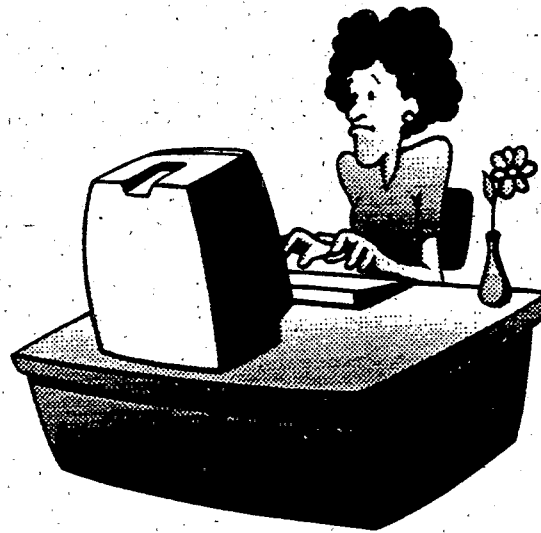


GUIDE TO ACCESSING POLLUTION PREVENTION INFORMATION ELECTRONICALLY



Northeast Waste Management Officials' Association
129 Portland Street, 6th floor
Boston, MA
(617) 367-8558
February 1997

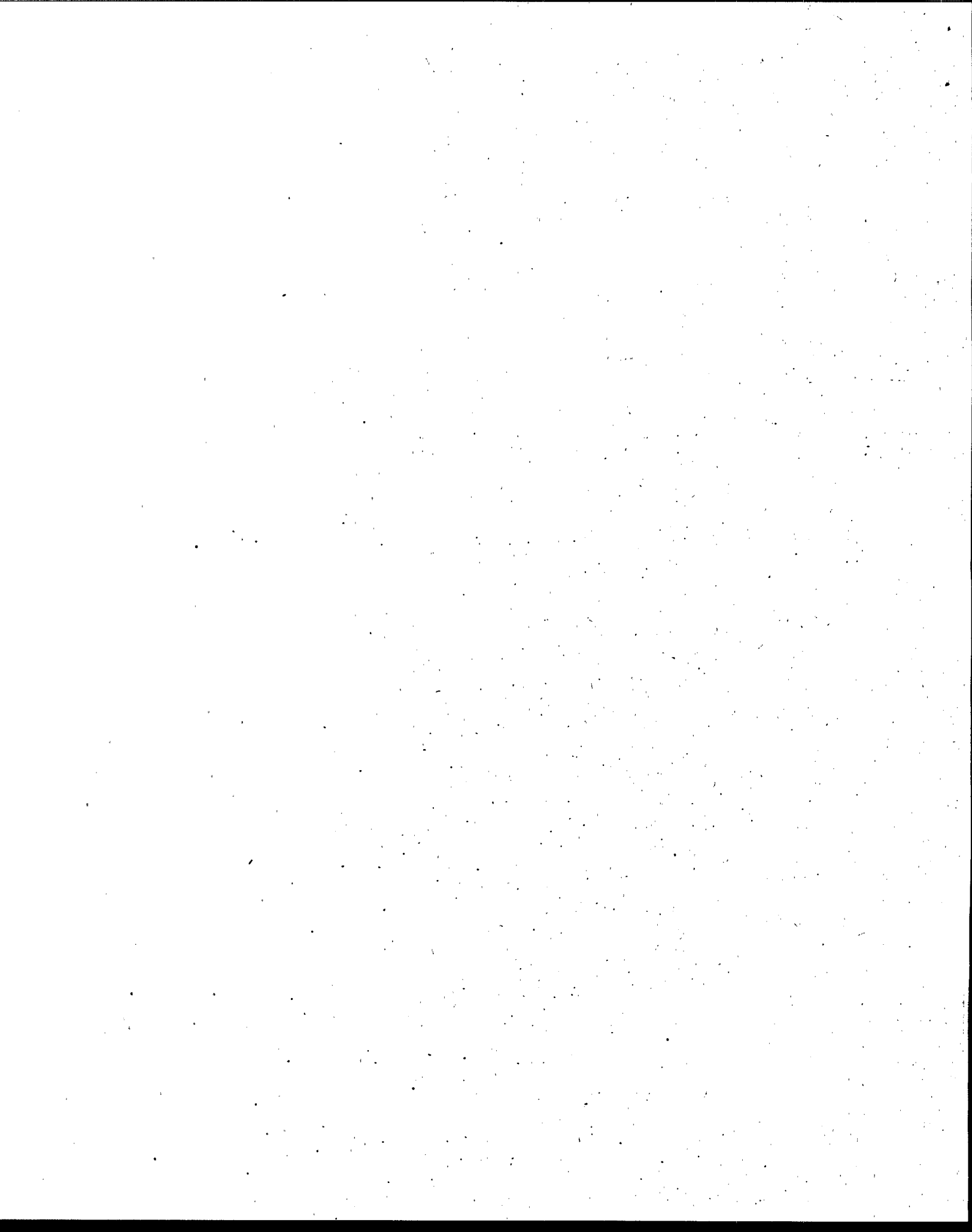
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Guide to Accessing Pollution Prevention Information Electronically

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NORTHEAST WASTE MANAGEMENT OFFICIALS' ASSOCIATION

The Northeast Waste Management Officials' Association (NEWMOA) is a non-profit, nonpartisan, interstate governmental association. The membership is composed of state environmental agency directors of the hazardous waste, solid waste, waste site cleanup and pollution prevention programs in Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont.

NEWMOA's mission is to help states articulate, promote and implement economically sound regional programs for the enhancement of environmental protection. The group fulfills this mission by providing a variety of support services that facilitate communication and cooperation among member states and between the states and EPA, and promote the efficient sharing of state and federal program resources.

NEWMOA was established by the governors of the New England states as an official interstate regional organization, in accordance with Section 1005 of the Resource Conservation and Recovery Act (RCRA). The organization was formally recognized by the U.S. Environmental Protection Agency (EPA) in 1986. It is funded by state membership dues and EPA grants.

NEWMOA established the Northeast States Pollution Prevention Roundtable (NE P2 Roundtable) in 1989 to enhance the capabilities of member state environmental officials to implement effective source reduction programs. The NE P2 Roundtable's program involves the following components: (1) managing a regional roundtable of state pollution prevention programs; (2) publishing a newsletter; (2) managing a clearinghouse of books, reports, case studies, fact sheets, notices of upcoming meetings and conferences, and a list of P2 experts; (3) organizing training; and (4) conducting research and publishing reports and other documents. The clearinghouse provides pollution prevention information to state and local government officials, the public, industry, and others. Funding for the NE P2 Roundtable is provided by the NEWMOA member states and the U.S. EPA. For more information contact: Terri Goldberg, NEWMOA, 129 Portland Street, 6th floor, Boston, MA 02114, (617) 367-8558 x302 (Phone); (617) 367-0449 (Fax).

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INTRODUCTION

This *Guide to Accessing Pollution Prevention Information Electronically* has been developed as a starting point for you to begin using the Internet and other computer-based tools, as a resource for your pollution prevention research. There is a wide variety of information that can be accessed on-line and more and more is being added every day. This document covers clearinghouses and their databases; software; listservs; and Internet sites that contain pollution prevention information.

Users should remember that information changes rapidly, especially on the Internet. Some of the addresses for web-sites in this guide may have changed and new sites will most likely have been added since NEWMOA published this document. We apologize for any out-of date information. However, if you would like to assist us in maintaining this document, we would appreciate your help. If you have any suggestions, corrections, or would like to add a site to this guide, contact Lisa Regenstein at NEWMOA via e-mail at newmoa@aol.com, by phone at (617) 367-8558 ext. 304 or at 129 Portland Street, 6th floor, Boston, MA 02114.

This manual is broken down into 7 sections as described below:

- * Section 1 provides contact information for pollution prevention clearinghouses in the Northeast as well as national clearinghouses.
- * Section 2 describes the databases of pollution prevention clearinghouses and provides instructions on how to use Inmagic software. This software is the platform for the majority of these databases.
- * Section 3 provides an overview of pollution prevention software.
- * Section 4 describes what an Internet listserv is and provides information on listservs serving the pollution prevention community.
- * Section 5 provides background information on the Internet and how to get connected.
- * Section 6 provides information on general searching techniques for finding information on the Internet.
- * Section 7 provides an extensive list of Internet sites that contain P2 information and a brief description of the site.

REGIONAL AND NATIONAL POLLUTION PREVENTION CLEARINGHOUSES

What are pollution prevention clearinghouses?

Pollution Prevention Clearinghouses are technical libraries containing compliance and industrial process information. There is an abundant amount of information on pollution prevention technologies held in these government clearinghouses. Often, these clearinghouses will do searches for you on specific topics and provide this information to you free of charge or at low costs. The following is a list of the state and regional clearinghouses in the Northeast and the national clearinghouses.

ConnTAP P2 Clearinghouse

Contact: Bob Brown
50 Columbus Blvd., 4th floor
Hartford, CT 06106
Phone: (860) 241-0777; Fax: (860) 244-2017
Email: ConnTAP@aol.com

Maine P2 Clearinghouse

Contact: Ann Pistell
Maine DEP, Office of Innovation and Assistance
State House Station 17
Augusta, ME 04333
Phone: (207) 287-7881; Fax: (207) 287-2814

New Hampshire P2 Clearinghouse

Contact: Kathy Blake
NH DES, Pollution Prevention Program
6 Hazen Drive
Concord, NH 03301-6509
Phone: (603) 271-6460; Fax: (603) 271-2456
E-mail: nhppp@deswmdpl.mv.com

New Jersey Technical Assistance Program

NJIT, CEES Building
323 King Blvd.
Newark, NJ 07102
Phone: (201) 596-5864; Fax: (201) 596-5864
E-mail: mhealy&hertz.NJIT.edu

New York State P2 Clearinghouse

Contact: Sitansu Ghosh
New York State DEC, P2 Unit
50 Wolf Road
Albany, NY 12233-8010
Phone: (518) 457-2553; Fax: (518) 457-2570
E-mail: sitansu.ghosh@dec.mailnet.state.ny.us

Rhode Island P2 Clearinghouse

Contact: Richard Girasole
Rhode Island DEM, Office of Technical and Customer Assistance
235 Promenade Street
Providence, RI 02908
Phone: (401) 277-6822; Fax: (401) 277-3810

Suffolk County Water Authority P2 Clearinghouse

Contact: Judy Jakobsen
SCWA, Pollution Prevention Program
PO Box 38
Oakdale, NY 11769
Phone: (516) 563-0306; Fax: (516) 277-4097

Technical Transfer Center (TTC)

Contact: Janet Clark
Toxics Use Reduction Institute
University of Massachusetts, Lowell
1 University Avenue
Lowell, MA 01854-2866
Phone: (508) 934-3275; Fax: (508) 934-3050
E-mail: clarkjan@turi.org

Vermont Pollution Prevention Clearinghouse

Contact: Greg Lutchko
Vermont Office of Environmental Assistance
103 South Main Street, Laundry Building
Waterbury, VT 05676
Phone: (802) 241-3627; Fax: (802) 241-3273
E-mail: gregl@wasteman.anr.state.vt.us

NEWMOA P2 Clearinghouse

Contact: Lisa Regenstein
NEWMOA
129 Portland Street, 6th floor
Boston, MA 02114
Phone: (617) 367-8558; Fax: (617) 367-0449
E-mail: newmoa@aol.com

EPA's P2 Information Clearinghouse (PPIC)
401 M Street, SW, MailCode 7409,
Washington, DC 20460
Phone (202) 260-1023

POLLUTION PREVENTION CLEARINGHOUSE DATABASES

Some programs have merged the databases of the pollution prevention clearinghouses in their regions. These databases allow the user to do their own searches at their convenience. The following list provides information on the databases, software requirements, and ordering information. Several of the programs use the Inmagic software. The DOS version of this program is now available as share-ware and can be downloaded from their web-site (<http://www.inmagic.com>). The other software programs that is used by RLIBY is Pro-cite and that can be downloaded from the North Carolina web-site.

P2INFO

P2INFO is a bibliographic database that catalogues the holdings of the ten pollution prevention clearinghouses in the Northeast. The P2INFO database contains over 11,000 entries and can be accessed using Inmagic software. For more information on clearinghouses in the Northeast region, contact Lisa Regenstein at Northeast Waste Management Officials' Association (NEWMOA), 129 Portland Street, 6th Floor, Boston, MA 02114, (617) 367-8558 ext. 304.

RLIBY Database

The Rliby database catalogues the information held in the North Carolina Waste Reduction Resource Center. The database runs off a program called Pro-cite. Both the software and the database can be downloaded from North Carolina's home page. For more information on Rliby, contact Rudy Mohrbach at the Waste Reduction Resource Center, Raleigh, NC 27611-7687, (919) 715-6500.

TECHINFO

The TECHINFO database is similar in structure and content to P2INFO database. TECHINFO catalogues the information held in several state P2 clearinghouses in the Great Lakes region. For more information on this database, contact Ester Burke at the Illinois Management Resource Center, One East Hazelwood Drive, Champaign, Illinois 61820, (217) 244-8989.

VENDINFO

VENDINFO is a database of vendor information. It uses the Inmagic software as its platform. VENDINFO can assist users in locating vendors that sell pollution prevention equipment. For more information on this database, contact Ester Burke at the Illinois Management Resource Center, One East Hazelwood Drive, Champaign, Illinois 61820, (217) 244-8989.

