

2006 Guide to Pollution Prevention Tools

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Abstract

Growing awareness to the problem of pollution and associated regulatory policies by governmental environmental agencies has created a lot of interest in the area of pollution prevention (P2).

Various aids are available on the Internet for helping the general public, not just to understand the concept of pollution prevention, but also to help in carrying out P2 measures. This guide is intended to serve as a reference document for most of the pollution prevention aids available on the internet for their use by small and medium size companies.

The report consists of a summary of websites and a brief description of the type of information available on the websites. The report also presents a brief description and the web addresses of 97 tools which are found online. Apart from tools available online the report incorporates nine different tools that were developed by the University of Toledo as a part of the Pollution Prevention Incentives for States Grant from the US EPA. The tools are the GAP Assessment tool, MSDS Manager, Emission Reduction tool, Lean Assessment Screening tool, HVAC Checklist, Energy Assessment Spreadsheet, Hybrid HVAC System Design Tool, Building Sustainability Tool and Hospital Assessment Tool.

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CHAPTER 1

INTRODUCTION

The United States of America's Pollution Prevention Act of 1990 states that the pollution should be prevented or reduced at the source whenever feasible. The US Environmental Protection Agency further defines pollution prevention as the use of 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, or protection of natural resources by conservation [1, 2, 3]. Berger [4] points out that the need for pollution prevention is stronger than ever because of environmental challenges, cost competition, and consumer and shareholder demands.

The definition of pollution prevention from various references is given below:

1. ASTM definition[9]: The act of reducing or eliminating the use, release or generation of a pollutant or potential pollutant through source reduction, recycling, reuse, reclamation or modification of existing practices.
2. USEPA's definition[10]: Pollution prevention means "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

- Any practice that (these practices are known as “source reduction”):
 - 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
 -

More specifically, pollution prevention in an industrial environment means in-plant practices, including, but not limited to:

- Process modifications,
- Feedstock substitutions,
- Product reformulation,
- Management practices or housekeeping alterations,
- Recycling within industrial processes, and
- Equipment replacement or modifications.

The changes in management practices or housekeeping alterations would include maintenance and preventive maintenance, training, inventory control, and improvements in housekeeping.

Pollution prevention and source reduction are used interchangeably throughout the US and mean the same thing. Methods for achieving waste reduction divide conveniently into two basic types: pollution prevention or source reduction and recycling.

In this report an attempt has been made to provide information about the online resources, existing tools and new tools developed by the Air Pollution Research Group (APRG) at the University of Toledo that are available for pollution prevention. Small to medium size businesses will be able to download these tools and will be able to use for pollution prevention work.

CHAPTER 2

GENERAL POLLUTION PREVENTION INFORMATION ON THE INTERNET

The growth of information available on the inte

2.1 GENERAL POLLUTION PREVENTION INFORMATION ON INTERNET

- Agriculture Compliance Assistance Center (AgCenter) – <http://es.epa.gov/oeca/ag/>

The AgCenter provides "one-stop shopping" for the agriculture community. The Center offers comprehensive, easy-to-understand information about compliance -- commonsense, flexible approaches that are both environmentally protective and agriculturally sound. The Center also provides information on reducing pollution and making good use of the latest pollution prevention technologies.

- Automotive Service and Repair: Greenlink – <http://www.ccar-greenlink.org/>

This site offers access to environmental compliance information and pollution prevention information to those working in the automotive service, repair, and auto body industry.

- EnviroSense: <http://es.epa.gov/links/vicyoung.html>

This site is a source of Internet bookmarks related to P2 and environmental information.

- Canadian Center For Pollution Prevention (C2P2) - <http://c2p2.sarnia.com/expertise/index.html>

The Canadian Center for Pollution Prevention (C2P2) was founded to stimulate the adoption of pollution prevention approaches — to influence changes in behavior. Serving as a catalyst for change, the C2P2 disseminates information so that others include pollution prevention in their decision-making and helps businesses, governments and the public find solutions that result in pollution prevention action.

