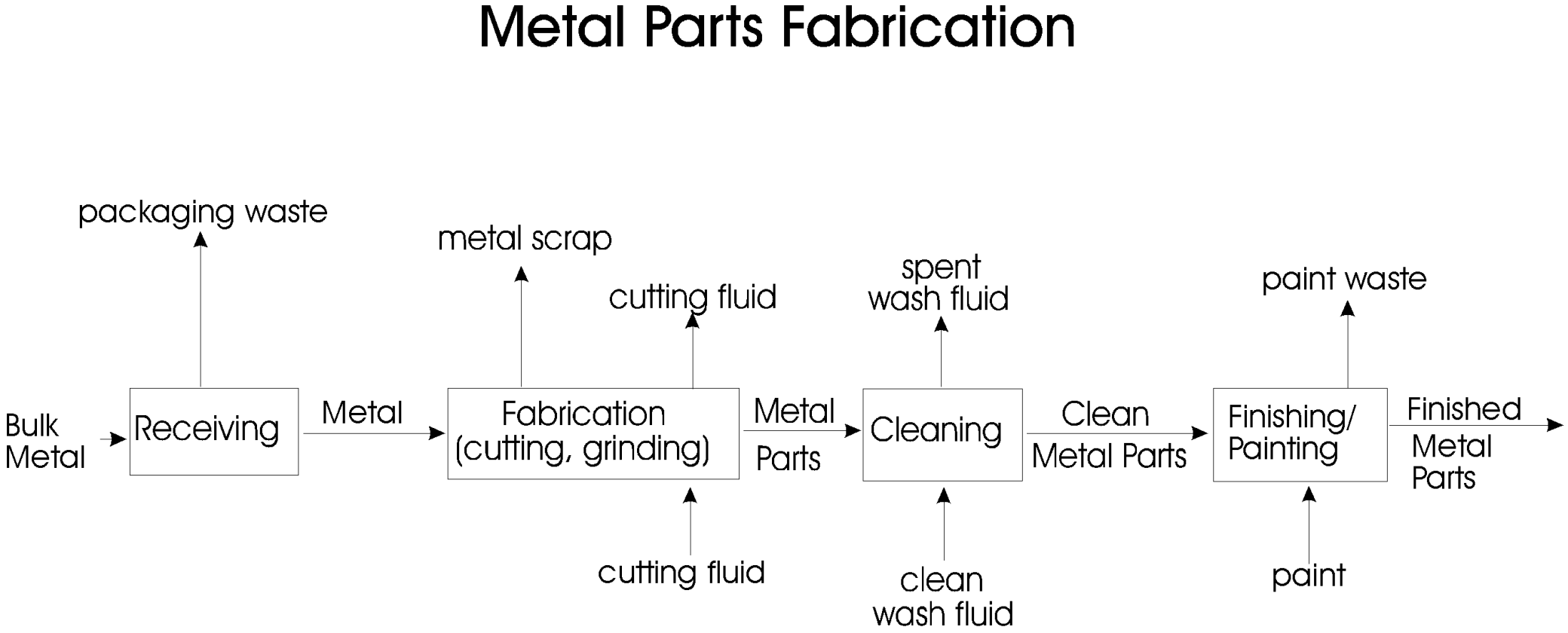

Figure 4: Simplified general process flow design

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Chapter 14
Do Feasibility Analysis

"We have found that up to 65 percent of the waste generated by industrial plants can be prevented at little or no cost to the plant. Most of the recommendations we make to companies have a pay-back period of less than one year."

Charles A. Czarnecki, Waste Advantage

Once suggestions for pollution prevention options are gathered and the costs associated with these options calculated, they should be reviewed by the pollution prevention team and the least beneficial options eliminated from further consideration. These options may be reviewed again at a later time since pollution prevention is a continuous process and what is less beneficial now may work better in the future. The remaining options should then be examined in more detail to determine their overall benefits. Technical, economic and environmental feasibility of each option, based on the company's requirements for these criteria, should be studied. For example, each company has their own standards for economic evaluation, feasibility for implementation, levels of expertise, operational requirements, etc. Those options found to be consistent with the company's goals can then be scheduled for implementation. There may even be cases in which certain benefits of a project override low economic return.