Using Inmagic Databases

P2INFO, TECHINFO, and VENDINFO are all databases use Inmagic software as their platform. The following pages provide information on how to use these databases. The instructions are for the DOS version of the software. A windows based version is available, however, most programs are still using the DOS version.

Starting Inmagic

To start the program, change to the directory where the software was installed and type Inmagic. Most often the directory name is also Inmagic:

```
C:\cd\inmagic
C:\inmagic>inmagic
```

The Main menu appears on the screen. All of the menu screens contain the following elements:

- Status line:** This is the top line of the screen where information is displayed about the current operation, such as the number of records retrieved after a search. The database name and other information is always displayed here.
- Display area:** This is the area below the status line. Inmagic presents lists, forms, and database information here.
- Message line:** The bottom line on the screen is where important messages are displayed.
- Menu:** The bottom line on the screen is the menu of available options. You use the menus to move through the Inmagic screens and perform operations (sometimes a menu appears as a vertical list in the center of the screen instead of as a menu bar at the bottom of the screen).

The main menu is the first menu to appear in Inmagic. From the main menu you have the following options:

- Open a database
- Define a database, report format, or related items
- Get on-line help
- Use Inmagic utilities
- Quit from Inmagic

There are two ways to choose options from a menu. Use the arrow keys to highlight the option and press **Enter**, or type the bold character in the option, which is usually the first letter.

To open a database, choose **Open Database** from the main menu. A list of available databases is displayed. Select the database you want, and press **enter**.

Searching Inmagic Databases

There are two ways of searching the database, using the command function or searching from the search screen. The search screen method is easier to use. In order to conduct a search, a database must first be open.

- 1) Choose "open database" from the Main Menu and select the database you would like to search.
- 2) From the menu you can choose to search either from the search screen or with the command option.

Searching from the Search Screen

- 1) **Opening the Search Screen** - Select *Search* from the menu options. The search screen now appears. The status line should indicate which database you have opened and the number of records retrieved in your search. The Menu line (second from the bottom) shows what function keys are available. The search screen prompts appear just above the Menu line, and the large area in the middle displays records and search items.
- 2) **Defining the Search** - The cursor should be located next to the first search prompt. You can move the cursor to any of the search prompts with the arrow keys. To define your search you have several options. The following list outlines controls that can refine searches:

Prompt	Searching Parameter
=	Entered before text in the search prompt in order to find an exact match.
>	Greater than.
<	Less than.
Wn	Find all occurrences of two words or phrases when they are within n word(s) of each other.
Pn	Find all occurrences of two words or phrases when the first precedes the second by no more than n words.
*	This is a wild card that indicates "any set of characters". Use it at the end of a word or term. For example, the search plat* will find platers, plating, plate, plated...
	Use the colon between words or terms on the same search prompt to specify a range. For example, 1:1000, or a:d or 1990:1995.
, /	Means OR. Use either a comma or slash between words or terms to indicate that either term will satisfy the search.
&	Means AND, use between words or terms to indicate that both conditions must be satisfied. The search electroplating & chrome will find only those records that contain both words.
&-	Means NOT.

- 3) **Search Results** - Once you have defined your search and Inmagic has searched the database, the results of the search will be displayed on the screen and a new menu will be displayed. The menu screen provides the following options:

Display	This displays the records found on the screen. Records are displayed
Store	Saves the search criteria and the results in a work file for use later
Report	Displays the report screen to sort, format, print, or rewrite the search results
Continue	Returns to the search prompts and the previous search criteria in order to modify it
New	Redisplay the search screen, clearing all prior search criteria
Delete	Remove all the records found from the database
Modify	Make the same change to all records found in the search
Quit	Return to the search screen

once you have determined which records you would like to include in a report, the records can be printed, or displayed in other formats. Choose report from the search results Menu to display the report screen. Several options are presented for sorting, choosing a format, and other possibilities.

To print a report, follow these steps:

- 1) Choose report from the *Search* results menu
- 2) Choose *Format* from the Report menu. Highlight the report you would like to use from the list and press enter.
- 3) Choose *Sort* from the report menu. A list of fields will be displayed. Highlight the field you wish to sort by, *Titles*, for example. You can also choose to sub-sort the list as well.
- 4) Choose *print* from the report menu. The report will be sorted, reformatted and sent to the printer. You may want to choose *display* to see the report prior to printing or you can choose *write* to save it to an ASCII file. The file can then be used with your word processing software.

POLLUTION PREVENTION SOFTWARE

Parts of this section are taken from an article entitled "Software Tools for Pollution Prevention" originally prepared for Northwest Pollution Prevention Resource Center, "Pollution Prevention Northwest" by Scott Butler and reprinted with the authors permission. The complete text can be accessed via the Internet at URL <http://www.seattlehatchelle.org/P2online/P2Byte.htm>

Today, you can buy software that will help you write a business plan, compose a song or write a script, learn to fly an airplane or dissect a frog, brainstorm a speech or proposal, or choose between apples and oranges. Indeed, if you spend a lunch break browsing the shelves of your local software store, you may come away wondering if there's any part of our lives that someone hasn't figured out how to put on disk! Not surprisingly, this trend includes pollution prevention. However, the number of commercial pollution prevention tools is still relatively small, with most of the software originating from government agencies and university research programs. This is in part because of the relatively small market for such software. After all, a program designed to prevent pollution is not going to sell as many copies as the latest version of "DOOM" But increasingly, tools are becoming available to help pollution prevention planners do their work smarter, faster, and better.

What is pollution prevention software?

Since pollution prevention encompasses such a broad range of activities, from good housekeeping and improved management practices to product and process redesign, it can be a bit difficult to determine just exactly what qualifies as "pollution prevention software." For this purpose, I've focused on a few key categories of software tools that address decisions common to most pollution prevention programs. These categories include:

◆ **Opportunity Assessment Software.**

An important step in pollution prevention is being able to identify opportunities to reduce or eliminate waste. Several tools have been developed to help users in identifying pollution prevention options for specific manufacturing processes or products, and to assist the user in organizing their opportunity assessment efforts.

◆ **Process Analysis Software**

With their roots in sophisticated chemical process simulation tools such as Pro/II or ASPEN-PLUS, process analysis tools are designed to help users perform detailed analysis of chemical processes. Typical chores might include the process optimization and on-line identification and evaluation of waste reduction and treatment options. Examples include Batch Design Kit, available through GenSym (Cambridge, MA) and EnviroPro Designer, developed by Professor Demetri Petrides at the New Jersey Institute of Technology.

◆ **Decision Analysis Software**

A great deal of attention has been focused on decision tools for making informed decisions about possible pollution prevention alternatives. These tools help the user evaluate the environmental and cost consequences of different pollution prevention options, and can be powerful tools in

understanding some of the "hidden costs" of waste. Also included in this category are tools designed to assist the user in evaluating the full lifecycle impacts of decisions.

◆ **Related Software Tools**

A number of software tools are available which are not specifically designed for pollution prevention, but can nonetheless be very useful aids. In particular, some of the commercial tools developed for process and decision analysis can be directly applied to pollution prevention analysis tasks. Because these tools have been developed and commercialized for a broader range of applications than just pollution prevention, they often offer more sophisticated interfaces, better integration with other applications, and better user support than is available for software designed specifically for pollution prevention.

Of course, not all pollution prevention software fits into these categories, and the boundaries between these categories are often blurred. So while the following list is far from comprehensive, it does provide an overview of currently available tools. In most cases, I've included contacts (phone and world wide web sites) for the tools, along with a quick description of the tool.

Opportunity assessment software

Opportunity assessment software helps the user in identifying pollution prevention options -- often an important step in establishing a pollution prevention program -- or breathing fresh ideas into a program that has solved the "easy problems." These tools are good complements to on-line database systems such as EnviroSense or P2GEMS.

CAGE

Research Triangle Institute (919-541-6916)

Coating Alternatives Guide (CAGE) is an expert system and database for small- and medium-sized businesses in the miscellaneous metal parts coating industry; state technical assistance offices; or anyone seeking information on coating technologies. CAGE is designed to operate on a PC-AT or better. Users answer questions concerning the material or part that they are currently coating; e.g. current coating process, part material, surface preparation, application technique, cure method, performance requirements, appearance requirements, and economics. Based on answers to each question, CAGE then internally scores and tallies each low-pollution alternative and provides a relative ranking of these alternatives. This software package is currently available for beta testing only. For more information contact Mike Kosusko, US EPA, National Risk Management Research Laboratory, Air Pollution Prevention and Control Division, Research Triangle Park, NC 27709-2194; or 919 541-2734.

EarthAware

EnviroAccount Software (1-800-554-0317 or 916-756-9156)

While EarthAware might stretch common definitions of a pollution prevention tool, I've included it because (1) it's commercially available, and (2) it is an effective environmental education tool which emphasizes a preventative approach to the environmental choices we each face in our daily lives. Using a combination of hypertext tutorials, databases, and links to Internet sites, EarthAware is an attractive piece of software which may provide even a veteran pollution prevention planner with new ideas for reducing waste.

Environmental Assessment Resource Guide (EARG)

Purdue University (317) 494-1173

EARG is a generic source of information to help users conduct environmental assessments for virtually any project. Topics covered include scoping, generation of alternatives, impact identification, and analysis, mitigation, decision making, and post-decision analysis. Of particular interest are the World Bank Mitigation Tables that addresses a variety of project types. Requires Windows 3.1

This software can be obtained in the following ways: (1) purchase a CD-ROM containing over 50 environmental programs developed by US EPA and Purdue University including the energy program for \$25 from Purdue University; (317) 494-1173 or The Farm Building Plans Service, Purdue University, 1146 ABE Building, West Lafayette, IN 47907-1146; (2) download software from EPA's Public Access Web Server (the files are in compressed form and can be uncompressed using PKUNZIP version 2.04g (<http://www.epa.gov/grtlakes/seahome>); (3) obtain the software on disk from US EPA Region 5 from Karen Reshkin at (312) 353-6353 or reshkin.karen@epamail.epa.gov

Pollution Prevention Electronic Design Guide (P2EDGE)

Pacific Northwest National Laboratory (509-375-3703)

P2EDGE is essentially an electronic "idea notebook" of pollution prevention strategies that can be applied to the design and construction of buildings and other fixed facilities. Originally designed for the US Department of Energy for use by their facility planners, the P2EDGE software is used in conjunction with the Pollution Prevention Design Opportunity Assessment protocol to help designers identify opportunities for minimizing the impact of hazardous material spills, reduce hazardous material inventories, reduce stormwater pollution, and incorporate recycled materials into construction of buildings, parking lots, and landscaping. Many of the strategies are accompanied by graphic examples, bibliographic citations, or other supplemental information. A checklist lets you keep track of which ideas are being evaluated for inclusion in the building design, who's responsible, and other information related to implementation.

P2EDGE is a fun tool to use for inspiration if you are involved in building, upgrading, or operating a facility. New versions are currently under development that will expand the P2EDGE database to include pollution prevention strategies in chemical process design and in textile product design. The software requires Windows and works best on a 486-class machine or better.

P2 Progress

P2 Research Branch, Risk Reduction Engineering Lab, fax: 513 569-7688.

EPA has developed a software program, called P2P (Pollution Prevention Progress), to help firms assess the results of product redesign, reformulation or replacement activities. The software leads the user through a brief protocol designed to help identify the pollutants generated before and after the product/process change. Copies of P2P are available by writing to the P2 Research Branch, Risk Reduction Engineering Lab, USEPA, Cincinnati, Ohio 45268, or fax 513 569-7688.

Residential Energy Efficiency

Purdue University, (317) 494-1173

This program presents effective ways to reduce home energy consumption. Topics include insulation,

Windows, doors, weatherstripping, and caulking. The expert system feature allows users to calculate how much they will save by making their homes more energy efficient. After you enter information about your home and the energy-savings that you intend to make, the program uses local utility and climate data to calculate your savings in money, energy, and reduction of pollutants. Requires Windows 3.1

This software can be obtained in the following ways: (1) purchase a CD-ROM containing over 50 environmental programs developed by US EPA and Purdue University including the energy program for \$25 from Purdue University; (317) 494-1173 or The Farm Building Plans Service, Purdue University, 1146 ABE Building, West Lafayette, IN 47907-1146; (2) download software from EPA's Public Access Web Server (the files are in compressed form and can be uncompressed using PKUNZIP version 2.04g (<http://www.epa.gov/grtlakes/seahome>); (3) obtain the software on disk from US EPA Region 5 from Karen Reshkin at (312) 353-6353 or reshkin.karen@epamail.epa.gov.

Solvent Alternatives Guide (SAGE)

Research Triangle Institute (919-541-6916)

SAGE exemplifies much of what pollution prevention software can be, providing a technically competent, user-friendly source of information on cleaning technologies. Instead of providing the user with a conventional database, SAGE provides an "expert system" interface that leads the user through a series of questions which help the system narrow down the cleaning options based on wide variety of part and process specific issues. The user is then presented with a detailed technology description of each applicable option, along with the rationale for their selection.

Perhaps the most valuable way to use SAGE is to pay attention to the types of questions it asks in selecting technologies. I've found this to be a great way to sharpen my thought processes in making cleaning technology decisions, and the technology descriptions contained in SAGE are often as detailed and to the point as anything else available.

