

What is Pollution Prevention?

Pollution prevention (P2) means working at the source of pollutants to prevent them from being generated or to reduce the amount generated. It is using materials and energy more efficiently, and conserving natural resources, including water. It is following best management practices, and involving all employees in their implementation, to reduce and prevent pollution. Finally, P2 means also seeing the financial benefits of increased efficiency in the use of raw materials, energy, water or other resources. Pollution prevention includes:



- Source reduction, which is any practice that:
 - Reduces the amount of any hazardous substance, pollutant or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal; and
 - Reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants.
- 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.
- Equipment or technology modifications; process or procedure modifications; product reformulation or redesign; substitution of raw materials; or improvements in housekeeping, maintenance, training or inventory control.

To consider in-process recycling a pollution prevention activity, it must serve a productive function with the making of the commercial product for which the original process was designed and must be an integral part of that process (i.e., the production process cannot function without the recycling process).

Pollution prevention does NOT include:

- Energy recovery.
- Treatment of a waste stream.
- Disposal.

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- Recycling.
- Any practice that alters a hazardous substance, pollutant or contaminant once it is generated.
- A practice that is not necessary for production.
- Practices that create new risks to human health or the environment.

Why Practice Pollution Prevention?

Pollution prevention is about increasing operational efficiencies, reducing risks, and effectively meeting environmental responsibilities. Unlike most pollution control strategies, P2 offers important economic, regulatory, environmental and social benefits that can often result in a more competitive business. A facility that commits to an effective, ongoing P2 program that is dedicated to eliminating, reducing or reusing wastes can often:

- Save money by reducing waste treatment and transportation costs.
- Save money by reducing costs for energy, water and raw materials.
- Minimize compliance issues and costs associated with regulated wastes.
- Reduce future liability through reduced risks to workers, communities and the environment.
- Avoid costs of accidents and spills.
- Improve production times.
- Enhance public image and community relations.

Pollution Prevention and Technical Assistance and Resources

An excellent way to get started with any P2 effort is to draw upon the many resources available through the Indiana Department of Environmental Management's (IDEM's) Office of Pollution Prevention and Technical Assistance (OPPTA). The following is a brief description of IDEM's assistance programs, incentive programs and industry partnerships:

■ Compliance and Technical Assistance Program

The Compliance and Technical Assistance Program (CTAP) is Indiana's business assistance program, statutorily authorized to operate under Indiana Code (IC) 13-28-1, 13-28-3, and 13-28-5-4. CTAP is a nonregulatory program that provides free, confidential compliance and technical assistance to regulated entities.

CTAP was established to help Indiana businesses achieve compliance with environmental regulations. CTAP staff members provide guidance on air, water, and waste regulations, and they are knowledgeable about current environmental issues and new technologies. They are able to assess the environmental compliance of an entire facility or they can help address concerns about a particular process or regulation. For additional information on compliance assistance, visit IDEM's website at www.idem.IN.gov/ctap or call (317) 232-8172 or (800) 988-7901 (in-state only).

■ Governor's Awards for Environmental Excellence

The state of Indiana annually recognizes Indiana's leaders who have implemented outstanding environmental strategies into their operations and decision-making processes. By seeking out and utilizing innovative environmental practices, facilities/programs reduce waste, save money, and contribute greatly to Indiana's environmental protection efforts, as well as benefit the health and welfare of Indiana's communities and the state as a whole.

The Governor's Awards are open to all Indiana facilities, state and local units of government, individuals, and technical assistance organizations that operate or support environmental protection efforts of outstanding quality. Eligible technical assistance organizations include, but are not limited to, public entities, educational groups, trade associations, individuals, and public interest, community and labor groups. For more information, visit IDEM's website at www.idem.IN.gov/5147.htm.

■ Indiana Partners for Pollution Prevention

The Indiana Partners for Pollution Prevention is an organization comprised of Indiana industries and businesses that are interested in pollution prevention as well as the financial and environmental benefits P2 projects can bring. The Partners provide a forum where Indiana businesses can network and exchange ideas about P2 experiences and discuss how P2 fits into current and future IDEM programs. The Partners realize that pollution prevention is the arena where the environment and economics can meet on common ground. Consider becoming a Partner if you want to:

1. Network with other Indiana businesses regarding P2.
2. Have your organization be recognized as a pollution prevention leader in Indiana.
3. Hear how other businesses have implemented successful P2 technologies.
4. Learn how P2 can improve your business practices.
5. Stay up-to-date with pollution prevention technologies.
6. Become more aware of and involved in IDEM's efforts to integrate P2 into various programs.
7. Partner with IDEM in a proactive setting.