The benefits to be gained by implementing a pollution prevention project should be identified. Along with reduced waste generation (and associated costs), these benefits may include improved worker safety/morale, better community relations, reduced liability, reduced regulatory concerns, and improved relations with regulatory agencies. These benefits may be difficult to quantify but should be emphasized when evaluating options for implementation approval.

Technical Evaluation

There are many factors which should be considered when determining if a project is technically feasible. Table 6 presents some of these factors.

Table 6. Factors to Consider in Determining Feasibility

Process related	Company related

Existing technology available	Pollution prevention goals
Amount of downtime required	Product quality maintained
Equipment/procedure compatibility	Customer acceptance of product
Utility requirements/availability	Likelihood of success
Specific training required	Creation of other environmental concerns
Acceptable service from vendor	Reduction of treatment/disposal costs
Ease of implementation	Payback period
Quality assurance	Regulatory compliance costs
	New markets for modified products

(adapted from *Pollution Prevention: A Guide to Program Implementation*, Illinois Hazardous Waste Research and Information Center, 1993)

Personnel that will be directly affected by implementing the project should be consulted and included in the decision-making process. They typically have knowledge of process details that may inhibit the project success and are essential in proper implementation. For projects that involve a new technology or technique, a bench-scale or pilot test may be required to assess the technical feasibility. At this point, if it is determined that an option is not feasible by these criteria, the option should be deferred for consideration at a later time when the circumstances for evaluation may be different. If possible, illustrate effects of an option by modifying flow diagrams of existing processes to show how potential options will improve plant processes.

Economic Evaluation

Once a pollution prevention project has been found to be technically feasible, the economics of the project should be examined. In the previous chapter, the full cost of waste generation and the cost savings for implementing a pollution prevention option were determined. In cases which involve capital and start-up expenditures, the payback period or other economic criteria were calculated. This information is necessary when evaluating the economic feasibility of a project.

Any project that yields a cost savings (annual waste handling or annual operating costs) has potential for profitability. If there are no initial costs involved, then a project can be considered economically feasible if there is a cost savings. Options such as better operating practices may be the most practical to implement first since they do not require an initial capital investment.

For projects with capital and start-up costs, an additional profitability criterion must be examined: payback period and other economic criteria (as calculated in Chapter 13). Typically, if the payback period is less than two years, the project may be considered economically feasible. This criteria varies depending on the company. There may also be other profitability measures that must be considered; this, too, will depend on the company. Before making the final economic feasibility determination, the accounting department controller should be consulted since his/her approval will usually be necessary before the project may proceed. Give the accountant or controller copies of the pollution prevention cost references mentioned in the previous chapter.

Environmental Evaluation

Factors to consider when conducting an environmental evaluation include:

- effect on number and toxicity of wastes
- transfer of pollutants to other media
- environmental impact of alternative input materials
- energy consumption.

The team should review information on the environmental aspects of the relevant product, raw material, or constituent part of the process. The team should consider the environmental effects not only of the production phase and product life cycle but also of extracting and transporting the alternative raw materials and of managing any new wastes.

Companies should start working with the appropriate regulatory agencies as early in the evaluation process as possible. Some pollution prevention projects will require new permits or changes to existing permits. It will also be necessary to learn what regulations might apply to the project. Appendix B and Appendix G of this manual provide contacts for assistance in the environmental evaluation of pollution prevention options.

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Chapter 15
Write the Assessment Report

"An assessment report will help you focus subsequent pollution prevention efforts and will be useful as a record of what aspects of your business you examined for pollution prevention opportunities."