SOLUTIONS Facilities P2 Plan CD-ROM

SOLUTIONS Software Corporation (407-321-7912)

SOLUTIONS Software specializes in providing public-domain documents (regulatory lists, manuals, etc) on CD-ROM. Their Facilities Pollution Prevention Plan CD-ROM (compatible with Windows) includes complete texts of federal pollution prevention regulations, executive orders, and guidance documents, along with a hypertext version of the EPA's Facility Pollution Prevention Planning Guide. This tool can be especially helpful to small businesses seeking help in organizing their pollution prevention plans, and provides a rich source of "boilerplate" language

for plans, permitting the user to focus on putting their creative energy into identifying and implementing pollution prevention, rather than writing about it.

Waste Reduction Advisory System (WRAS)

State of Illinois Hazardous Waste Research and Information Center WRAS is one of the oldest software packages for pollution prevention, developed for the State of Illinois in 1987. It is basically a MSDOS-compatible database of pollution prevention and waste minimization article abstracts, organized by both keyword and Standard Industrial Code (SIC). While the articles are somewhat dated, the

...the tool, and the quick access to pollution prevention strategies makes it one of the few tools that has remained on my home computer through three consecutive hardware upgrades. Though HWRIC has no current plans to maintain the software, the low price (\$20) makes it a worthwhile investment.

Decision support software

P2/FINANCE

Tellus Institute

P2/FINANCE was originally developed as for the U.S. EPA by the Tellus Institute as a means of illustrating environmental cost accounting principles, particularly for the evaluation of capital investment options such as process upgrades or modifications. The software helps users identify the full range of environmental costs associated with a process, by taking into account such factors as waste management and liability costs, which often get "lumped" into overhead accounts. The original version, still supported by Tellus, was developed as a spreadsheet template, with versions available for Microsoft Excel or Lotus 1-2-3.

Industry-specific versions of P2/FINANCE are being developed by Tellus for the screen and lithographic printing industries, printed wire board fabrication, and metal fabrication industries. Considerable effort has gone into the update of the original spreadsheets, and the current version of P2/FINANCE are implemented as stand-alone FoxPro applications.

Other tools...

Many of the most interesting pollution prevention software tools are not "P2 tools" at all, but are general purpose applications that can be adapted to pollution prevention problems. One such tool that I've enjoyed using is:

IdeaFisher

IdeaFisher Systems, Inc., 714-474-8111

IdeaFisher is a creative thinking tool that should be familiar in concept to anyone who's been through one of Harry Freeman's "associative memory" exercises. It uses the power of associative thinking (building on the word association that your brain makes to stimulate creative thinking) to help you expand on ideas. The main feature of the software is an "Idea base" which contains thousands of questions which will help you refine your idea. The learning curve for this software is somewhat steep, but it can be helpful when you're faced with a problem (pollution prevention or otherwise) that defies solution.

Expert Choice

Expert Choice Incorporated, 412-682-3844

Expert Choice is a Windows-compatible program for applying the Analytical Hierarchy Process (AHP), a decision methodology that can be very useful in making complex decisions with incomplete information. I've often thought that Expert Choice would make terrific tool for choosing between pollution prevention options, and selecting pollution prevention priorities in large facilities.

Evolver

Axcelis, Inc. 206-632-0885

Evolver is the ultimate techno-geek toy, but it is a toy with very serious applications. Evolver is an add-in package for Microsoft Excel which permits the user to apply genetic algorithms to a wide variety of process and product optimization problems. This includes product scheduling, recipe optimization, machine optimization, and almost any other problem you can model on a spreadsheet. Though hardly for the timid, Evolver is a powerful tool that can be used to solve problems that other optimization tools can't touch.

Waste Prevention Computer Tool Kit

Women Voters Publication Sales, 202 429-1965

This computer program outlines a step-by-step process for developing and implementing a waste prevention program in homes, schools or businesses. To help accomplish this, the kit includes resource audit worksheets, letter and memo templates, clip art, flyers, fact sheets, curricula for grades K-7, tips for the home, shopping checklist, strategies for various types of businesses, tips for specific departments in businesses and schools, evaluation forms and more. Special sections of the kit provide community leaders, solid waste educators and building managers with the information and tools needed to develop and implement waste prevention programs.

Because the tool kit is a Windows-based software program, the user can copy the worksheets and tools to another Windows application, manipulate them to meet program needs and print out a program specific worksheet or tool. This tool kit is designed to reduce the amount of labor and paper required to create necessary documents and thereby save valuable time and money.

For further information, contact League of Women Voters Publication Sales, 1730 M Street, NW, Washington, DC 20036-4505. Telephone: 202 429-1965; or Fax: 202 429-0854.

There's Always More....

In addition to the tools discussed in this article, there are many other software tools which can be useful in implementing a pollution prevention program. For example, a quick check of the Internet (try starting with the listing at Yahoo) will reveal dozens of commercial MSDS databases, hazardous material tracking systems, and waste tracking software products which can be essential tools in assessing pollution prevention opportunities and measuring program effectiveness, especially in large or complex facilities where waste priorities are not intuitively obvious. Another good source is a new document from EPA entitled "Incorporating Environmental Costs and Considerations into Decision Making: Review of Available Tools and Software" (EPA742-R-95-006, published February 1996), available from PPIC.

Finally, a number of environmental trade magazines publish annual environmental software reviews -- one of the better ones is the "Annual Hazardous Materials Management Software Buyers Guide," published annually by TNEJ -- The National Environmental Journal, Campbell Publishing, Columbus, GA. Computers Don't Prevent Pollution, People Do

Just as the latest word processor won't guarantee that you'll write best sellers, pollution prevention software won't guarantee that you'll prevent waste. But the tools described here can save you time in identifying pollution prevention options, improve the quality of your decisions, or help to overcome creative blocks. Properly used, they are an effective part of your pollution prevention "toolkit."

POLLUTION PREVENTION LISTSERVS

What is a listserv?

A listserv is an Internet Email software package that allows a group of participants to easily exchange information using Internet E-mail. Individuals subscribe to the listserv by sending an Email message to the listserv owner. Once on the listserv, participants begin participating in the dialogue in the following way. A member of the listserv posts a question to the list address. That question is then sent out to all listserv members. Anyone with an answer to the question, posts their response to the list. In this way all participants in the list can follow the discussion. Listservs differ from discussion groups and bulletin boards in that each subscriber receives a copy of all the messages and must decide whether to read, save, delete or respond them. This provides a means for insuring a constant level of participation and speed of response when compared to other forums. There are a number of different ways that listservs can operate. The following list provides an overview of these formats:

Open or closed list - An open list is one where anyone can subscribe by sending an Email message to the list management program (an Email address such as majordomo@world.std.com) saying in effect 'sign me up'. The list management software automatically adds the person's Email address to the members on the list. For a closed list, anyone can send a message saying 'sign me up' but the list management software sends the message to the person who is in charge of the list, the list administrator. The list administrator decides if the person who wants to join is eligible. If so, the list administrator sends a special message to the list software, and the person is signed up.

Public vs Private list - a public list is one where information about the list is available to anyone with an Email address who knows to send the right command to the list management software. Information that can be requested includes the names and Email addresses of people on the list. Private lists withhold this information. Only the list manager can access this information.

Moderated vs Unmoderated list - In a moderated listserv messages are read by the list administrator prior to the message being posted on the listserv. The administrator reads the message to make sure it is appropriate for posting. In an unmoderated list, messages are directly posted to subscribers.

Individual messages vs Digest format - In a individual format listserv, messages are sent to subscribers as they are posted to the listserv. This means that on active listservs, a large number of Email messages can be sent to subscribers on a single day. In the digested format, messages are bundled together and sent as one message. These messages are sent out at regular intervals, perhaps daily or weekly.

Pollution Prevention Listservs

The following list provides information on existing pollution prevention-focused listservs.

NBEN Talk

The Northeast Business/Environmental Network hosts a discussion open to public and private pollution prevention experts and professionals in different industries for technical, policy or management topics to support pollution prevention and competitiveness. To subscribe to NBEN talk by sending an e-mail message to the NBEN on-line engineer, Michele Thompson at thompson@NBEN.org.

P2 Policy

The P2 Policy listserv is a forum for discussing pollution prevention policy. Currently, this is a private, unmoderated, closed listsev with 385 pollution prevention professionals subscribed. To subscribe to P2 Policy send a message containing your name, address, phone number, E-mail address and the name of your organization to 102262.2671@compuserve.com. Questions about the service should be addressed to Tyrone L. Foster at the above E-mail address or call the National Pollution Prevention Roundtable at (202) 466-7272.

P2REG

P2REG is a forum for discussing regulatory issues surrounding pollution prevention technologies and policies. To sign up for the P2REG listserv send an Email message containing your name, a message noting that you would like to subscribe to the P2REG listserv, your Email address, your mailing address, and your phone number to listman@uiuc.hazard.hwric.edu.

P2TECH

P2tech is a forum for pollution prevention technical assistance providers who are interested in sharing information on pollution prevention technologies. This listserv currently has 371 subscribers. To sign up for P2TECH send an Email message containing your name, a message noting that you would like to subscribe to the P2TECH listserv, your Email address, your mailing address, and your phone number to listman@uiuc.hazard.hwric.edu. This listserv also archives messages from this forum.

P2 Trainer

The National Pollution Prevention Roundtable, European Roundtable on Cleaner Technologies and Products, and the National Education and Training Association have started this on-line pollution prevention discussion service. The P2TRAINER listserv is designed to encourage the exchange of information about up-to-date pollution prevention educational programs and training opportunities. The intention of P2TRAINER is to encourage listing of educational, and training curricula, and upcoming seminars, workshops, and meetings. Currently, there are 150 subscribers to this listserv.

To subscribe to P2TRAINER, send a message with the word to P2TRAINER containing your name, address, phone number, E-mail address and the name of your organization to: 102262.2671@compuserve.com. Questions about the service should be addressed to Tyrone L. Foster at the above E-mail address or call the National Pollution Prevention Roundtable at (202) 466-7272.

PRINTECH/PRINTREG

Two industry specific listservers have been established for the printing industry by the Printers' National Environmental Assistance Center. PRINTECH focuses on the discussion of technical issues regarding environmental compliance and pollution prevention for printers, offering advice on alternative cleanup solvents, inks and fountain solutions. PRINTREG provides information on regulatory activities affecting printers, such as the development and application of rules and the enforcement status of self audits. Direct access to industry experts is provided by technicians from the Graphics Arts Technical Foundation and Printing Industries of America.

To subscribe, send an e-mail message to Wayne Pferdeheft at pfirdeheft@epd.engr.wisc.edu. Please specify the list(s) to which you wish to subscribe (you may subscribe to both) and indicate your name, organization, phone number and E-mail address.

P2PRINT

P2PRINT is a regional electronic mailing list for printers and other professionals interested in reducing or eliminating the use of toxics in printing. The region covered by P2PRINT is the northeastern United States, specifically Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. The goal of P2PRINT is to help printers help each other find answers to questions about environmental issues related to printing. Some of the topics that are discussed on the list include

- less toxic alternatives to existing inks
- substitutions for existing cleaning solutions
- ways to handle cleaning rags
- managing hazardous or non hazardous printing wastes,
- questions about new, existing or proposed environmental regulations
- Material Safety Data Sheets (MSDS) on printing materials
- questions about new techniques, processes, or equipment related to P2 in printing
- training or upcoming meetings where pollution prevention in printing will be a topic

The messages to the P2PRINT list are saved on the GLIN web site. These can be particularly useful if you just subscribed and want to know what has already been said about a particular topic. If you have access to the web, point your web browser at: <http://www.great-lakes.net/lists/p2print/96/maillist.html>. If you do not have web access but want background information about a particular topic, send a message to the list manager, Maureen Hart (mhart@tiac.net). To subscribe to P2PRINT send an email message to "p2print-request@great-lakes.net" with the word "subscribe" in the body of the message. Or send a message to mhart@tiac.net with your name, email address and interest in P2 and printing in the Northeast. Questions about P2PRINT should be addressed to the P2PRINT list manager, Maureen Hart. She can be reached at NEWMOA, 129 Portland Street, Suite 601, Boston, MA 02114-2014, (617)367-8558 x305 or at mhart@tiac.net.

WHAT IS THE INTERNET?

The following article appears in the journal JOM, Understanding the Internet: A Guide for Materials Scientists and Engineers 47 (4) (1995), pp. 9-13. JOM is a publication of "The Minerals, Metals & Materials Society" and was downloaded from the Internet.

Newspapers and magazines are full of stories about the Internet and the coming information superhighway. Predictions for the future range from on-line video rentals and 500 channels of cable television to video telephones and global electronic libraries. Unfortunately, metaphors and hyperbole have obscured the fact that the Internet is useful now and that it connects a significant fraction of the United States and the world. This article describes, without too many metaphors, the current and near-future capabilities of the Internet and provides basic information about access methods, popular services, and planned changes. In addition, the article also offers a brief introduction to Net culture and etiquette.

The Official Definition

The most common definition of the Internet is "a worldwide network of networks"; unfortunately, this definition lacks any hint of the scope of services available through the Internet. Here, tens of thousands of networks owned and operated by governments, corporations, nonprofit organizations, and educational consortia are interconnected and easily accessible through a number of standardized interfaces. As a result, it is difficult to measure the total number of the Internet users, but as many as 30 million people worldwide are believed to have some connection to the system.

Currently, the chief "backbone" of the U.S.'s portion of the Internet is the National Science Foundation sponsored NSFnet, which connects more than 17,000 regional networks. The NSFnet's traffic is, however, being transferred to commercial networks. The regional networks, in turn, are connected to local networks at companies and institutions. TMS, for example, is connected to the Internet through PREPnet (the Pennsylvania Research and Economic Partnership Network).