The Indiana Partners for Pollution Prevention annually sponsor the Pollution Prevention Conference and Trade Show. This event provides a look at how award-winning companies have used pollution prevention to improve their businesses. Past topics have included new and emerging pollution prevention technologies and options for successful and profitable product substitutions. For more information, visit IDEM's website at www.idem.IN.gov/ppp/2334.htm.

■ Other Resources

IDEM's website at www.idem.IN.gov/4447.htm provides links to pollution prevention resource materials, success stories, guidance documents, and other resources that can be used to become more knowledgeable about P2 or prepare and/or implement a P2 program. Fact sheets on specific pollution prevention and clean manufacturing opportunities for the following industry sectors are available at www.idem.IN.gov/prevention/2344.htm.

- Chemical Manufacturing
- Fabricated Metal Products
- Foundry Core Production
- Metal Degreasing
- Paint Manufacturing
- Paper and Pulp Processing
- Plastic Processing and Manufacturing

The Pollution Prevention Plan

To effectively incorporate pollution prevention principles into your facility operations, a plan is needed. Your plan will help you determine pollution prevention options, evaluate alternatives, and consider how feasible it is to implement. To be effective, a pollution prevention plan should contain the following steps:

1. **Get Organized**
 - Get senior management's commitment.
 - Make it a team effort (include employees and management at every level and department).
2. **Analyze Your Process**
 - Map out the steps in each process.
 - Determine the amounts of raw materials used, releases to the environment and waste generated.
 - Determine the full costs of raw materials use, releases to the environment and waste generation.
 - Tour your facility and ask questions.
 - Target processes for pollution prevention.
3. **Identify P2 Alternatives**
 - Determine the sources of releases and generated wastes.
 - Hold a brainstorming session.
 - Consider a range of pollution prevention techniques.
 - Encourage employee participation.
 - Seek outside help.

4. **Evaluate Alternatives**
 - Determine what is feasible.
 - Analyze if production steps can be eliminated.
 - Select alternatives for implementation.
5. **Implement Projects**
 - Schedule projects and set goals.
6. **Measure Progress**
 - Account for production variations.
 - Measure the reduction of environmental releases for they may provide an opportunity for fewer regulatory requirements.
 - Publicize success stories.

Eight Ways You Can Incorporate P2 Today

There are typical ways to increase efficiency and prevent waste in all aspects of a business. The following is a brief review of some of the most common P2 opportunities and techniques a business can use to achieve its P2 goals.

1. Cost Accounting

Experience has shown the most successful P2 programs are those that account for the true cost of wastes, including expenses for lost raw materials; staffing; needed paperwork and insurance; sample analyses; and storage, treatment, and disposal costs. Successful billing strategies to account for the true costs of wastes include the following approaches:

- Charge direct and indirect costs of all air, land, and water discharges to specific processes, products, or departments.
- Allocate treatment/disposal costs to operations/departments that generate the waste.
- Allocate utility costs to specific processes, products, operations, or departments.

2. Purchasing and Inventory Management

- Order products according to need. The cost associated with the disposal of surplus hazardous materials often exceeds the purchase price of the item.
- A coordinated material-purchasing program can monitor all requests for products throughout the company or plant and implement efficient purchasing policies.
- An inventory control program can promote sharing of materials between common users, provide data on who is using extremely hazardous products, identify large volume users, locate unused caches of materials, and identify where waste reduction/material substitution options are viable. Inventory control should rotate stock on a first-in, first-out basis.

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3. Packaging, Shipping, and Containers

A second look at the transportation and product packaging that companies send and receive often leads to waste reduction without sacrificing product safety or quality.

- Request that deliveries be shipped in returnable/recyclable containers.
- Work with suppliers and customers to eliminate excess packaging.
- Increase your use of reusable shipping containers and recycled or recyclable packaging.
- Purchase products in bulk, in concentrated form, or in quantities matching process demand.

4. Energy Usage and Efficiency

Energy use is a key area where increased efficiency can result in significant cost savings. Energy savings can be achieved by simple changes in daily operations, maintenance practices, and employee habits, and can be implemented at little or no cost. Although more significant energy savings may involve investment in new/upgraded equipment, these simple changes typically have excellent financial returns. The following are basic energy efficiency activities:

- Submeter energy usage for detailed information on how and where energy is used.
- Maintain equipment and the facility through an ongoing maintenance program (see table below).