The task force should write a report that summarizes the results of the pollution prevention assessment at the company level. Table 7 lists the report contents. The report will provide a schedule for implementing prevention projects and will be the basis for evaluating and maintaining the pollution prevention program. It may also be needed to secure internal funding for projects that require capital investment, if the members of the pollution prevention assessment task force do not have the authority to commit funds.

You may be tempted to omit this step if your company has an owner-manager and only a few employees. A summary assessment report may not be needed to resolve pollution prevention project conflicts among different areas, and your funding approvals probably are not a formal procedure requiring cost justifications. However, an assessment report will help you focus subsequent pollution prevention efforts and will be useful as a record of what aspects of your business you examined for pollution prevention opportunities.

Table 7. Elements to Include in an Assessment Report

For each process that is assessed, the report should include: ● The results of the assessment ● The options proposed ● The results of options screening ● The results of feasibility analysis ● The project proposal for each selected option
For each project proposal, the report should include: ● The project's pollution prevention potential ● The maturity of the technology and a discussion of successful applications ● The overall project economics ● The required resources and how they will be obtained ● The estimated time for installation and startup ● Possible performance measures to allow the project to be evaluated after it is implemented

Input of the Assessment Teams

In a company that has several assessment teams, the task force will need to evaluate the results and resolve any conflicts that might exist among the teams about the approach and the resources required for the projects they propose.

As input to this integration effort, each assessment team should prepare a summary report, presenting the results of their investigations and listing the options they screened. Each report should describe in some detail the options that the team has determined are feasible and propose a schedule for implementing them. The options recommended for immediate implementation should then be described in detail as proposed projects.

These proposals should evaluate each project under different scenarios. For example, the profitability of projects could be estimated under both optimistic and pessimistic assumptions. Where appropriate, sensitivity analyses indicating the effect of key variables on profitability should be included. Each proposed project should outline a plan for adjusting and fine-tuning the initial projects as knowledge and experience increases. The proposals should include a schedule for addressing those areas and wastes with lower priorities than the ones selected for the initial effort.

Preparing and Reviewing the Assessment Report

The task force will use the assessment teams' reports and project proposals to prepare the summary assessment report and implementation plan. The report should include a qualitative evaluation of the indirect and intangible costs and benefits to your company and employees of a pollution prevention plan. It will provide the basis for obtaining funding of pollution prevention projects. Pollution prevention projects should not be sold on their technical merits alone; a clear description of both tangible and intangible benefits can help a proposed project obtain funding.

Before the report is issued in final form, managers and other experienced people in the production units that will be affected by the proposed projects should be asked to review the report. Their review will help to ensure that the projects proposed are well-defined and feasible from their perspectives. While they probably were involved in the site reviews and other early efforts of the task force, they may spot inaccuracies or misunderstandings on the part of the assessment teams that were not apparent before. In addition to ensuring the quality of the assessment report and implementation plan, this review will help ensure the support of the people who will be responsible for the success of the project.

The final assessment report should be included as a part of the original pollution prevention program plan (see "Augmenting the Plan" in Chapter 10). As stated above, the report will provide a schedule for implementing prevention projects and will be the basis for evaluating and maintaining the pollution prevention program.

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Chapter 16
Implement the Pollution Prevention Plan

"You can state corporate positions, write detailed mission statements, outline ambitious goals and prepare detailed plans, but the way you reduce waste is by installing projects that reduce waste."

Ken Nelson, Dow Chemical

Select projects

Once the pollution prevention team selects the projects to be implemented, management approval must be obtained. If management support was obtained as described in Chapter 7, the approval process should not be difficult (providing the project benefits, profitability, and feasibility are acceptable). The pollution prevention coordinator (or whoever will be in charge of the project) should present to management the details of the project along with the budget and project justification (particularly economics). Individual companies will have their own procedures to be followed for project endorsement.