The Reality

In reality, the Internet is still largely uncharted. Popular services, such as the Macintosh software archive at Stanford University, are usually run by volunteers and may be choked by overuse. Unlike commercial services such as CompuServe, GEnie, or America OnLine, there is no central authority responsible for content or user support. The superhighway metaphor is accurate in one respect--the Internet is a way to get to services and other users and is not a destination in itself.

Technically, the Internet is run by an oligarchy. Interested individuals and institutions provide engineering and research directions and promote the development and enhancement of services.

Significant engineering efforts have covered the continued development of information archives (collections of programs and data), multimedia services (e.g., pictures and sounds), and information-transfer protocols. The technical initiatives that keep the Internet's capabilities growing are well beyond this article's scope, but it is important to realize that both technical and organizational

Internet is used by a relatively small number of people and companies. Despite its distributed nature, the Internet requires agreement on the basic rules for transferring information between systems.

Socially, the Internet is an anarchy. University staff and students are the most common users, but many major and minor businesses, magazines, government installations, and local electronic bulletin boards are tied into the Internet as well. One pleasure provided by the Internet is the unexpected interactions: a discussion of car problems might elicit a detailed description of assembly-line procedures from a line worker or a plant engineer. Another example involves a classics professor who posted a query about the heat treatment of bronze in ancient times. He received assistance from several metallurgists and has since corrected his translation of Homer's *Odyssey*. Unfortunately, seemingly free access to the Internet has bred a certain amount of irresponsibility. Neophytes rarely realize the ease of offending tens of thousands of people with an off-hand comment and should be careful until they understand the unwritten rules for Internet use, also known as "netiquette."

HOW TO GET STARTED

Any relatively up-to-date personal computer equipped with a modem (a computer interface to standard phone lines) can access the Internet. Many systems are bundled with everything needed to make the first contact, and several computer or operating-system manufacturers, such as IBM and Apple, operate on-line services. Further, standard modem communication software can be used to connect to a local or national service provider that provides, for a small fee, Internet access. Some of these services are listed in the section Common Services and Access Providers.

Alternatively, many institutions have direct Internet connections and can provide essentially free access for networked personal computers. The site's system management can provide the details. In this case, it is important that new users be familiar with their institution's policies concerning appropriate Internet use and privacy of communication; just as one should be familiar with work rules regarding personal and long-distance phone calls.

Regardless of the mode of access, the Internet is not restricted to researchers. Personal, professional, and most commercial traffic are acceptable.

Dial-Up Connections

Most users without Internet access through office- or school-based systems have dial-up connections to the Internet. Dial-up users need a personal computer, a modem, appropriate communication software, and a host system to call, usually via a local or toll-free number. Some dial-up systems provide little more than access to the Internet, while others provide a wide range of additional services, such as on-line newspapers, airline reservations, software support groups, and specialized access software. Choosing a provider requires the user to appreciate the distinctions in the types of services offered. Although the distinctions between different types of dial-up systems have blurred, there are essentially two types: access providers, which chiefly sell access to services at other Internet sites, and on-line services, which provide their own bulletin boards and services as well as varying degrees of Internet access.

Internet access providers support the full range of Internet services by connecting your computer to a system that is on the Internet. Some providers support software that, in effect, connects home computers directly to the Internet. This allows the use of friendlier and more powerful services such as the World Wide Web without an intervening shell (i.e., a command-oriented interface similar to the "C" prompt in Microsoft's DOS) or a limited menu system. Access providers usually do not have many services of their own, but they do provide access at a low cost. Some even allow unlimited connections for a flat monthly fee, which is a good deal for heavy users. Unfortunately, some access providers may not have enough phone lines, local phone numbers, or support. Word-of-mouth recommendations are usually the best way to find an access provider since most do not have national coverage.

On-line services like CompuServe, Delphi Internet, GENie, America OnLine, and Prodigy offer varying levels of Internet-based services in addition to their own extensive collections of services. Prodigy, for example, offers nearly complete World Wide Web access via the same user-friendly interface as their other services; other on-line services are close behind. Electronic mail is "gatewayed" or transferred from the on-line service to the Internet, and users are given an electronic-mail address that can be reached by Internet users. One minor difficulty: mail messages may be limited in length to 20,000-30,000 characters. On-line services usually charge a monthly minimum fee (\$6-20) with additional charges (\$2-5 per hour) for use that exceeds a small monthly allotment of gratis hours.

Distinctions between on-line services and access providers have been blurred as on-line services have added Internet access and access providers now support additional services such as on-line news and friendly connection software. Further, on-line services plan to provide better access to their systems and value-added services via the Internet; regional access providers are expanding to provide nationwide service. In the near future, it will be difficult to tell the two types of providers apart.

Direct Connections

Eventually, if the Internet is to become more civilized, users will need direct, high-speed connections. Friendly interfaces, graphics, sounds, and video--all within the current technical limits of the Internet--require prodigious data transfer rates to be effective. A direct connection is one that does not involve ordinary phone lines with their relatively slow data-transfer rates of approximately 1,000-3,000 characters per second. In practice, full-time, direct connections are only available to institutions, which lease high-speed connections to regional networks. Sophisticated users in some areas have installed digital telephone lines at home. While moderately priced (\$100-200) modems can now send 3,000-4,000 characters per second; cable systems and local telephone companies are the most likely sources for future small business- and home-based Internet connections.

COMMON SERVICES AND ACCESS PROVIDERS

The following are the "big four" for on-line services; all have some level of Internet access (e-mail at minimum) and are working hard to add more. Fees, levels of service, and helpfulness vary widely. Call the providers for specific information related to compatibility, service areas, and so on. It must be noted that this list is far from exhaustive.

- America OnLine, (800) 827-6364: Friendly software for DOS-based and Macintosh computers. Internet Center provides extensive support for new Internet users.
- CompuServe, (800) 848-8990: Originally terminal-oriented, but friendly software for Macintosh and DOS computers is now available.
- Delphi Internet, (800) 694-4005: Terminal-oriented and may be difficult for novices to use, does have, however, relatively complete Internet access. A new user interface is planned.
- Prodigy, (800) 776-3449: Family and consumer-oriented. Prodigy was the first service to permit World Wide Web access through its personal computer support software.

There are hundreds of regional access providers. Two of the largest are:

- Netcom (800) 488-2558: Friendly Internet access software for Windows-equipped personal computers.
- Performance Systems International, (800) PSI-3031: High-speed and digital phone access in major urban areas.

WHAT'S OUT THERE?

Electronic Mail

Electronic mail (e-mail) is the most common Internet service and is the lowest common denominator of Internet access. Many otherwise unconnected computers have the ability to transfer e-mail to others through the Internet. E-mail allows users who know their correspondents' addresses to send text messages. Internet addresses typically consist of a user name and a host name, separated by "@". User names are typically the recipient's user name or log-in identification. The host name consists of a machine or site name, followed by "domain" names of increasing generality. Domain names are short abbreviations for divisions, companies or organizations, types of organization (i.e., educational, commercial, military, or government), and countries. My address, for example, is "mailto:meltsner@ctc.com". The part to the left of the @ is my last name; "ctc" is an abbreviation for Concurrent Technologies Corporation, my employer's name; and "com" means that "ctc" is a company. Most sites without a country domain are in the United States.

The biggest problem associated with e-mail is the lack of any centralized directory service. Frequently, the easiest way to find an address is to call the individual to whom you wish to send mail. When you receive the message, it should contain the correct return address.

FTP

The largest single source of Internet traffic is file transfer. FTP, or file transfer protocol, provides access to hundreds of gigabytes of programs, text, recipes, weather maps, and other miscellanea. Most users find archived material by browsing a few popular archives or through messages on newsgroups. Access

typically requires that the user or the service provider have a direct connection to the Internet, although some archives can respond to file requests by electronic mail.

Computers with FTP servers store voluminous archives of files, with little explanation. Directory and file names are limited as well: a picture of the Saturn V, for example, might be listed as "bigSat5.gif," with no indication as to the differences between it and other archived Saturn V pictures. To address this problem, newer protocols support friendlier browsing and retrieval.

Gopher, for example, provides longer descriptions of archived items.

World Wide Web

The World Wide Web (WWW or web) goes beyond Gopher and provides a uniform view of the Internet as a series of interconnected "pages" in a global encyclopedia with the ability to jump between computers by clicking on buttons, individual phrases, or words. With the WWW, such links are used to access related works, commentary, or non-text material such as sounds or movies. Most WWW programs also support forms to allow users to fill in blanks and click on menus (much like Windows and Macintosh programs) to search through databases and run remote programs. Web developers also adopted the idea of a universal resource locator (URL). A URL lists all the information needed to access remote files and terminal-based services in a consistent fashion.

In many respects, the web is a perfect metaphor for the Internet. One popular program for browsing the web is Mosaic, which is a product of the National Center for Supercomputing Applications; it allows users to retrieve files, browse reports, perform full-text searches, and retrieve graphics and sounds from around the world without ever typing a single command or host name.

The web's only problem is the sheer amount of data transferred when graphics are accessed. Even with a high-speed modem, pauses of a minute or more between pages are common. Luckily, many web services recognize this problem and provide pages with minimal graphics for users without high-speed connections. Some access providers have also developed methods to minimize the amount of information that needs to be transferred while browsing.

To cope with the myriad of files available in Internet archives, several indexing services have been developed. Archie, the first Internet-wide archive index, allows users to search for files by name and returns a list of archive sites with copies. Veronica, an index of Gopher servers, allows for similar searches of item titles and menu text. Lycos allows users to search for phrases and a word in more than one million documents worldwide. There are several other services as well, with different search capabilities. Indexes are the only practical alternative to luck and word-of-mouth for finding useful services. Unfortunately, they may be busy and difficult to access since most are run by volunteers.

While few Internet archives exist for materials-specific information, archives are available for personal computer and workstation software, numerical analysis libraries, graphics systems, and other tools of general interest to scientists and engineers (Table I). Many government laboratories and universities also provide WWW or Gopher listings of their services, ongoing research projects, and technical publications.

- List of Internet Archives for Engineers and Scientists
- Personal computer software "ftp://mirror.archive.umich.edu"
- Personal computer software "ftp://wuarchive.wustl.edu"
- Unix software "ftp://ftp.gatekeeper.dec.com"
- Mosaic and graphical software "ftp://ftp.ncsa.uiuc.edu"
- FAQs, manuals, and documentation for netnews and the Internet "ftp://rtfm.mit.edu"

NOTE These archives can be accessed by FTP, outside of normal business hours. More sites can be found by reading comp archives and other newsgroups.]

News and Discussion Groups

The most addictive services on the Internet allow users to communicate with a large audience and to find appropriate audiences for their interests. The Internet supports mailing lists, newsgroups, and Internet relay chat. The first two serve as forums or bulletin boards for those interested in a specific topic, and the last is essentially a worldwide, text-based conference or citizen's band simulator split up into topics by channels.

Early mail systems allowed a system manager to set up lists that could redistribute messages automatically. Today, users can now add or remove themselves from mailing lists by mailing command messages to special addresses where mail servers will automatically perform requested services. One popular family of mail server programs handles more than eight million messages a day for more than 16,000 mailing lists. While e-mail lacks the immediacy of Gopher or the WWW, mailing lists are effective for users without full Internet access or the desire to search through archives and newsgroups.

Newsgroups grew out of another computer network--the Usenet. First intended as a simple shared bulletin board for computer users at the University of North Carolina, the Usenet news system, or netnews, has grown to thousands of discussion areas with hundreds of thousands of participants, loosely organized into seven major areas, regional newsgroups, and a free-for-all alternative hierarchy. Some sites also carry commercial newsgroups, such as Clarinet's wire news and a national columnists service. A recent count of news traffic showed more than 4,000 groups and nearly a gigabyte of technical discussion, digitized sounds and pictures, chatter, and other less-classifiable interchanges in the preceding two weeks.

A survey performed at the start of 1995 by Brian Reid of Digital Equipment Corporation confirmed the immense size of the Usenet news system. For example, about 320,000 readers scan popular groups like misc.jobs.offered (a positions offered group), where more than 400 articles are distributed per day. Even lightly used groups like sci.materials reach 38,000 readers and distribute about 15 articles per day. Sorting through this flood of information is made easier by the hierarchical organization of news groups. Much like Internet addresses, but reversed, newsgroups are defined by increasingly specific names or categories.

The right software is also essential. Newsreaders are programs that can access newsgroups stored on a network server or at a commercial service. Some newsreaders can filter out unwanted discussions or sort newsgroups into more coherent discussions. In an attempt to reduce the number of repeated discussions,

many groups have FAQ (frequently asked question) articles that list popular questions with short answers that summarize the current wisdom in a given area. FAQs are also posted to the invaluable "answers" newsgroups such as news.answers or comp.answers. A detailed guide to the intricacies of netiquette can even be found in news.answers, but most common errors can be avoided by reading a group for a month before posting any new questions.

Of course, no one should rely solely upon newsgroups for information or advice. Too many users respond without knowing the truth. One should try to write articles that are as accurate and well written as possible, even if it may seem like no one else is. While many newsgroups are plagued with noise, the occasionally definitive answer or well-written summary makes reading a few worthwhile.