Maintenance Activities That Increase Energy Efficiency	
Furnaces	<ul style="list-style-type: none"> • Analyze flue gas and adjust the fuel-air ratio to increase efficiency.
Process Heat, Heat Recovery and Heat Containment	<ul style="list-style-type: none"> • Enhance sensitivity of temperature control and cutoff. • Use flue gas waste heat to preheat combustion air.
Process Cooling: <i>Cooling Towers and Chillers/Refrigeration</i>	<ul style="list-style-type: none"> • Use a cooling tower instead of refrigeration when outside temperature allows. • Use waste heat for absorption refrigeration.
Motors and Drives	<ul style="list-style-type: none"> • Develop an ongoing motor replacement program to upgrade existing motors to high efficiency motors. Where power factor is not controlled elsewhere in the shop, choose replacement motors with high power factor. • Use variable speed drives to control motor speeds.
Compressed Air Systems	<ul style="list-style-type: none"> • Compressed air is almost always the most expensive means for performing work at a facility and should only be used when essential. • Keep air hose lengths as short as possible to reduce pressure drops. • Keep air compressors at lowest possible pressure settings for your demand requirements. • Establish a vigorous maintenance program and check for leaks often.

Electrical Power	<ul style="list-style-type: none"> De-energize excess transformer capacity and increase power factor for facilities and equipment by installing the proper combination of fixed and variable capacitance.
Heating, Ventilation, and Air Conditioning (HVAC) Equipment	<ul style="list-style-type: none"> Develop an optimal start/stop schedule for your HVAC system. Use a seven-day, programmable thermostat to coordinate system operations with loads. Install variable air volume systems where practical. Install an airside, rooftop, central, or waterside economizer to use outside air to cool the space. Be prudent on opening of overhead doors for they result in significant heat or cooling loss.
Elements of an Ongoing Maintenance Program	
Lighting	<ul style="list-style-type: none"> Install a light-emitting diode (LED) lighting system or skylight system to take advantage of natural lighting. Remove two out of four tubes in fluorescent fixtures where lower light levels are acceptable. Also, disconnect the ballast that operates these tubes to save even more energy. If necessary, install reflectors or higher output lamps so more light is utilized. Install low-wattage, long-life, light-emitting, diode exit signs. Use high-efficiency halogen, low-voltage halogen, and quartz lamps where lighting quality is critical (e.g., retail displays). Replace mercury vapor or other inefficient, high-intensity, discharge lighting systems with an efficient metal halide, sodium, or other high-output fluorescent system. Do not over-light areas; tailor lighting levels to the task and occupants, and increase the use of task lighting. Rewire fixtures or use dimming controls so unnecessary lighting can be turned off. Install occupancy sensors in areas of sporadic use.
Office Equipment	<ul style="list-style-type: none"> When purchasing new equipment, buy higher-efficiency models. Equipment with the U.S. EPA Energy Star label is a good choice for energy efficiency. Also check the Energy Guide label included on many major appliances.

5. Solvent Usage and Alternatives

Regulatory and cost pressures, along with related worker safety and liability issues, have led to the development of numerous alternative cleaning technologies, safer solvents, and improved cleaning and recovery equipment. Implementing safer cleaning technologies often requires:

- A better understanding of the chemistry, mechanics, and other fundamentals of cleaning.

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- A clear determination on how clean equipment or process materials truly need to be.
- An analysis of production steps for redundant cleaning.
- A review of upstream processes/practices and how they influence the cleaning process.
- An awareness and understanding of the pros and cons of potential alternatives.
- Some degree of modification of both up- and down-stream processes and practices.
- A significant experimentation and learning period for identifying appropriate and effective alternative cleaners, optimizing cleaner concentrations and cleaning times, adjusting equipment and process operations, and modifying employee practices.