Obtain funding

When approval has been obtained, the necessary funding for the project should be acquired. Again, this procedure will vary with the company. It may be worthwhile to contact the Ohio Department of Development, the Federal Small Business Administration, and other governmental offices. These organizations may provide loans or grants for pollution prevention projects. A joint project of U.S. DOE and U.S. EPA, the National Industrial Competitiveness Through Efficiency: Energy, Environment, and Economics (NICE3) provides one-time grant funds for research and demonstration projects (see Appendix B).

Install the selected projects

When funding is in place, project implementation can begin. The phases of implementation will be the same as for most other projects in the company. Personnel that will be directly affected by the project (line workers, engineers) should be involved from the start. Those personnel indirectly affected (e.g., controllers, purchasing agents) should also be involved as project implementation proceeds. Any additional training requirements should be identified and arrangements made for instruction. All employees should be periodically informed of the project status and should be educated as to the benefits of the project to them and to the company. Encourage employees to comment on the plan and to suggest additional reduction options. This may ease the natural resistance to change.

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Appendix G
Ohio EPA Information Sources

Please see Divisions and Offices of the Ohio EPA for updated information.

Central Office (CO)
1800 Watermark Dr.
P.O. Box 1049
Columbus, Ohio 43216-1049
(614) 644-3020

Central District Office (CDO)
P.O. Box 1049
3232 Alum Creek Drive
Columbus, Ohio 43216-1049
(614) 728-3778
(800) 686-2330

Northwest District Office (NWDO)
347 North Dunbridge Road
P.O. Box 466
Bowling Green, Ohio 43402
(419) 352-8461
(800) 686-6930

Southwest District Office (SWDO)
401 East Fifth Street
Dayton, Ohio 45402-2911
(513) 285-6357
(800) 686-8930

Northeast District Office (NEDO)
2110 East Aurora Road
Twinsburg, Ohio 44087
(216) 963-1200
(216) 425-9171
(800) 686-6330

Southeast District Office (SEDO)
2195 Front Street
Logan, Ohio 43138
(614) 385-8501
(800) 686-7330

Executive Offices

Division of Air Pollution Control	(614) 644-2270
Division of Drinking and Ground Water	(614) 644-2905 and 644-2752
Division of Emergency and Remedial Response	(614) 644-2924
Environmental Education Fund	(614) 644-2873
Division of Environmental and Financial Assistance	(614) 644-2798
Division of Environmental Services	(614) 294-5841
Division of Hazardous Waste Management	(614) 644-2917
Legal Office	(614) 644-2115
Office of Pollution Prevention	(614) 644-3469
Public Interest Center	(614) 644-2160
Division of Solid and Infectious Waste	(614) 644-2621
Division of Surface Water	(614) 644-2001 and 644-2856

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Chapter 18
Maintain the Pollution Prevention Program

"The most successful companies are those that maintain an ongoing series of challenges - setting tough, long-term goals, and revising them up if they seem too easy."

Joel Makower, "the e factor"

Now that a pollution prevention program is underway, it must be sustained in future years. This involves reaffirming commitment to the program at all levels including upper management. Employee enthusiasm and interest must be maintained to ensure continuation of the program. Ideally, the entire cycle should be repeated following the successful implementation of each pollution prevention project. Some specific ideas for sustaining the program include bringing new personnel into the pollution prevention team, training, and publicizing success stories.

Rotate Pollution Prevention Team

To maintain the flow of fresh ideas, the pollution prevention team members should be rotated to introduce new perspectives. With an ongoing pollution prevention program, there may be new employees who join the company over the years that want to participate. A new team leader may step in with high energy, enthusiasm and creativity. If some members do step down, they can serve as consultants to the new team. There may also be dedicated team members who wish to remain on the team; this should be encouraged as they have gained valuable experience. The composition of the team should still include employees from all levels and departments. The importance of a written pollution prevention plan is that it will outline the operating procedures for the program and provide continuity even when team members are replaced.

Refresher Training

Pollution prevention awareness and training should be conducted on a periodic basis so that all new or reassigned employees understand the company's commitment to pollution prevention. Pollution prevention training should be incorporated into a number of the companies existing training programs (health and safety, environmental, processes, etc.). This training should be an ongoing process.