- Center for Neighborhood Technology - <http://www.cnt.org/>

This site is designed to promote public policies, new resources and accountability, which supports sustainable, just, and vital urban communities.

- Central European Environmental Da

EnviroLink is a grassroots non-profit organization that unites hundreds of organizations and volunteers around the world and serves over 1.5 million people in 130 countries. This web site offers links to environmental web sites and EnviroNews, a sustainable business network, and other environmental information related to ecology.

- Environmental Law Institute (ELI) – <http://www.eli.org/>

Program, publications, and software tools are also located at this web site.

- P2GEMS – <http://www.p2gems.org/>

P2 Gems is an Internet search tool for facility planners, engineers, and managers who are looking for technical, process, and materials management information on the web. The Toxics Use Reduction Institute manages this site.

- Pacific NW Pollution Prevention Resource Center – <http://www.pprc.org/pprc/>

This website includes an on-line database of P2 research projects, an on-line P2 request of proposals clearinghouse, P2 technology reviews, a newsletter, and other information for businesses in the Northwest.

- Pollution Prevention Roundtable – <http://www.p2.org/>

The site provides information on the activities of the National P2 Roundtable. The P2 Roundtable provides a national forum for promoting the development, implementation, and evaluation of efforts to avoid, eliminate or reduce pollution at the source. The site provides information on legislative briefings, upcoming conferences, publications, and access to P2 Roundtable yellow pages, links to 50 TDt.3(natura4)8.75 0 TD0.0o lw0.0003 T 0 gos web sits, and(infor

The Waste Minimization National Plan (WMNP) web site provides access to the WMNP and presents descriptions of available tools, programs, and plans; available to assist in reducing the presence of persistent, bio-accumulative, and toxic chemicals in hazardous waste. Access to the Waste Minimization Prioritization Tool is also available at this site.

2.2 MATERIAL SUBSTITUTION

- SAGE – Solvents Alternative Guide – <http://clean.rti.org>

SAGE is a comprehensive guide designed to provide pollution prevention information on solvent and process alternatives for parts cleaning and degreasing.

- Coating Applications Research Laboratory (CARL) - <http://www.ecn.purdue.edu/CMTI/CARL/>

The PPRC is a nonprofit organization that works to protect public health, safety and the environment by supporting projects that result in pollution prevention and the elimination or reduction in toxic use. The database includes over 300 P2 projects. The request for Proposals (RFP) Clearinghouse provides information about P2 projects. The site offers search engines, up-to-date newsletters, P2 conference schedules and abstracts on P2 research projects.

- UC Berkeley Center for Green Design and Manufacturing–
<http://greenmfg.me.berkeley.edu/green/Home/Index.html>

Research, publications, contacts and green design software is available at site.

- Ø Minnesota Technical Assistance Program - <http://www1.umn.edu/mntap/>
- Ø NH Department of Environmental Services - <http://www.des.state.nh.us/>
- Ø New Jersey Technical Assistance Program for Industrial Pollution Prevention - <http://www.njit.edu/njtap/>
- Ø New York Department of Environmental Conservation - <http://www.dec.state.ny.us/website/pollution/prevent.html>
- Ø North Carolina Waste Reduction Resource Center - <http://wrrc.p2pays.org/>
- Ø Oregon Department of Environmental Quality, P2 Division - <http://www.deq.state.or.us>
- Ø South Carolina Department of Health & Environmental Control - <http://www.state.sc.us>
- Ø Tennessee Department of Environment & Conservation - <http://www.state.tn.us/environment/>
- Ø Texas Natural Resources Conservation Commission (TNRCC) - <http://www.tnrcc.state.tx.us/>
- Ø Vermont Agency of Natural Resources - <http://www.anr.state.vt.us/>
- Ø Virginia DEQ, Office of Pollution Prevention - <http://www.deq.state.va.us/p2/homepage.html>
- Ø Washington Department of Ecology, Hazardous Waste & Toxics Reduction Program - <http://www.ecy.wa.gov/>

2.6 ACADEMIC RESOURCE CENTERS

- The National Pollution Prevention Center (NPPC) for Higher Education - <http://www.umich.edu/~nppcpub/index.html>

The site provides educational material to universities, professionals and the public. The NPPC actively collects, develops and disseminates pollution prevention educational materials.