In general, pollution prevention opportunities for solvent cleaning processes include:

- Using alternative cleaning technologies such as:
 - Aqueous and semi-aqueous cleaning processes.
 - Thermal and steam cleaning processes.
 - Abrasive blasting using dry ice, baking soda, starch, plastic, and other media.
 - Supercritical carbon dioxide solvent cleaning.
- Using alternative/less hazardous solvents with low vapor pressure, low toxicity, and non-ozone-depleting characteristics such as lactic acid, dimethyl esters, dimethyl sulfoxide, n-methyl pyrrolidone, glycol ethers, terpenes, soybean, and other bio-based solvents.
- Extending solution life by pre-cleaning, using in-line filtration, countercurrent flows, reducing drag-out and evaporative losses, keeping lids closed, and removing sludge and surface oils/scum.
- Reclaiming/recycling spent solvents using distillation, filtration, and vapor recovery equipment and off-site recycling services.
- Evaluating and modifying upstream processes and practices, solvent handling/storage practices, and employee practices for reducing solvent waste generation. Eliminate redundant cleaning steps.

6. Water Usage

Water use and wastewater discharges entail substantial costs for many manufacturers. By metering water usage and regularly taking inventory of all water users, companies can reduce a major operating expense and reduce the demands on wastewater treatment facilities. The following are easy-to-implement conservation activities:

- Use countercurrent rinsing and equip all hoses with shut-off nozzles.

- Install automatic valves on equipment to stop water flow when not in use.
- Replace high-volume hoses with high-pressure, low-volume cleaning systems.

7. Preventative Maintenance and Housekeeping

Preventative maintenance is a proactive approach that involves regular testing and replacement or repair of equipment and operational systems. By inspecting to uncover leaks, cracks, and other conditions that could cause breakdowns or failure of systems, you can reduce waste released to the air, water, or land and save money by reducing the need for costly cleanup projects. The elements of a good plan should include:

- Identification of equipment or systems that may malfunction.
- Establishment of schedules and procedures for routine inspections.
- Prompt repair or replacement of defective equipment.
- Supply of spare parts for equipment that needs frequent repair.

8. Employee Training

In-house employee training programs are established to teach employees about various environmental topics at your facility including management practices to ensure that your environmental goals continue to be met. An employee training program should include:

- Operation of equipment to minimize energy use, water use, and material waste.
- Proper materials handling to reduce waste and spills.
- Importance of P2 by explaining economic and environmental ramifications and benefits of waste generation and disposal.
- Detecting and minimizing material loss to air, water, or land.
- Emergency procedures to minimize lost materials during accidents.

Employee training programs need strong commitment from senior management. Frequent communication to ensure employee understanding of environmental goals and objectives is necessary.

Environmental Management System Concepts and Standards

The environmental management system concept is based on the Deming-Shewhart Plan-Do-Check-Act model and is designed to improve environmental performance beyond regulatory compliance. An EMS creates a more level playing ground in environmental control in the world market, providing a competitive advantage and giving credibility to environmental programs. An EMS is practical and applicable even to the smallest business or organization that wishes to improve environmental performance. Voluntary EMS implementation by industry and organizations is increasing in Indiana and throughout the world.

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Each EMS is tailored to the organization implementing it, but there are standards or formats that can be followed when developing your system. The business community developed standards for environmental management to provide consistency and credibility for the use of an EMS. All EMS standards have these basic components:

- Management commitment
- Environmental policy
- Aspects, impacts, goals and objectives – PLAN
- Implementation and operation – DO
- Measure – CHECK
- Checking and corrective action – ACT
- Management review
- Continual improvement

The standard provides the basic framework, but documents and policies are tailored to each facility's needs. Many facilities may already have programs and documents that satisfy most of these common elements. Such facilities will only need to formalize procedures and documents so programs can be managed in a logical and accessible manner.

The best known and most widely used EMS standard in the United States and throughout the world is ISO 14001. The International Organization for Standardization (ISO), consisting of representatives from industry, government, non-governmental organizations, and other entities, first published EMS standards in November 1996. An updated EMS standard was released in 2004, called ISO 14001: 2004. ISO 14001 is a standard that is harmonizing environmental management practices and requirements around the globe. The ISO 14001 standard outlines elements that must be followed if a facility wishes to be in conformance with this internationally recognized standard.

The elements of the ISO 14001 standard are as follows:

- **Environmental Policy**
- **Planning**
 - Environmental aspects
 - Legal and other requirements
 - Objectives, targets and programs
- **Implementation and Operation**
 - Resources, roles, responsibility and authority
 - Training awareness and competence
 - Communication
 - Documentation
 - Document control
 - Operational control
 - Emergency preparedness and response

- **Checking**
 - Monitoring and measurement
 - Evaluation of compliance
 - Nonconformity, corrective action and preventive action
 - Control of records
 - Environmental management system internal audit
- **Management Review**

Implementation of an EMS does not substitute for compliance with regulations, but can improve compliance records, reduce environmental risk to employees and the surrounding community, and address issues that are not regulated. In short, environmental management is a continual improvement process propelled by the desire to comply with regulations and operate cost-effectively. Fully developing and integrating an EMS into day-to-day management processes and operations is a more efficient way of doing business.