Publicize Success Stories

Publicity is one of the most effective means to sustain the pollution prevention program. Internal publicity raises the awareness of employees of activities going on at the facility and encourages further

participation. The results of the various projects should be relayed through bulletin boards, newsletters, interoffice memos, etc. The names of the pollution prevention team members, as well as those employees offering suggestions, should be included in these publications. If individual successes are recognized, other employees may wish to join in to receive the same recognition. Presentation ceremonies for employee/team incentive awards will also help publicize successes. Cost savings, waste reductions, and product quality improvements due to pollution prevention activities/projects should be highlighted.

The pollution prevention program can be a key public relations tool. Any reduction in waste is a benefit to employees, the community and the environment and should be publicized. News releases should be prepared for local and state media documenting the project and the benefits gained by the company and the surrounding community. Reporters could also be invited to the facility for a demonstration of a new technology.

Further public recognition can be facilitated through national, state, county, and local award programs. The Ohio EPA solicits nominations for the Governor's Awards for Outstanding Achievement in Pollution Prevention each year. These awards are presented to individuals; environmental, community, educational and non-profit organizations; business, industry, agricultural, trade, or professional organizations; and local governments that demonstrate significant achievements in pollution prevention.

Trade association meetings and publications are another good avenue for promoting a company's pollution prevention program. Case studies can be submitted which demonstrate the company's progressive stance in environmental protection while describing the use of innovative technologies and techniques to reduce waste. These case studies should emphasize the benefits gained by the company - not only waste reduction but also cost savings, quality improvements, safety improvements, regulatory compliance, and better community relations. Applying for state or national pollution prevention awards can also be a means to publicize the company's efforts.

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Chapter 17
Measure Progress: Program and Project Evaluation

"Pollution prevention performance must be measured if it is to be improved, and it must be improved if it is to be praised."

Joel Hirschhorn

Once a pollution prevention program is established it should be continuously evaluated and updated. This periodic review by the pollution prevention team should be conducted for all stages of the program, from management support and team selection to project implementation. Once the elements have been examined, the program can be modified and goals redefined to improve overall effectiveness.

Program Evaluation

The progress of the pollution prevention program can be determined by looking at the individual activities and projects. One way of measuring progress is quantitative. For example, look at actual waste reduction, both in terms of actual change in quantity and change in hazard level. The actual change in quantity is the difference between the waste per production unit reported in the current year and the waste per production unit reported in the previous year. The change in hazard level is based on toxicity, reactivity, ignitability, and corrosivity of the waste and industrial hygiene/employee exposure-type measurements. This comparison measurement is most useful when evaluating an alternative material substitution such as switching from an organic solvent to a water based solvent. These measures of waste reduction may not be appropriate for all facilities and wastes. Other quantitative measurements are adjusted quantity change and throughput ratio. Additional guidelines and detailed descriptions on measuring waste reduction can be found in Chapter 4 of U.S. EPA's *Facility Pollution Prevention Guide*.

Progress can also be measured qualitatively through employee involvement, attitude and number of ideas suggested. Some examples of qualitative evaluation criteria are presented in Table 8.

Table 8. Program Evaluation Criteria

Project Element	Evaluation Criteria
Management support	Statements of support Approval of projects Providing ideas/input Praise and publicity of successes

Team aspects/program initiation	Employee enthusiasm and participation Using skills from training Supporting projects Providing ideas
Understanding process	Processes characterized Flow diagrams developed All wastes and sources identified Waste accounting system implemented
Project implementation	Projects completed within budget Projects completed on schedule Waste reduction achieved Cost savings attained Raw material savings achieved Product quality improved Worker safety improved Cost allocation system implemented
Continuing the program	Follow-up and review procedures established Employees kept informed and involved Pollution prevention team composition rotated

(adapted from *Pollution Prevention: A Guide to Program Implementation*, Illinois Hazardous Waste Research and Information Center, 1993)

When evaluating the elements of the program, it is important to identify those strategies and techniques which have been very successful, marginally successful, or have failed. If possible, the reasons why these projects were or were not successful should be determined. This information will be beneficial for modifying the program and redefining goals.