Terminal-Based Services

Before services like Gopher and the WWW were developed, the only way to interact directly with services like a book catalog or weather report was to connect as a "dumb" terminal with the telnet protocol. Terminal access meant that users had to enter different commands for each service, although some systems provided menus and on-screen help to assist novice users. Ironically, while remote access was one of the purposes of the ARPANET, the Internet's predecessor, it's one of the least popular major services. Other programs have taken over much of the interaction with other computers: the web (for graphics-rich presentation) or mail servers (for users with slow connections). For example, the TMS bulletin board system, TMS OnLine, which provides information on society publications, meetings, and activities, is in the process of converting to a web-based system.

Users on the Internet

Today, the typical Internet user is most likely to be a computer science student or professional, but there are an increasing number of mechanical engineers, materials scientists, solid-state physicists, metallurgists, and others interested in materials. In addition to TMS OnLine, there are several other areas where JOM readers may find other Internet users with similar interests.

The easiest way to find other materials engineers and scientists with similar interests is in the sci.materials and sci.engr.metallurgy newsgroups. Of the nonmaterials groups, the sci.engr.mech group has excellent discussions of materials-related problems within the context of mechanical design and engineering. Most personal computer users will also find the comp.sys.mac and the comp.sys.ibm-pc families of groups of interest, but the sheer number of messages makes it difficult to find useful information. A warning: "advocacy" groups exist to draw endless, useless arguments and are rarely worth reading.

In addition to the Internet's array of general interest software and data archives, there are also more specialized services, such as the numerical algorithms library at <ftp://research.att.com>. Government organizations such as National Institute of Standards and Technology and the National Science Foundation provide useful archives of papers and project information via Gopher and the web. Gopher services provided by <telnet://marvel.loc.gov> allow access to information from much of the federal government. Fedworld (<telnet://fedworld.gov>), a bulletin board system, is accessible through telnet to fedworld.gov and provides access to individual government bulletin boards from most federal departments.

While materials-specific information is rare, archives serving other engineers and scientists are of use to the materials community. Announcements of new items and archives are common in many newsgroups, with news.comp.archives being devoted solely to announcements of archived material. Comp.infosystems.www announce lists new and improved web sites

What is the Future for the Internet Engineering Community?

While the computer science and electrical engineering communities are almost fully accessible via the Internet, other engineering and science disciplines have lagged behind. Currently, there are several newsgroups of interest, a few mailing lists, and a limited number of researchers and students. In some cases, like the knowledge-based systems session at the 1994 TMS Annual Meeting, significant work can be performed solely over the Internet. James McDowell of Michigan State University and the author organized the session over the Internet, including abstract submission and paper refereeing. Others have also taken advantage of the Internet for professional communication. Many session organizers list Internet addresses in calls for papers; undoubtedly, most abstracts and papers will be submitted electronically in the future.

While materials information services are available via the Internet, they are terminal-based systems that use the Internet as an alternative to a dial-up connection (i.e., telnet). However, more sophisticated systems are under development. For example, one company has evaluated a patent search service that takes a description, matches it against all patents since 1971, and returns the titles of the most similar patents to the proposed invention. Services like this provide a unique capability to materials scientists and engineers.

Given the growing number of networked materials scientists and engineers, the only missing piece is the availability of more materials properties databanks and technical report archives on the Internet as well as an index via Gopher or the WWW to these resources. "Where can I find the (blank) properties of (blank)?" is probably the most frequently asked question on the materials and engineering newsgroups. Too often, the only response is "Try a library." Of course, when such services become available, they may not be free. Methods to charge for use of Internet services are a major area of research and development.

Some materials-related services are available, of course. For example, the National Center for Excellence in Metalworking Technology, operated by Concurrent Technologies Corporation for the U.S. Navy Manufacturing Science and Technology Program, plans to deliver metalworking information via a WWW server at <http://www.ncemt.ctc.com>. Other organizations involved in materials-related technology development and deployment have similar plans.

While Internet access is not essential for materials scientists and engineers, it does allow users access to information from the wide range of disciplines that support the materials community. If the history of the Internet is any guide, services of specific use to the materials community will also grow as the Internet materials community grows. The Internet represents the best opportunity to reach scientists and engineers with the new ideas and problems that the materials community needs.

FOR MORE INFORMATION

The Internet (http://www.yahoo.com/Computers/Internet/Beginner_s_Guides) is its own best documentation, but the following sources will provide the reader with the information needed to get started

- Hahn, Harley, and Rick Stout. The Internet Yellow Pages. Osborne MacGraw-Hill, 1994. Exhaustive list of mailing lists, sites, etc. Obsolete as soon as you buy it, but fun to browse.
- Krol, Ed. The Whole Internet User's Guide & Catalog. 2nd ed. <http://www.mecklerweb.com/mags/iw/v5n6/book1.htm>. O'Reilly & Associates, 1994. One of the oldest and still best guides to the Internet, both in terms of services and culture.
- InternetWorld (<http://www.mecklerweb.com/mags/iw/iwhome.htm>), Mecklermedia Corp. Subscriptions: P.O. Box 713, Mt. Morris, Illinois 61054, or (800) 573-3062. \$29 per year. Glossy magazine oriented towards both personal and professional uses for the Internet.
- Online Access, Chicago Fine Print. Subscriptions: 5615 W. Cernak Road., Cicero, Illinois 60650, or (800) 36-MODEM. \$24 per year. Oriented towards personal use of the Internet and on-line services.

SEARCHING FOR INFORMATION ON THE INTERNET

By Chris Venditto. Originally appeared in Internet World magazine. Copyright 1996 Internet World. reprinted with permission.

With a magnitude measured in millions of pages, the World Wide Web is not an easy medium to master. Early in 1996, Lycos Inc., which catalogs the Web on a daily basis, put the size of the Web at roughly 19 million pages. Other estimates suggest the Web is doubling in size every four months. If these figures are accurate and growth continues at current rates, a staggering 150 million pages (containing 50 or 60 billion words) will be publicly available by the end of this year--with millions more being generated on the fly at dynamic Web sites.

Sifting through this much material to find the information you need clearly calls for automated search tools of some sort. And, in fact, sites devoted to searching the Web are multiplying at a dizzying rate. One of the most popular, InfoSeek Guide, claims to have performed over one billion searches in its first 10 months online. The company says its servers run as many as seven million searches a day. Each of these systems offers essentially the same service: You log onto the page with a browser, type a query into a text box, and within seconds the program returns a list of clickable links. No special software is needed. Each site is quite different from Net directories like Yahoo and Magellan, which are essentially registries of Web sites based on descriptions submitted by Webmasters or written by the directory's staffs to hypertext searches on AltaVista.

Engine Anatomy

Web search engines attempt to create a detailed record of the Web using automated software agents--nicknamed spiders--that crawl from URL to URL, visiting every site in the public areas of the Web and recording the addresses. All search engines handle these initial steps in essentially the same way. What the various systems do from this point on makes for some significant differences in the quality and quantity of search results. Some send robot software to every site and record the full text of every page. Others first analyze the addresses in the database to determine which sites seem most popular (typically by determining the number of links pointing to the sites in question). They then send out software to record information at these sites only--anything from the bare HTML title and header to an algorithmically constructed summary of contents to the full text of the entire site. And whatever the scope of the database, it must be rebuilt, refreshed, or updated regularly to keep the system current.

The search logic used to extract information from the database is another crucial component of these tools. Engines should be able to find the Web sites that match the search criteria and rank the results according to a degree of relevancy. And to play on this big-league turf, they've got to be fast. Actual search time for a typical query is measured in fractions of a second. InfoSeek Guide, one of the busiest services, says it performs as many as 175 searches a second during peak hours.

What's the Difference?

Few people, we think, give much thought to the search engines they use. They find what's handy or what they've heard about, often using what's on their browser or a favorite Web site. The various search sites do seem different, but it's hard to pin down the differences. We set out to clarify the distinctions and

determine which tool is best for a given problem. On the surface, it would seem that each search engine should be able to find the same sites based on a given query, so you might think that the main difference would be speed. However, tests found the opposite to be true. We found the differences in performance to be negligible. Aside from frequent busy signals at WWW Worm, search times were almost always just a second or two. While each service is subject to occasional slow periods as demand hits a peak, none of the services (aside from WWW Worm) had consistent performance problems. A comparison of search results, however, revealed dramatic differences in content.

The most striking conclusion drawn from tests was that all these engines had a long way to go before they could be relied on to deliver consistently accurate search findings. Each one delivered a high proportion of irrelevant information when challenged with anything beyond a simple search on a well-represented topic. Moreover, using the same terms, no two search engines yielded the same results on a search during our entire testing period. There was a fair amount of overlap in results, and each engine delivered the same results when we repeated searches, but no engine succeeded in delivering more than a modest number of relevant links on most searches. Clearly, "signal-to-noise ratio" is one important criterion for choosing a search engine. Some engines delivered relevant results only when the search remained simple. To achieve good results, others required you to construct carefully structured database queries using often-cryptic Boolean logic.

Art of the Search

Many serious Web searchers have become skilled at skimming copious quantities of search-results text in an effort to pinpoint relevant information. However, by choosing the right site for the job and making the effort required to craft an intelligently phrased query, you can dramatically improve the quality of your results. If your goal is site-seeing and you're happy to find any information on a particular topic, all the search engines will do a fine job. (In fact, the designers of some search sites acknowledge that their main goal was not to deliver a precise result, but to get users within a link or two of the desired information.)

But when you're on the trail of something specific, you may need to visit more than one site--and spend some time reading the online FAQs so you can construct an effective query. Delving deeply into this world of hide-and-seek, our testing revealed that each engine has its own strengths and weaknesses, that different engines are suitable for different types of tasks--such as getting a quick listing of the main sites devoted to a particular topic or organization or, on the other end of the info-spectrum, finding every single reference on the Web to some highly specific subject. Further, some online search services include FTP and Gopher sites in their databases, and some even provide databases that index the complete text of selected newsgroups.

If you're really interested in making the most of online search resources, avoid the habit of picking your search tool simply because it's the closest at hand. Make an effort to familiarize yourself with the available alternatives and add a bookmark or icon to your browser for each engine that's relevant to your needs. Another option is to bring in additional help. Some Web search tools provide access to a combination of search sites. This certainly speeds and simplifies the process of employing multiple engines and may save you time as well. With the current Web search engines providing their service for free (InfoSeek has a more extensive fee-based service), it's certainly worth spending the time to make the best use of these publicly available resources.

Search Engines

There are Web sites that ambitiously attempt the near-impossible to provide Net surfers with a searchable index of almost every word on every Web page in the world. These search pages allow you to find very specific information, even when it is not reflected in the title or summary of the page.

Alta Vista

Access: <http://altavista.digital.com/>

Digital Equipment Corp.'s Alta Vista offers a fast search of what it claims is the largest Web index yet compiled--a database of more than 21 million Web pages containing more than 8 billion words--over a 45GB index. Articles from more than 13,000 Usenet newsgroups are also available for searching. The default simple search is indeed simple, and the one-line searching suggestion is more helpful than you might think. Alta Vista's advanced search options are powerful but require some study of the help page to learn. It's a must-visit search site.

Tests revealed Alta Vista to be as fast as its founders had hoped it would be. Digital says a single Alpha system running at 266MHz and equipped with 256MB of memory handles all queries (separate hardware crawls through the Web to compile and build the database). Alta Vista's search results to be consistently more comprehensive than any of the other sites'. Even obscure references in little-known sites were found. You may spend more time looking through the results of an Alta Vista search than you will at other search engine sites, but when you want to find as much as you can on a single topic, Alta Vista is the best place to look.

While most of the other sites are painstakingly crafted to extract only the essence of each page, Alta Vista's broad-based full-text index proved consistently reliable in finding any reference to a search term, no matter how slight the reference. While there was a slightly above-average rate of expired links in Alta Vista search results, search terms in the cited documents, which is not something we could say about every search engine.

Alta Vista's search algorithms seem to rely more on brute force than subtlety because simple queries often generated results for only one term in a phrase. And its search engine does not support stemming, as does InfoSeek's, so that all of its searches are performed only on the exact phrase, and not on the plural or other forms of the word. Fortunately, a Power Search option makes it possible to refine a query. You can create a query using the operators and, or, not, or near. But you don't receive the same level of help in constructing your query that's offered by engines such as Lycos and Open Text. Alta Vista does present a date filter range for its results, a feature none of the others provide.

Excite

Access: <http://www.excite.com>

Architext Software's Excite database is smart and user-friendly. Use keywords to search its database of more than 1.5 million Web pages or try a concept search. Concept searches will find a page related to the words you search on, even if those words are not actually on the Web page. It's like searching an index combined with a thesaurus. Excite also offers a browsable, searchable directory of more than 50,000 reviewed Web sites, a Usenet search of more than a million articles, and a search of Usenet classified from the past two weeks. It's not the largest Web index, but one of the most useful.

Excite's profile rose considerably early this year when Netscape chose it as the link behind Navigator's coveted Net Directory command. The appointment has increased traffic at Excite's site but also has led to some confusion. Excite provides both a Web search engine and Web directory organized by category (similar to Yahoo's index, which was supplanted by Excite as Navigator's Net Directory). All told, Excite provides the fullest range of services of all the Web search sites. While its keyword search engine is most prominent, the site also offers a daily news summary, opinion columns, cartoons, and reviews of Web sites written by a team of journalists.

Tests found that Excite was among the best of the search engines at staying current. And it did a fairly good job at finding relevant information. It was about equal to InfoSeek and Open Text in the quality and quantity of its search results.