2.7 ENVIRONMENT, HEALTH, AND SAFETY[5]

- Office of Federal Environmental Executive (OFEE) - <http://www.ofee.gov/recycled/cal-index.htm>

This site provides information on sustainable environment, Waste prevention and recycling, Green purchasing and Environmental management Systems.

- DOE's Safety & Health Technical Information Services – <http://tis.eh.doe.gov/portal/home.htm>

The web site provides accurate and current information regarding MSDS sheets, EPA Chemical Fact Sheets, and other topics related to materials, health, and safety.

- Environmental Indicators Web site - <http://www.epa.gov//indicators/index.html>

This site provides information on a variety of data that provide a picture of the environmental status of a state, county or region within the United States using EPA data. Indicators include air quality, water quality, hazardous waste management, use of toxic chemicals and pesticides. Information on frequently asked questions, environmental progress and indicator reports and links to 6rental sta40spraaste ms0.0002 Tc-00.0t0.2wd6-ts andnvirov

ides. Information on

This web site provides information on OSHA standards, programs and services, compliance assistance programs, and technical information. This site also contains links to other health and safety sites on the Internet.

- Right To Know Network (RTKNET) -

them available to the public. Data is also available for the Bio-fuels Information Center and the Clean Cities program.

- Ames Laboratory Environmental Technology Development (ETD) – <http://www.etd.ameslab.gov/>

As part of the US Department of Energy, Ames Laboratory ETD is developing technological solutions to the problems of contamination resulting from nuclear weapons production. Features of this site include a library and Internet "Green" Pages.

- Climate Wise – <http://www.epa.gov/oppeinet/oppe/climwise/cweb/index.htm>

This site provides information on EPA's Climate Wise program; a government-industry partnership that helps businesses improve energy efficiency and reduce greenhouse gas emissions.

- The Electric Power Research Institute (EPRI) – <http://www.epri.com/>

EPRI conducts research and development activities and P2 initiatives for the electric utility industry.

- Energy Efficiency and Renewable Energy Network (DOE) – <http://www.eren.doe.gov/>

Offers hundreds of pages of information from the Office of Energy Efficiency and Renewable Energy. This online library of resources offers news and archives about conservation techniques and developments in the world of energy.

- Energy Information Administration (DOE) – <http://www.eia.doe.gov/>

This site provides information on energy prices, consumption information, and

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The web site provides information on recent events in LCA, case studies, and downloadable copies of software.

- European Network for Strategic Life Cycle Assessment Research and Development (LCANET) -<http://www.leidenuniv.nl/interfac/cml/lcanet/hp22.htm>

LCANET is a concerted action in the Environment and Climate Program for establishing a European Network for Strategic Life-Cycle Assessment (LCA) Research and Development: LCANET. The task of this network is to describe the state-of-the-art of LCA methodology and to provide input to the EU Environment and Climate Research and Development Program.

- EcoDS (Environmentally Conscious Decision Support System) –
<http://shogun.vuse.vanderbilt.edu/usjapan/ecods.htm>

EcoDS is a decision support tool for 8.94 436oprovid.17 0 TD800.0001 Tc0.0599 Tw133EcoDS ihise

CHAPTER 3

TOOLS AVAILABLE ON THE INTERNET

In the face of the various technological advancements, it is only natural that software and information technology is being put to use in environmental fields. Today, tools are being developed that can be applied to different areas of an industrial process to aid P2 experts, planners, mitigators, and even house owners. P2 tools find their use in compliance assessments, in measurement of pollution and/or its prevention or offer solutions to P2 problems being faced by the users.

A myriad of tools are available on the Internet. The EPA website has a huge database of tools that serve various uses in real life situations. Other tools are also mentioned in this section.