Program Modification

To ensure continuing progress and success of the pollution prevention program, the individual components and the overall plan should be modified using the knowledge gained from experience. Successful strategies and techniques can be used again or adapted to other areas where progress has been slow or impeded. The initial pollution prevention goals should be redefined and/or expanded, reaching for the ultimate goal of zero waste generation.

This is also an appropriate time to check to see if results and a written summary of the implementation of each step of the program have been added to the pollution prevention plan. As discussed in Chapter 10, writing summaries and adding them to the pollutionprevention plan will provide a record of all pollution prevention activities in the program. The compilation of reports will be a good reference for anyone who is interested in reviewing your facility's pollution prevention program.

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Appendix A
References

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Klafter, B. 1992. Pollution Prevention Benchmarking: AT&T and Intel Work Together with the Best. Total Quality Environmental Management, Vol. 2, No. 1, p. 27-34.

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Washington State Department of Ecology. 1992. Pollution Prevention Planning - Guidance Manual for

Chapter 173-307 WAC. Publication #91-2. Washington State Department of Ecology, Waste Reduction Recycling and Litter Control Program, Olympia, Washington.

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Appendix E
Examples of Pollution Prevention Activities

Table E-1. Pollution Prevention Through Good Operating Practices

(adapted from *Facility Pollution Prevention Guide*, U.S. EPA, 1992)

Good Operating Practice	Program Ingredients
Waste segregation	Prevent mixing of hazardous wastes with nonhazardous wastes Store materials in compatible groups Segregate different solvents Isolate liquid wastes from solid wastes
Preventive Maintenance Programs	Maintain equipment history cards on equipment location, characteristics, and maintenance Maintain a master preventive maintenance (PM) schedule Keep vendor maintenance manuals handy Maintain a manual or computerized repair history file
Training/Awareness-Building Programs	Provide training for: ● Operation of the equipment to minimize energy use and material waste ● Proper materials handling to reduce waste and spills ● Emphasize importance of pollution prevention by explaining the economic and environmental ramifications of hazardous waste generation and disposal ● Detecting and minimizing material loss to air, land, or water ● Emergency procedures to minimize lost materials during accidents

Effective Supervision	Closer supervision may improve production efficiency and reduce inadvertent waste generation Centralize waste management. Appoint a safety/waste management officer for each department. Educate staff on the benefits of pollution prevention. Establish pollution prevention goals. Perform pollution prevention assessments.
Employee Participation	"Quality circles" (free forums between employees and supervisors) can identify ways to reduce waste Solicit and reward employee suggestions for waste reduction ideas
Production Scheduling/Planning	Maximize batch size to reduce clean out waste Dedicate equipment to a single product Alter batch sequencing to minimize cleaning frequency (light-to-dark batch sequence, for example)
Cost Accounting/Allocation	Charge direct and indirect costs of all air, land, and water discharges to specific processes or products Allocate waste treatment and disposal costs to the operations that generate the waste Allocate utility costs to specific processes or products

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Appendix F
Pollution Prevention Information Available from Ohio EPA

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Appendix H
Trade Secrets and Confidentiality Requests

This appendix provides information about trade secrets and confidentiality requests for pollution prevention and waste minimization plans. Specific provisions for permitted hazardous waste facilities, Class I injection well facilities, air pollution control, and water pollution control are listed for reference. Other related information about trade secrets and confidentiality requests include: Toxic Chemical Release Reporting, Ohio Administrative Code Rule 3745-100-13, Trade Secret Claims; and Miscellaneous Rules, Ohio Administrative Code Rule 3745-49-031, Inspection of Public Records.

Facilities should contact the appropriate Ohio EPA program before submitting trade secret or confidential information to confirm the most current procedures for requesting confidentiality.