InfoSeek

Access: <http://guide.infoseek.com>

InfoSeek Guide claims to be not the largest but the fastest Web index. (This is difficult to verify because the speed of your search depends on many factors, including how close you are to the search site, how busy the Net is, how busy the search site is, and your hardware/software combination.) It is fast and easy to use. Searches can include newsgroups, Usenet FAQs, and reviewed sites. The results are displayed in order of relevance, and any match from a search can be used to find similar pages. On the down side, InfoSeek limits search results to the first 100 hits. InfoSeek Professional, which costs \$4.95 per month for 50 transactions, offers more powerful searches, including those of computer, business, and medical news, entertainment reviews, and corporate facts.

InfoSeek's engine has the best arsenal of search parameters among the tools in this roundup. Fortunately, they're kept hidden from users. InfoSeek allows you to type in a query that's as detailed as you wish and it will apply the logic in the background. That means you can forget about learning how to use the search tool and just concentrate on the question you want answered. The full text of each page in the InfoSeek Guide database is indexed. Searches are case-sensitive (dramatically improving the effectiveness of searches on proper names), and when you enter a phrase, InfoSeek uses proximity ranking to improve the relevancy of its findings. The search results that InfoSeek displays are the most complete of any service we tested. Its items include the title of the Web page, its URL, a relevancy score, the size of the file, and a computer-generated summary. When you locate a site that seems relevant, you can improve your results dramatically by selecting the Similar Pages command. InfoSeek will refine the search by focusing on the terms in the first site's listing. Within seconds, you'll see a list of sites that are likely to be relevant.

InfoSeek Guide is one of two services offered by InfoSeek. It is an advertiser-supported free search engine for searching the Web, FTP sites, Gopher menus, and a database of reviews written by InfoSeek's staff. InfoSeek also offers its Professional subscription service for searching through business-oriented databases. While the size of its current database prevents it from being the clear winner, when you want to find a specific piece of information and don't want to wade through dozens of citations to find it, InfoSeek Guide should be your first stop.

Lycos

Access: <http://www.lycos.com>

Lycos is one of the oldest Web search sites and it's the one that generates the most controversy through its marketing. Claiming to house the largest database of Web pages, Lycos is a constant target of competitive challenges. Lycos is a unique search site because it has a large number of binary files in its database, including GIF, JPEG, wav, and MPEG files. It also indexes FTP archives and Gopher menus, giving its index greater depth than most. Its claim to be the largest Web index has some merit, since it totals more than 19 million unique URLs, including those binary files. However, only about 11.5 million of these are Web pages and less than half of those have been fully searched and indexed; the Lycos database contains about 2.3 billion words, whereas Alta Vista has more than 8 billion.

Whether or not the Lycos database is a complete snapshot of the Web should be of little concern to users as long as the search engine delivers accurate results. In tests, Lycos often delivered the most comprehensive results (generally equivalent to Alta Vista's). However, the size of each report often was overwhelming. Generally, relevant information is not found on the first two or three pages of Lycos's search results as often as the case with Excite, InfoSeek, and Open Text searches. Lycos builds its database cumulatively rather than rebuilding the database periodically. In updating information on new and existing URLs, Lycos's software creates a measure of each site's popularity by looking at the number of other links pointing to a site. The engine then uses this popularity index in performing each search. The relevancy of each hit result is partly based on the site's relative popularity. Lycos's method of database compilation would seem to dramatically increase the likelihood of out-of-date links in its search results (a possibility stressed by Lycos's competitors), but in tests the validity of Lycos's links were about average.

The Lycos database is not based on the full text of each page. Rather, it creates abstracts of pages based mainly on headers, titles, links, and the first few words of key paragraphs--all of which is designed to maximize broadly relevant information. One result of this design is that the engine doesn't do well on searches for short references buried within documents. This may explain why searches for "satellite access to the Internet" were not fruitful. However, when we searched on simple terms that were likely to appear in many documents (such as NBC), Lycos did a good job at finding the most relevant pages (such as the NBC home page). When Lycos does yield relevant information, its display of search results can be helpful. Each page includes statistics on the search, noting the number of occurrences for each search term. And every time the search term appears in a citation, it's marked in bold, which makes it easy to scan through the pages. Lycos also numbers each citation, a nice feature that eases navigation chores on long searches when the results are more than a few sites. (Open Text and WWW Worm are the only tools that number all search findings.)

OpenText

Access: <http://index.opentext.com>

Open Text offers an excellent combination of power search options and ease of use. Its advanced search tool uses pop-up menus for specifying Boolean or proximity operators and the part of the site to search. It also offers a weighted search that orders the results based on the weight you assign to each search term, the number of times each term appears on a Web page, or both. The Open Text database covers every word on every page it indexes. Try a search for "As You Like It" in most Web indexes and you'll receive an error message, no matches, or a list of Web sites containing the words like and you. Only Open

Text and Alta Vista will find sites mentioning the Shakespearean play. (Formerly, only Open Text indexed every word, but a recent improvement in Alta Vista's index now allows search phrases containing small words such as at, and, the, or, and of to yield exact matches.)

Open Text is arguably the best-designed search site on the Web. It has the most comprehensive collection of search tools and one of the most appealing layouts, making it a pleasure to use. It's hard to think of a desired search option Open Text doesn't offer. Boolean operators are supported and results are clearly marked, showing URLs and the size of each data file. The results are numbered and scored by relevancy. You can even view a small report that shows where Open Text found its matches on the Web page.

While some Web search engines give you the means to perform a keyword search and perhaps add a way to refine the search, Open Text offers three types of searching:

- You can search on a simple term.
- You can perform a "power search," which can include up to five search terms and use any of five operators between terms (and, or, not, but not, near, and followed by). You also can specify the field to search for each term (anywhere, title, summary, first heading or URL).
- You can create your own weighted search, in which you select the relevancy for up to four different terms in a search.

Open Text may be the ideal front end for a detailed search, but it doesn't always deliver the goods on a quick search. One reason is that its searches are limited to strings. If you type in a complex query from Open Text's main menu, you'll find a match only if all the terms appear in that exact order within a document. Like InfoSeek, Open Text gives you the option of using any search result as the basis for a more specific search. While Open Text's database is broad, it is not nearly as extensive as Alta Vista's, which consistently found more results on terms. Open Text's performance is likely to improve dramatically this spring when the database is scheduled to increase from the full text of 1.6 million pages to about 10 million pages.

Webcrawler

Access: <http://www.webcrawler.com>

The WebCrawler philosophy is simple: keep the database lean and display a clean list of results. WebCrawler offers few frills, but in spite of its name, its searches are quick. WebCrawler's main drawback is that it doesn't display a text summary for each item found. You see only the page title and a number showing WebCrawler's relevancy ranking. As a result, unless page titles happen to be descriptive, you have little to go on before exploring the sites themselves. Fortunately, you can save WebCrawler's search results pages as bookmarks, so methodically visiting the sites is fairly easy.

To compile its database, WebCrawler surveys the entire Web, evaluating the popularity of each site and storing only the contents of pages that seem well-traveled or that fill in gaps in the existing database (in addition to sites that request listing). WebCrawler claims to replace the entire contents of its database monthly, supplementing the site with weekly updates. As a result, the database does seem up to date. If

...are looking for esoteric information, however, WebCrawler may not be of tremendous help, since the database covers only about 500,000 Web pages

The WebCrawler engine appears to go awry when you extend a simple search, making it more complex. You have a choice of searching for all of the terms in your query or some of them, and you can choose from a display of 10, 25, or 100 search results. WebCrawler doesn't support Boolean operators or upper-case letters. The bottom line on WebCrawler is that it is best used when you want to zero in on popular sites, but not for complex searches. WebCrawler returns the title of the Web page, but without a summary or description.

WWW Worm

Access: <http://www.cs.colorado.edu/home/mcbryan/WWW.html>

An early pioneer in the field of Web-searching tools, WWW Worm is now almost an anachronism. Once considered among the best navigational aid for the Web, WWW Worm rarely crops up in any current discussion of top search tools. As the other Web sites aggressively vie for the attention of Web users, feverishly build staffs, and add computing resources, WWW Worm remains housed on an overworked server at the University of Colorado, almost hidden behind an obscure URL. You may find it helpful in locating the most recent address of a page that's moved or in finding the pages relating to an institution, but probably due to its lack of full text indexing, WWW Worm did poorly overall in tests. WWW Worm may be of use primarily to savvy searchers who are trying to find all the addresses for a particular organization. For example, a search on "usdoj" will be fruitful for someone who needs a definitive list of URLs for the U. S. Department of Justice. And the WWW Worm can be extremely valuable in enabling companies to size up the scope of their competitor's investment in the Web. For what it's worth, WWW Worm is the only search engine in this group--and of any we're aware of--that displays GIF images when they appear in a search results listing.

Other WWW Search Engines

You will also find Web search engines at Inktomi and HotBot. These sites offer basic search options and a quick search of fairly large databases. Inktomi's results include the number of times a word appears in a document and a summary of the page. URL's for other sites include:

Hot Bot - <http://www.hotbot.com>

Inktomi - <http://inktomi.berkeley.edu/query.html>

Directories

With a directory, you can browse categories, organized according to topics such as art, business, entertainment, humor, politics, science, and so on. Tired of surfing hyperlinks? Some directories offer much more than a list of Web sites. Looking for the perfect cup of coffee? A search for "coffee" on a Web index will bring up as many as 100,000 Web documents--any page containing the word "coffee" in any context. You could narrow your search by adding search terms--or you could try your search in PointCom's Top 5% of the Web. Your results will be far fewer and will include only sites reviewed and chosen by Point as being the best of the Web. Other directories, such as The Whole Internet Catalog, also screen submissions and accept only better-quality sites.

Magellan

Access: <http://www.mckinley.com>

McKinley's Magellan Internet Directory gives you another kind of quality control over your search results. It rates many of its Web sites using a scale of one to four stars. You can narrow your search to sites with a minimum rating of, say, three stars. You also can exclude sites with mature content by searching for "Green Light" sites only. Or you can extend your search to Magellan's larger database of not-yet-reviewed sites. Other directories, instead of rating Web sites, simply indicate which are the most often visited.

Yahoo

Access: <http://www.yahoo.com>

Yahoo is the largest and most popular directory. Search for anything in Yahoo and the results are listed by category, so that you can immediately see if a site is relevant to your search terms. Its list of sites is arranged hierarchically, with so many topics, subtopics, and sub-subtopics that you'd easily get lost, if not for Yahoo's smart search form, which can search all of Yahoo or only one particular subject area.

The Whole Internet Catalog

Access: <http://nearnet.gnn.com/wic/>

The Whole Internet Catalog includes interviews, articles, news, book excerpts, literary reviews, a business directory, a directory of personal home pages, and more. In addition to its NetDirectory, Excite presents national and international news, weather, opinion columns, and cartoons. Business directories help you locate products or services--similar in function to telephone Yellow Pages. Some of these business listings have associated Web pages. The largest of the business directories is Nynex's Interactive Yellow Pages, containing more than 16 million entries.

Apollo's Business Directory

Access: <http://apollo.co.uk>

Apollo's business directory is international and can be searched by country, state, or type of business. Other searchable business directories include New Rider's Official WWW Yellow Pages, Linkstar, World Wide Yellow Pages, and Virtual Yellow Pages.

What's New on the Internet

Web indexes are an indispensable tool for searching the Net. But suppose you want to visit the newest Web sites. It takes anywhere from several days to several weeks for a new site to appear in a Web index. To find the very newest sites, you'll need to use a "What's New" directory of Web sites (see What's New). Submissions to these sites take only hours to be posted. What will you find there? Everything and anything. The newest of the new on the Web can be found at:

Starting Point--New

Access: <http://www.stpt.com/new.html>

Starting Point's New list is a grab bag of the best and worst of new Web sites.

What's New Too

Access: <http://newtoo.manifest.com>

What's New Too prides itself on not filtering or rejecting any announcements of new sites. With What's New Too you can search the past day, past week, or all past announcements in its database. You also can create a customized set of new site announcements from specific categories to view on a daily or weekly basis. Thousands of new sites are added to the Web every day. NCSA's What's New is, therefore, understandably choosy about which new sites it promotes. It reviews sites and chooses mainly multilevel content-rich sites (without sexually explicit content) that are new or newly updated. The review process delays the posting of a site by one or two weeks.

E-Mail Addresses

Looking for somebody? Maybe he or she has an e-mail address.

Four11 Directory

Access: <http://www.four11.com>

Four11 Directory is a free database of more than three million e-mail addresses and personal Web pages. Anyone can search Four11, but if you register you can access additional search features, such as searching for someone by an old e-mail address. Four11 also offers Web pages and a membership upgrade for a fee. Additional search features for paying members include a sleeper search, which checks the newest entries to the database for up to the next year. If and when your search is successful, you are notified by e-mail.

LookUp

Access: <http://www.lookup.com/lookup/search.html>

LookUp is another e-mail address database that's smaller than Four11 but offers more features available for free. Registered members can perform advanced searches and add their own personal Web pages at no charge.

Gopher Archives

From William Shakespeare to Jane Austen, from Frankenstein to Peter Pan, complete texts of books, poems, and other literature can be found on numerous Gopher servers--almost always in no-frills plain text. You can also find documents of lesser fame--articles and information and writings of every kind. Gopher sites can be searched from many search engines. For people without access to the Web, Archie, Jughead, and Veronica are well-known Gopher search indexes. But take note, only directory and file names are indexed. It is therefore easy to find the works of Charles Dickens, or Alice's Adventures in Wonderland. But do you remember who authored that famous phrase, "No man is an island"? If you can't seem to recall the admittedly obscure title of that work, you'd go insane trying to find it by jumping from one Gopher menu to another. But a good Web index will quickly bring you to a Web page with "Devotions Upon Emergent Occasions," by John Donne.