S No.	Tool Name	Purpose	Website
1	MFFP2T	This tool calculates the quantity of waste generated by a particular process flow sheet and also estimates various options for waste reduction.	http://www.colan.org/CO%20Update/COUpdate08_EPA_Technical_Article.html
2	BV2	This software calculates the total annual use of heating, cooling and electricity.	http://eeredev.nrel.gov/buildings/tools_directory/
3	Coatings Guide	This is a pollution prevention tool for paints and coatings users	http://cage.rti.org/
4	Environmental Sustainability Kit	Is a set of tools-ideas, procedures and resources to help local leaders, residents, and business work toward making their own communities more sustainable.	http://www.environmentaldefense.org/documents/1247_ESK.pdf
5	ProcureSmart	To reduce the amount of pollution causing products.	http://www.ga.com/atg/pollution.php
6	Expert Choice	It's a terrific tool for choosing between pollution prevention options, and selecting pollution prevention priorities in large facilities.	http://www.expertchoice.com/
7	Evolver	It permits the user to apply genetic algorithms to a wide variety of process and product optimization problems.	http://www.axcelis.com/
8	Green Cleaning P2 Calculator	This quantifies the projected environmental benefits of purchasing and using "green" janitorial services and products	file:///U:/P2%20Tools/What's%20New%20Item.htm
9	BASINS 3.1	A multi-purpose analysis system that integrates a geographical information system(GIS), national watershed data, and state-of-the-art environmental assessment and modeling tools into one convenient package	http://www.epa.gov/waterscience/basins/
10	Paper Calculator	This tool calculates the U.S. average energy and wood consumption and e	

		pollution prevention.	
13	EDGE (3.1)	Designed to help engineers and designers incorporate sustainable measures into the design of facilities to reduce life-cycle costs and increase materials and energy efficiency.	http://www.pnl.gov/doesustainable/design/
14	TRILOGY	This program offers a complete one-stop introduction to a wide range of environmental issues and decisions that affect small to medium-sized communities.	http://www.epa.gov/seahome/trilogy.html
15	ReVA	This program is designed to produce the methods needed to understand a region's environmental quality and its spatial pattern.	http://amethyst.epa.gov/revatoolkit/Welcome.jsp
16	ABEL	Evaluates a corporation's or partnership's ability to afford compliance costs, cleanup costs or civil penalties	http://www.epa.gov/compliance/civil/econmodels/index.html
17	BEN	Calculates a violator's economic savings from delaying or avoiding pollution control expenditures	http://www.epa.gov/compliance/civil/econmodels/index.html
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26	AIRMaster+	Provides comprehensive information on assessing compressed air systems, evaluating savings and effectiveness of energy efficiency measures.	
27	CVAT	This helps to compare the emissions and financial impacts for a range of energy-efficient and renewable energy products	http://www.climate-northeast.org/Business_tools.php

40	PHAST	Provides introduction to process heating methods and tools to improve thermal efficiency of heating equipment.	http://www1.eere.energy.gov/industry/bestpractices/software.html#nox
41	PSAT	Helps industrial users assess the efficiency of pumping system operations.	http://www1.eere.energy.gov/industry/bestpractices/software.html#nox
42	Roof Energy Cost Savings Calculator	It is designed to showcase the benefits of ENERGY STAR labeled roof products	http://roofcalc.cadmusdev.com/
43	Steam System Tool Suite	It highlights the potential steam system improvements of the plant.	http://www1.eere.energy.gov/industry/bestpractices/software.html#nox
44	WUFI-ORNL/IBP	This is a menu driven PC program which allows realistic calculation of the transient coupled 1D heat and moisture transport in multi-layer building components exposed to natural weather.	http://web.ornl.gov/sci/btc/apps/moisture/
45	ARIP	It's a collection of information on accidental releases of hazardous chemicals at fixed facilities	http://yosemite.epa.gov/oswer/ceppo/web.nsf/content/evalandstudy.htm#program
46	CAMEO	A system of software applications used widely to plan for and respond to chemical emergencies	http://www.epa.gov/ceppo/cameo/index.htm
47	IRIS Database for Risk		