General Provisions for Trade Secrets

The general provision for trade secrets for the State of Ohio can be found in the Ohio Revised Code Section 1333.51, Theft or conversion of trade secret.

Ohio Revised Code Section 1333.51 Theft or conversion of trade secret

(A) As used in this section:
(1) "Article" means any object, material, device, or substance, or copy thereof, including any writing, record, recording, drawing, sample, specimen, prototype, model, photograph, blueprint, or map.
(2) "Representing" means describing, depicting, containing, constituting, reflecting, or recording.
(3) "Trade secret" means the whole or any portion or phase of any scientific or technical information, design, process, procedure, formula, or improvement, or any business plans, financial information, or listing of names, addresses, or telephone numbers, which has not been published or disseminated, or otherwise become a matter of general public knowledge. Such scientific or technical information, design, process, procedure, formula, or improvement, or any business plans, financial information, or listing of names, addresses,

or telephone numbers, is presumed to be secret when the owner thereof takes measures designed to prevent it, in the ordinary course of business, from being available to persons other than those selected by the owner to have access thereto for limited purposes.

(4) "Copy" means any facsimile, replica, photograph, or reproduction of an article, or any note, drawing, or sketch made of or from an article.

(B) No person shall, with intent to deprive or withhold from the owner thereof the control of a trade secret, or with intent to convert a trade secret to his own use or the use of another, obtain possession of or access to an article representing a trade secret.

(C) No person, having obtained possessions of an article representing a trade secret or access thereto with the owner's consent, shall convert such article to his own use or that of another person, or thereafter without the owner's consent make or cause to be made a copy of such article, or exhibit such article to another.

(D) No person shall, by force, violence, threat, bribe, reward, or offer of anything of value on or to another person or member of his family, obtain or attempt to obtain from such other person an article representing a trade secret.

(E) No person shall, without authorization, enter upon the premises of another with intent to obtain possession of or access to an article representing a trade secret.

Permitted Hazardous Waste Facilities

The Ohio Revised Code Section 3734.12(G) instructs the Director of Ohio EPA to establish procedures to ensure protection of trade secrets. Trade secrets are defined in the Section and this definition is the same as the definition in Ohio Administrative Code Rule 3745-50-30 (see below). Ohio Hazardous Waste Facility Installation and Operation Permits contain a standard condition for confidential information. The Ohio hazardous waste rules also include a rule, Ohio Administrative Code Rule 3745-50-30, for trade secrets and request for confidentiality. The condition and the rule are listed below.

Ohio Hazardous Waste Facility Installation and Operation Permit Condition Confidential Information

Ohio Administrative Code Rule 3745-50-30

In accordance with Ohio Revised Code Chapter 3734 and the rules adopted thereunder, the Permittee may request confidentiality of any information required to be submitted by the terms and

conditions of this permit.

Ohio Administrative Code Rule 3745-50-30 Trade secrets - request for confidentiality.

(A) Any record, report or other information obtained under the hazardous waste rules or Chapter 3734. of the Revised Code shall not be available to the public upon a showing satisfactory to the Ohio EPA that all or part of such record, report or other information (other than discharge or emission data) would divulge methods or processes entitled to protection as trade secrets of such person, in which instance, the Ohio EPA shall consider such record, report or other information or part thereof confidential and administer such record, report or other information pursuant to this rule.

(B) A request for confidentiality shall be submitted to the Ohio EPA simultaneously with submissions of the specific record, report or other information, and such request shall be accompanied by sufficient supporting documentation. Failure to make such timely request shall constitute a waiver of the right to prevent public disclosure.

(C) A decision as to the confidentiality request shall be made by the Ohio EPA within forty-five days of receipt of a request filed in accordance with rule 3745-49-031 of the Administrative Code. Until such decision is made, the record, report, or other information or part thereof, shall be confidential. The person requesting confidentiality shall be notified by mail of the decision.