Gopher - <gopher://gopher.unr.edu>

Archie - telnet to: <archie.rutgers.edu> or to <archie.sura.net> and log in as archie.

Galaxy - <http://galaxy.einet.net/gopher/gopher.html>

Software Search

There is a load of free software, not-quite-free software, demos, fixes, upgrades, and image files waiting on the Net

FTP

Access: <http://129.241.190.13/ftpsearch/>

You can search out and download any of thousands of freeware and shareware programs located on FTP servers around the world. How do you find the right stuff? Start with FTPsearch. Its easy to use, has plenty of search options, and covers more than 3,000 FTP sites around the world. Pop-up menus allow you to set search parameters and format the results. With more than seven million unique file names in the index, you can find just about any file at an FTP site--but only if you have some inkling as to the file's name. FTPsearch only searches on file names, not on the path nor a description of the file's contents.

Snoobie

Access: <http://www.snoobie.com>

Snoobie claims to have the fastest search of any FTP index. Snoobie is fast, but that's partly because it provides virtually no search options and only spartan results. Only one search term is allowed. You cannot use operators, nor can you make the search case-sensitive. The results list only the file name and size. Snoobie's index, which also includes directory headings, contains more than 5.6 million names. It's perhaps the fastest, but not the best site for an FTP search.

CNET (Virtual Software Library)

Access: <http://www.shareware.com>

If it's software you yearn for, go directly to c|net's shareware.com. Something of a misnomer, shareware.com also includes freeware, demos, upgrades, and the like. Its archives contain more than 175,000 files of software. What this database lacks in size it makes up for in ease of use. Its search options are the best of any FTP search site. You can search by file description as well as by file or directory name, use operators, match case, and limit by file creation date. Shareware.com, formerly known as the Virtual Software Library, also lets you browse its newest arrivals, most popular downloads, or entire database. Try out its e-mail newsletter, Shareware Dispatch. It's free and can be customized to a particular platform.

Jumbo

Access: http://www.jumbo.com/Home_Page.html

Jumbo lets you browse or search through several categories of software, including business, words and graphics, programming, utilities, and games. At the opposite end of the spectrum from Snoobie and FTPsearch, Jumbo provides full program descriptions to read before downloading.

Newsgroups

The strength of Usenet News is also its weakness--anyone can post anything. That's why you need a good Usenet search tool to separate the wheat from the chaff.

DejaNews

Access: <http://www.dejanews.com>

The best Usenet search options come from DejaNews. You can limit a search to certain newsgroups or authors, specify a precise range of dates, or merely bias your search towards newer or older articles. DejaNews has one of the most powerful searches of newsgroups available, yet power-user options are promised soon.

Sift

Access: <http://sift.stanford.edu>

Alta Vista's advanced Usenet search also is powerful; it can search "from" and "subject" headers as well as keywords, summaries, and specific newsgroups. Excite and InfoSeek Guide have good Usenet searches as well. Each one allows you to extend a search to similar articles with a single click of the mouse. Frequent newsgroup readers will want to check out SIFT, a free personalized Usenet filtering service from Stanford's Digital Library Project. Newsgroup articles are filtered by topics you specify and combined onto a single Web page.

Metasearches

Ideally, a metasearch Web site would allow you to send a single query to multiple databases simultaneously, then retrieve, combine, and organize the results. This is more myth than reality. The majority of metasearches can query multiple databases, but only one at a time.

SavvySearch

Access: <http://www.cs.colorado.edu/~dreiling/smartform.html>

SavvySearch is the amazing exception to the rule. It can perform parallel searches on up to five databases at once. Results are retrieved and combined on one page, with duplicates eliminated. That alone would make it one of the better metasearches. But wait, there's more! SavvySearch uses your search terms, its own data about past searches, and other factors to create a Search Plan. Up to 21 search engines are ranked and grouped according to their anticipated usefulness to your query. Click on any group to perform additional parallel searches. There's nothing else like it on the Net. There are numerous sites that combine several search forms onto a single page, which is convenient but not indispensable. Of these, two stand head and shoulders above the rest.

All-in-One Search Page

Access: <http://www.albany.net/allinone/>

The All-in-One Search Page places more than 200 basic search forms on one Web site, but you must enter your query repeatedly into each search form. Searches are performed individually.

Internet Sleuth

Access: <http://www.intbc.com/sleuth/sleuth.html>

Internet Sleuth has the largest, most comprehensive collection of searchable databases on the Net--more than 900 of them. Of particular interest are the hundreds of specialized databases--everything from a computer industry events directory to Civil War photos. Lost contact with your favorite expert on *Homo sapiens neanderthalensis*? Try a search on its worldwide e-mail directory of anthropologists. Feeling a little uneasy about that strange plant Aunt Edna gave you for your birthday? Better check the carnivorous

plants database. Other searchable databases include recent AIDS patents, Bartlett's Familiar Quotations, and abstracts from numerous American Medical Association journals. Internet Sleuth is one of the best Web sites for locating specialized information.

You might also want to check out:

CUSI--Configurable Unified Search Interface - <http://www.eecs.nwu.edu/susi/cusi.html>

MetaSearch - <http://metasearch.com>

Searchers - <http://gagme.wva.com/~boba/search.html>

Starting Point MetaSearch - <http://www.stpt.com/search.html>

W3 Search Engines - <http://cuiwww.unige.ch/meta-index.html>

W3 Catalog - <http://cuiwww.unige.ch/w3catalog>

Mega Tools

Lately, it seems the only thing growing faster than the World Wide Web itself is the catalog of tools for locating information on the Web. Actually, with seven major search engines, two super-directories, and a wide assortment of encyclopedic databases already online, searching the search sites is fast becoming an important art (or science) in its own right. Indeed, some tools for multi-site searching already are available. A modest investment in software--or in learning a new service--can enhance the results of your search efforts, saving you time even as it expands the scope of the Internet resources you draw upon.

Local Tools

WebCompass 1.0

One of the most ambitious tools is Quarterdeck Corp.'s WebCompass 1.0, a search agent that broadcasts your query to Yahoo, WebCrawler, and Open Text in one operation. Once you've installed the software and connected to the Internet, you can perform searches, saving the results locally and having them updated automatically. In addition to saving you the trouble of switching from site to site, the reports eliminate duplicate matches.

WebCompass 1.0 (\$139) processes searches via CGI scripts and requires users to install HTTP server software (included on the disk). The installation isn't nearly as difficult as configuring a full Web server, but troubleshooting problems can be tricky. The new WebCompass Personal Edition is much simpler to use and searches Lycos, Yahoo, WebCrawler, and InfoSeek (you can download evaluation copies from Quarterdeck; purchase price is \$40). In the CD-ROM version, you see only search results from each site, while the Personal Edition also returns ads that appear at sites.

Squrl

Squrl (an acronym for Search and Query Uniform Resource Locator) from Blue Squirrel aims at doing pretty much the same job as WebCompass, but offers the software on a mix-and-match basis. You can buy modules for Alta Vista, Excite, Lycos, Open Text, and a number of Web directories at \$5 each, or collect the entire set for \$49. You can store Squrl results in an HTML page, which makes it possible to develop a self-updating Web site that tracks a topic.

Online Tools

Several Web-based super-search services have recently become available. They're as easy to use as the Web search engines reviewed in this roundup, but they combine multiple databases in a single search.

NlightN

NlightN allows you to perform any search using its meta-engine for free. However, if the results are in one of its many proprietary databases, you'll have to charge it to an NlightN account before you can see the full text. If your results are in the service's free databases, you can see it at no charge. Charges for individual articles begin at 10 cents. Knight-Ridder News Service, the National Library of Medicine, and Business Wire are among the databases offered by NlightN. While NlightN offers the Lycos search engine as part of its free service, you don't actually see the Lycos database when you use NlightN; instead, you see a text summary of the Lycos results.

InfoMarket

IBM is in the process of building InfoMarket as an information mecca. Right now, you can register for free access to a variety of Web search tools and database searches, but IBM says it will begin to charge for the services at some unspecified time in the future. A search on InfoMarket encompasses Open Text, Yahoo, Hoover's Business Resources, Newsbytes (a computer-industry news service), Usenet News, the CIA World Factbook, and more. You can choose to have results displayed either by relevance score or grouped by source. InfoMarket searches are fast--equivalent to a search on just one of the databases on its own.

IBM isn't ready to discuss the fees it will charge, but it plans to introduce a new technology called "cryptolopes" (as in "encrypted envelopes") that will deliver copyrighted information to users for a nominal fee. In this scheme, IBM will act as an intermediary, collecting royalty fees for publishers and passing them along. The cryptolope will be encapsulated in a protected format to ensure that the copyrighted material is not freely distributed. If the scheme gains acceptance, InfoMarket is likely to add new publishers in short order.

The Perfect Search Tool

... doesn't yet exist. And as the Web grows, changes, and evolves, users will require more sophisticated search tools. Complexity on the Net seems to increase in logarithmic proportion to the number of sites. Twice as many sites may produce an Internet that is 10 times more complex because the sites are all interrelated. And with the number of Internet hosts more than doubling each year, even a so-called advanced search on a Web index may soon be insufficient to navigate the complexity. On the horizon are more sophisticated agent technologies. But for the present, you can usually find what you're looking for--assuming it's out there--with Web indexes, directories, and a few other search tools. Seek and ye shall find.

Other WWW Resources:

Internet World

Access: <http://www.mecklerweb.com>
Provides online articles and information from Internet World magazine.

Pathfinder

Access:

<http://pathfinder.com>

Pathfinder is a new Web site created by Time Warner. Their goal is to seek new ways to inform and be informed, entertain and be entertained. Pathfinder's goal is to be the future home of the largest Internet collection of news and entertainment producers, among them TIME, Warner Brothers, Sports Illustrated, People and more.

GENERAL POLLUTION PREVENTION SITES

Center for Technology Transfer and Pollution Prevention (CT2P2)

Access: <http://ingis.acn.purdue.edu:9999/cttpp/cttpp.html>
The CT2P2 has developed a series of over 30 PC-based computer programs on various aspects of the environment and pollution prevention. These downloadable programs include topics on groundwater education, management of domestic wastes, and pesticide storage

Department of Defense (DOD) P2 Tech Library

Access: http://clean.rti.org/larry/nav_in.html
This site is actually part of EnviroSenSe. It contains a variety of P2 information including data sheets on electroplating and finishing, hazardous materials/hazardous management, ozone depleting substances, painting/depainting, petroleum, oils, lubricants, and more. The purpose of the Tri-Service Pollution Prevention Opportunity Handbook is to identify available "off-the-shelf" pollution prevention (P2) technologies, management practices, and process changes that will reduce the amount of hazardous waste and solid waste being generated at Tri-Service industrial facilities. The handbook was prepared by the Naval Facilities Engineering Service Center (NFESC), under the direction of the Office of the Chief of Naval Operations (CNO-N45) and the Naval Facilities Engineering Command (NAVFAC); the Air Force Center for Environmental Excellence (AFCEE), and the Army Environmental Center (AEC).

EcoMall

Access: <http://www.ecomall.com/>
EcoMall contains information on renewable energy and "environmentally friendly" products.

Environmental Information Resources at George Washington University

Access: <http://gwis.circ.gwu.edu/~greenu/indexz>
Provides one-stop access to a broad range of environmental information including P2 and environmentally conscious manufacturing. Participants include US Green Building Council and Public Technology, Inc.

EnviroSenSe

Access: <http://es.inel.gov/>
EnviroSenSe, funded by the US EPA and the Strategic Environmental Research and Development Program (SERDP--a joint effort of DOD, DOE, and EPA), allows those implementing pollution prevention programs or doing research and development projects to benefit from the experience, progress, and knowledge of their peers. Its features include: a pollution prevention forum for all levels of government, researchers, industry, and public interest groups; Solvent Umbrella, a solvent alternative information guide; ASK EPA, an interactive forum for P2 questions; a directory of federal, state, and local P2 programs; international resources; technical/research and development information; and compliance and enforcement information. Industry content guides for the commercial printing and graphic arts, electronics assembly and manufacturing, iron and steel foundries and metal finishing sectors have recently been developed.

EPIC (Energy Pollution Prevention Information Clearinghouse)

Access: <http://146.138.5.107/EPIC.htm>

The purpose of EPIC is to facilitate the exchange of U.S. DOE pollution prevention information between DOE sites, state and local governments, and private industries. It includes a file listing of DOE-specific P2 information and a calendar of upcoming DOE-sponsored conferences, meetings, and training events related to pollution prevention.

Green Engineering WWW Servers (Environmentally Conscious Design & Manufacturing Lab)

Access: http://ie.uwindsor.ca/other_green.html

This site lists academic sites and research centers related to environmentally conscious design and manufacturing.

Hazardous Materials Management: The Canadian Publication of Pollution Prevention and Control

Access: <http://www.io.org/~hzmatmg/>

This site is an online Canadian P2 journal.

Illinois Waste Management and Research Center (WMRC)

Access: <http://www.inhs.uiuc.edu/hwric/hmlhome.html>

A division of Illinois' nonregulatory environmental agency, and the Department of Energy and Natural Resources, WMRC services include clean manufacturing and pollution prevention technical assistance. An online publications listing is available.