54	REACH-IT	This system gives information about innovative remediation and characterization technologies	http://www.frtr.gov/matrix2/appd_a/appd_a.html
55	PARIS II	Computer program for solvent substitution or design	http://www.tds-tds.com/parfact.htm
56	TRACI	Quantification of human health and ecological impacts of chemicals	

68	EFRAT	Used to calculate environmental and health impact estimations of chemical process design options	http://es.epa.gov/ncercqa_abstracts/centers/cencitt/year3/process/shonn2.html
		<i>EPI Suite</i>	
69	BCFWIN	Used to calculate the BioConcentration factor and its logarithm from the log Kow	http://www.epa.gov/oppt/exposure/docs/episuite.htm
70	HENRYWIN	Used to calculate Henry's Law constant by use of group contribution and bond contribution methods	http://www.epa.gov/oppt/exposure/docs/episuite.htm
71	KOWWIN	Used to estimate log Kow	http://www.epa.gov/oppt/exposure/docs/episuite.htm
72	MPBPWIN	Used to estimate melting point, boiling point and vapor pressure of organic chemicals	http://www.epa.gov/oppt/exposure/docs/episuite.htm
73	PCKOCWIN	Used to estimate soil adsorption coefficient (Koc) of a chemical	http://www.epa.gov/oppt/exposure/docs/episuite.htm
74	WSKOWIN	Used to estimate octanol-water partition coefficient using algorithms in the KOWWIN software	http://www.epa.gov/oppt/exposure/docs/episuite.htm
75	AOPWIN	Used to estimate the gas-phase reaction rate of a chemical with the dominant atmospheric oxidant and hydroxyl radicals	http://www.epa.gov/oppt/exposure/docs/episuite.htm
76	BIOWIN	Used to estimate aerobic biodegradability of organic chemicals	http://www.epa.gov/oppt/exposure/docs/episuite.htm
77	HYDROWIN	For estimating Acid- and Base-catalysed hydrolysis constants of certain organic classes	http://www.epa.gov/oppt/exposure/docs/episuite.htm
78	LEV3EPI	Used to predict partitioning of chemicals between air, soil, sediment and water steady state for environment model defaults which can be changed by the user	http://www.epa.gov/oppt/exposure/docs/episuite.htm
79	STPWIN	Used to predict removal of chemicals in a sewage treatment plant by using EPIWIN outputs	http://www.epa.gov/oppt/exposure/docs/episuite.htm
80	WVOLMIN	Used to estimate rates of chemical volatilization of a chemical from rivers and lakes	http://www.epa.gov/oppt/exposure/docs/episuite.htm
81	FIRE	Is a DBMS that provides EPA's recommended emission estimation factors for criteria and hazardous air pollutants as well as industry emissions and emission factors	http://www.epa.gov/ttn/chief/software/index.html
82	GCES	Used to assess existing processes, build a green chemical process, design a new green chemical for	http://www.epa.gov/greenchemistry/tools.htm

83	Mackay Level III v 2.20	a new or existing chemicals Used to map the life cycle of a chemical in the face of degradation and advection	
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96	CLEANTOOL	This is a wide database for metal cleaning	http://www.cleantool.org
97	GLRPPR	This tool quantifies the projected environmental benefits of purchasing and using “green” janitorial services and products.	http://www.ofee.gov/janitor/index.asp

CHAPTER 4

TOOLS DEVELOPED AT THE UNIVERSITY OF TOLEDO

These tools have been developed to assist small and medium sized industries in their pollution prevention efforts [7]. The theoretical basis of the tools is given in Appendix A. The software are available free of charge on the website www.p2tools.utoledo.edu. Detailed instructions are provided on the site and users also have access to user's manuals (see Appendix B) and PowerPoint slides (see Appendix C) to learn the use of these tools.

Tool	What it Does	Website
GAP Assessment Tool	This tool performs a GAP analysis, based on ISO 14001, to gauge the implementation of an Environment Management System in a facility	www.p2tools.utoledo.edu

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