■ Environmental Stewardship Program

Indiana entities who achieve environmental objectives through creating and implementing an EMS may qualify to participate in the Environmental Stewardship Program (ESP). ESP is a voluntary, performance-based leadership program designed to recognize and reward Indiana regulated entities for going above and beyond current environmental regulations. In return for their exemplary environmental performance, these establishments will receive program incentives including regulatory flexibility, public recognition, and networking opportunities. For more information, please refer to IDEM's website at www.idem.IN.gov/prevention/2359.htm or call ESP staff at (800) 988-7901 or (317) 232-8172.

■ Indiana CLEAN Community Challenge

The Indiana Comprehensive Local Environmental Action Network (CLEAN) Community Challenge is a voluntary recognition program for local Indiana government. CLEAN helps communities take steps to plan, develop, and implement a quality of life plan. This plan includes gathering input and support from the community and local businesses.

For more information, please refer to IDEM's website at www.idem.IN.gov/4135.htm or call CLEAN Community Challenge staff at (800) 988-7901 or (317) 232-8172.

What are the Benefits of an EMS?

■ Reduced Costs

Facilities that have implemented an EMS report improved operating efficiency through a focus on important issues, development of standard procedures, and increased employee training. Most companies have reported reduced energy and waste disposal costs through the systematic process of identifying potential process improvements.

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Some facilities have been given lower liability insurance rates and lower loan rates after developing an EMS because they have reduced their legal liability and likelihood of catastrophic occurrences.

■ Competitive Advantage

A number of larger companies in the United States, especially in the automotive and electronic fields, have developed EMSs and are now suggesting that their suppliers implement an EMS. Some markets, like Japan and the European Economic Union, require organizations to have EMSs to conduct business. In other words, consumers and manufacturers are giving preference to products from environmentally responsible suppliers.

■ Improved Image

An EMS can improve business image and give credibility to environmental programs. The local community, environmental regulators, and environmental groups see EMS development as an indication of an organization's willingness to be a responsible citizen and go beyond compliance. Accordingly, the surrounding community and environmental regulators will recognize your efforts.

■ Enhanced Regulatory Compliance

An EMS can help improve regulatory compliance and reduce liability from noncompliance. The adoption of procedures, work instructions, and additional training will add consistency and stability to your environmental programs. It will lead to improved control over your potential environmental impacts and help you anticipate and control upsets.

■ Improved Environmental Performance

Many of your goals will likely involve energy and waste reduction and pollution prevention. Achieving these goals will ultimately lead to improved performance and a cleaner environment. Plus, an EMS can help you measure the social, economic, and environmental benefits of your environmental management programs.

For More Information

<p>Compliance and Technical Assistance Program (CTAP)</p>	<p>CTAP provides free and confidential environmental assistance to Indiana businesses. CTAP is a nonregulatory program. CTAP staff are available weekdays to answer your environmental questions regarding air, water, and waste regulations, pollution prevention, and recycling. CTAP offers a Quality Assurance Guarantee that IDEM will not issue a Notice of Violation assessing a gravity-based penalty against a regulated entity that has sought out, received, and relied upon CTAP's written compliance assistance prior to the alleged violation.</p> <p>(800) 988-7901 (toll free in Indiana) or (317) 232-8172 www.idem.IN.gov/ctap</p>
<p>Environmental Management System Resources</p>	<p>www.idem.IN.gov/prevention/2348.htm</p>
<p>Environmental Management System Publications</p>	<p><i>Environmental Management Systems – Getting Started</i> (published by the North Carolina Division of Pollution Prevention and Environmental Assistance) www.p2pays.org/iso/getstart.asp</p> <p><i>Integrated Environmental Management Systems Implementation Guide</i> www.epa.gov/dfe/pubs/iems/iems_guide</p> <p><i>ISO 14001 Guidance Manual</i> (published by the National Center for Environmental Decision-Making Research) www.gdrc.org/uem/iso14001/ISO14001.pdf</p>

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