(D) Any record, report or other information determined to be confidential may be disclosed, without such person's consent:

(1) To officers, employees, or authorized representatives of the state or a federal agency;
(2) In any judicial proceeding; and
(3) In any hearing conducted by Ohio EPA or the board.

(E) As used in this rule, "trade secrets" may include but are not limited to, any formula, plan, pattern, process, tool, mechanism, compound, procedure, production data or compilation of information which is not patented, which is known only to certain individuals within a commercial concern who are using it to fabricate, produce, or compound an article, trade or service having commercial value, and which gives its user an opportunity to obtain a business advantage over competitors who do not know or use it.

Class I Injection Well Facilities

The Ohio Revised Code Section 6111.045(B), discusses trade secret information in waste minimization and treatment plans and references Ohio Revised Code, Section 1333.51, Theft or conversion of trade secrets. The Ohio underground injection control program rules also include a rule, Ohio Administrative Code Rule 3745-34-03, for confidentiality of information. The section and the rule are listed below.

Ohio Revised Code Section 6111.045(B)

Each waste minimization and treatment plan prepared and adopted under division (A) of this section shall be retained at the facility to which it applies and shall be made available for inspection and review by the director of environmental protection or his authorized representative. The disclosure of any trade secret information contained in any such plan is subject to section 1333.51 of the Revised Code.

Ohio Administrative Code Rule 3745-34-03 Confidentiality of information

(A) Any record, report or other information obtained by the Ohio environmental protection agency shall be made available to the public, except that upon a showing satisfactory to the director by any person that such record, report or other information, or particular part thereof (other than data concerning the amounts of contents of discharges or the quality of the receiving waters), if made public, would divulge methods or processes entitled to protection as trade secrets of such person, the Ohio environmental protection agency shall consider such record, report or other information, or particular part thereof confidential. Any confidential record, report, or information may be disclosed to other officers, employees, or authorized representatives of the state, another state, or of the United States, concerned with carrying out this act or when relevant in any proceeding under these regulations. Prior to divulging any confidential trade secret information, the director shall give ten days' written notice to the person claiming trade secrecy.

(B) A request for confidentiality shall be submitted to the Ohio environmental protection agency simultaneously with submission of the specific record, report or other information, and such request shall be accompanied by sufficient supporting documentation. Failure to make such timely request shall constitute a waiver of the right to prevent public disclosure.

(C) A decision as to the confidentiality request shall be made by

the Ohio environmental protection agency within forty-five days of receipt of the request and accompanying documentation. Until such decision is made, the record, report, or other information or part thereof, shall be confidential. The person requesting confidentiality shall be notified by mail of the decision.

Air Pollution Control

Ohio Revised Code Section 3704.08 Records to be available for public inspection; exception.

(A) Any records, reports, or information obtained under Chapter 3704. of the Revised Code shall be available for public inspection, except that upon a showing satisfactory to the director of environmental protection by any person that such records, reports or other information, or particular part thereof, other than emission data, to which the director has access under such chapter, if made public, would divulge methods or processes entitled to protection as trade secrets of such person, the director shall consider such record, report or other information, or particular part thereof confidential, except that such record, report, or information may be disclosed when necessary to sustain an action brought pursuant to section 3704.06 of the Revised Code ordering an adjudication hearing conducted by the director on the denial, modification, or revocation of a variance or permit.

Water Pollution Control

Ohio Revised Code Section 6111.05 Investigation of alleged acts of pollution; right of entry.

... Any records, reports, or information obtained under Chapter 6111. of the Revised Code shall be available for public inspection, except that:

(A) Upon a showing satisfactory to the director of environmental protection by any person that such records, reports or information, or any particular part thereof, other than data concerning the amounts or contents of discharges or the quality of the receiving waters, to which the director has access under this chapter, if made public would divulge information entitled to protection as trade secrets of such person, the director shall consider such record, report or information or particular part thereof confidential. Prior to divulging any alleged trade secret information pursuant to this division, the director shall give ten day's written notice to the person claiming trade secrecy.

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