Industrial Productivity and Energy Assessment

Access: <http://oipea-www.rutgers.edu/>

This site features P2 and waste minimization research activities currently underway in the areas of soy-based inks, waste assessment data tracking issues, and alternative P2 implementation techniques.

National Pollution Prevention Center for Higher Education (NPPC)

Access: <http://www.umich.edu/~nppcpub/nppc.html>

Created by US EPA and based at the University of Michigan, NPPC collects, develops, and disseminates educational materials on pollution prevention. The target audience is primarily academia.

National Pollution Prevention Roundtable (NPPR) Pollution Prevention Yellow Pages

Access: <http://es.inel.gov/nppr/nppr-yps.html>

This is an update to the Directory of State and Local Pollution Prevention Programs, published in 1994. This directory provides a listing of organizations and contacts that are sorted by state.

Northeast Business Environmental Network (NBEN)

Access: <http://nben.org/>

NBEN Online provides information on environmental activities in the Northeast including current notices, calendar of events, compliance tips, case studies, and online reference services, as well as discussion groups for businesses in the Northeast United States.

Pacific Northwest Pollution Prevention Research Center (PPRC)

Access: <http://pprc.pnl.gov/pprc/>
While primarily focused on the Pacific Northwest, PPRC provides information on pollution prevention research activities and funding opportunities throughout the U.S., including a publications listing. This site also includes access to a searchable pollution prevention research projects database, a funding clearinghouse, and back issues of their newsletter.

P2 Gems

Access: <http://www.uml.edu/TURI/index.html>
P2 GEMS is an internet search tool for facility planners, engineers and managers who are looking for technical and process/materials management information on the Web. Over 125 sites with information valuable to toxic use reduction planning and pollution prevention have been selected and catalogued for easy use. P2 GEMS are Web locations accessed by key words or by selection of one of four categories: product/industry, chemical/waste, process, or management tools.

P2Tech - Pollution Prevention Archives

Access: <http://www.great-lakes.net/lists/p2tech/search.html>
P2TECH provides access to P2 files on a variety of subjects. This information was generated from the P2TECH listserv. This information is not available in hypertext.

Tellus Institute

Access: <http://www.tellus.com>
A non-profit research and consulting organization devoted to resource management and environmental issues. Includes P2 information on total cost assessment and life-cycle assessment.

Toxics Use Reduction Institute (TURI)

Access: <http://www.turi.org>
The Institute was created to promote reduction in the use of toxic chemicals or the generation of toxic by-products in industry and commerce in the state of Massachusetts. The Institute works in conjunction with the Massachusetts Department of Environmental Protection and the Massachusetts Office of Technical Assistance. Many of the reports that TURI has developed are available in full-text format.

UC Berkeley's Center for Green Design and Manufacturing

Access: <http://euler.berkeley.edu/green/cgdm.html>
This site provides up-to-date information on UCB's Green Design program, which focuses on software and other design tools for the manufacturing industry. Summaries of past publications, current work and upcoming papers are provided.

UCLA's Center for Clean Technology (CCT)

Access: <http://cct.seas.ucla.edu/>
This site provides an overview of CCT's research programs. Pollution prevention research includes a strong focus on process industries and chemical engineering.

GENERAL ENERGY EFFICIENCY SITES

Alternative Fuels Data Center (AFDC) - National Renewable Energy Laboratory, U.S. Department of Energy

Access: <http://www.afdc.nrel.gov/>
The AFDC collects operating information from vehicles (in programs sponsored by the Alternative Motor Fuels Act) running on alternative fuels, analyzes those data, and makes them available to the public. Data is also available for the Biofuels Information Center and the Clean Cities program.

DOE--Energy Efficiency and Renewable Energy Network

Access: <http://www.eren.doe.gov/>
This site offers hundreds of pages of information from the DOE's 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 technology. A search engine is provided.

Electric Power Research Institute (EPRI)

Access: <http://www.epri.com/>
The mission of EPRI is to discover, develop, and deliver high value technological advances through networking and partnership with the electricity industry. It includes a list of technical business groups, databases, news, and links to other related information sources.

Energy Analysis and Diagnostic Center (EADC)--Industrial Assessment Database at Rutgers University

Access: <http://128.6.70.23/>
This site contains databases and other information relating to pollution prevention including an industrial assessment database.

Energy and Environment--Division of Lawrence Berkeley Laboratory

Access: <http://eande.lbl.gov/EE.html>
This site contains information on energy efficiency and building design. The site also includes a catalog containing profiles of environmental & energy related technologies and intellectual property available for commercialization, licensing, and sale; information on opportunities for technology transfer and research & development within the greater New York; and a contact list of people involved in Technology Transfer in New York State.

Environmental and Energy Technology Exchange

Access: http://www.eba-nys.org/ex_dir3.html
The primary function of this site is to expedite the transfer of new environmental and energy technologies by providing quality information on new technologies for buyers or investors. The site helps facilitate new research opportunities and partnerships between researchers and industry by providing information on research programs and opportunities.

Oak Ridge National Laboratory Energy Efficiency and Renewable Energy Program
Access: http://www.ornl.gov/ORNLEff/Energy_Eff.html
Oak Ridge National Laboratory's Energy Efficiency and Renewable Energy Program conducts research and development in the field of sustainable energy technology. This site features descriptions and news about their programs; it also contains search engines and databases.

Rocky Mountain Institute (RMI)
Access: <http://www.rmi.org/>
RMI is a nonprofit research and educational foundation with a mission to foster the efficient and sustainable use of energy and natural resources as a path to global security. It conducts research and publishes reports on a variety of topics including energy, water, and transportation.

The Office of Industrial Productivity and Energy Assessment (OIPEA)
Access: <http://128.6.70.23/>
This site contains databases and other information relating to pollution prevention including an industrial assessment database.

Solstice (Internet Information Service of the Center for Renewable Energy and Sustainable Technology)
Access: <http://solstice.crest.org/>
Solstice is a site for energy efficiency, renewable energy, and sustainable technology information and connections, including several databases.

The Sustainable Energy Guide: International Resources for Energy Efficiency and Renewable Energy
Access: <gopher://gopher.igc.apc.org:70/00/environment/energy/usaaid>
This is an electronic text version of a paper that lists many organizations involved in energy efficiency and renewable energy. It is not in hypertext and accessibility is slow.

POLLUTION PREVENTION SITES BY INDUSTRIAL SECTOR

General Industry Information Sites

Industry.Net (On-Line Marketplace)

Access: <http://www.industry.net>

A shopping mall for the manufacturing industry where shoppers can communicate with vendors. Features an online directory of 180,000 U.S. manufacturers.

Internet Green Marketplace

Access: <http://www.envirolink.org/products/index.html>

The Marketplace is a complete listing of all businesses on the Internet that have passed a stringent screening process focussed on social responsibility. It includes business/nonprofit services, financial services, home and office supplies, and "green" gifts.

Internet Industry Resources

Access: <http://mfginfo.com/htm/industry.htm>

This site, an offshoot of Manufacturers Information Network, includes links to various industry resources, such as computers, financial information, petroleum reserves, and Internet newspapers.

Manufacturers Information Network

Access: <http://mfginfo.com/>

This site provides a complete source of information for industry and those services related to manufacturing; it also includes a search engine.

Manufacturing Resource and Information World

Access: <http://www.csiworld.com/jsm.htm>

This site, dedicated to the industry, art, and science of manufacturing, features a manufacturer's directory, equipment and machinery classified ads, software for manufacturers, manufacturing news and notes, and more.

PROCOR Technologies, Inc.

Access: <http://procor.misi.net/>

PROCOR Technologies, Inc. is a software and professional engineering services firm specializing in material waste prevention. Its mission is to provide software and engineering solutions to help industry cut production costs by reducing the generation of hazardous and solid material waste.

Thomas Register of American Manufacturers

Access: <http://www.thomasregister.com:8000>

This a database for product and service suppliers in 52,000 categories. It includes an on-line supply finder.

Aerospace

United Technologies Corporation (UTC)

Access: <http://www.utc.com/EHS/ehspage.html>

UTC provides a broad range of high technology products and services to customers in the aerospace, building, and automotive industries worldwide. Its divisions include Pratt & Whitney, Otis, and

Sikorski: This site provides information on the corporation's environmental policies and programs and applications of P2 in its manufacturing programs

Agriculture

Farm*A*Syst/Home*A*Syst

Access: <http://www.wisc.edu/farmasyst/>
Farm*A*Syst helps farmers and ranchers identify pollution risks from nitrates, microorganisms and toxic chemicals. Home*A*Syst reaches non-farmers that face pollution risks from faulty septic systems, pesticide use, petroleum leaks, and hazardous waste disposal.

Air Conditioning

Air-Conditioning and Refrigeration Institute (ARI)

Access: <http://www.ari.org/intro.html>
ARI is a voluntary, non-profit organization comprised of the manufacturers of air conditioning, refrigeration, and heating products. Information about ARI, consumer brochures, press releases, and a database on alternative refrigerants are available at this site.

Automotive

Chrysler Corporation

Access: <http://www.chryslercorp.com/environment/>
This site provides information on Chrysler's recycling and conservation programs, and on the company's efforts in building flexible-fuel vehicles.

Ford Motor Co. Recycling

Access: <http://www.ford.com/corporate-info/environment/Recycling.html>
This site provides information on Ford's automotive recycling program.

GreenLink

Access: <http://www.ccar-greenlink.org>
The Coordinating Committee for Automotive Repair (CCAR) has launched a multi-media environmental information center to serve all sectors of the automotive industry. Called CCAR-GreenLink™, this center offers quick access to important information on a variety of environmental issues these professionals encounter in their daily work.

Pollution Prevention in the Auto Industry

Access: <http://www.apaa.org/pollut.html>
As part of the Automotive Parts and Accessories Association's home page, this is a compilation of pollution prevention initiatives (P2 projects) by auto companies under the Auto Industry Pollution Prevention Project (Auto Project). The Auto Project is a partnership between the Michigan Department of Environmental Quality and Chrysler, Ford, and General Motors to focus pollution prevention efforts on persistent toxic substances that adversely affect the Great Lakes basin.

Chemical Industry

BASF Waste Reduction Program

Access: <http://www.basf.com/eco/respcare/pp/wastred.html>
This site contains the waste reduction programs that is currently used by BASF CORP

Calgon Corporation

Access: <http://www.calgon.com/>
Calgon is a leading producer and supplier of specialty chemicals and a provider of related services for water treatment, papermaking, cosmetics, surface treatment, and specialty biocides for various other industrial applications. Products, general information, and technical support resources are some of the things available at this site.

CHEM-A-LUBE

Access: <http://catalog.com/source/chemalube/>
CHEM-A-LUBE is a manufacturer of high-quality specialty lubricants and chemicals based in Pennsylvania. Products include a citrus degreaser and alternatives to chlorinated solvents.

Ciba-Geigy

Access: <http://www.ciba.com/cc/safetyenvir.html>
Ciba-Geigy provides a policy statement about the company's commitment to environmental responsibility.

Coatings

Manufacturing and Processing--Engineering and Technology

Access: <http://galaxy.einet.net/galaxy/Engineering-and-Technology/Manufacturing-and-Processing.html>
A link in the Galaxy server, this site features information on corrosion, metallurgical, and industrial engineering, paints and coatings, and quality control.

The Paint / Coatings Network

Access: <http://netheaven.com/~horizon/pcn/paitcot.html>
The Paint / Coatings Net is a collection of resources, companies, and people involved in the paint and coatings industry and related finishing fields.

PPG Industries-Environment

Access: <http://www.ppg.com/cgi-bin/genobject/19>
PPG Industries' Environmental, Health and Safety home page includes an outline of their efforts to promote pollution prevention, process safety, and employee health and safety.

Dry Cleaning

Corner Cleaner

Access: <http://www.pond.com/~hhorning/cleaners.html>
This site has been developed as a resource for garment industry. This site contains current and back issues of the garment industry trade journal *National Clothesline*.

Dry cleaning Website

Access: <http://www.pond.com/~hhorning/wetclean/>
This site provides access to a variety of articles, reports, demonstration projects involving alternatives to dry cleaning

Wet Cleaning Project

Access: http://www.cnt.org/sus_man/wet_cln.html
This site provides information on the Center for Neighborhood Technology's Wetcleaning project. It also provides technical information on wetcleaning and links to other drycleaning related sites.

Electronics

Electronics Manufacturing Productivity Facility

Access: <http://www.empf.org> or <http://www.engr.uipei.edu/empf/>
The Navy National Center of Excellence for electronics manufacturing. EMPF facilitates cooperation between government, industry, and academia to develop and transfer manufacturing technologies to increase domestic productivity in electronics manufacturing.

IBM

Access: <http://www.clearlake.ibm.com/ETS/>
This site provides information and policies about IBM's environmental commitments.

Entertainment Industry

The Recording Industry Environmental Task Force (RIETF)

Access: <http://www.econet.org/RIETF/>
RIETF is a group of individuals and corporations concerned about the recording industry's impact on the environment. It promotes the use of environmentally sustainable practices throughout the recording industry, including the areas of manufacturing, production, packaging, consumption and reclamation.

Hospitals

Great lakes P2 Centre, Health Care

Access: <http://www.cciw.ca/ppc/hot/health-care/intro.html>
This site includes waste reduction success stories, P2 guides, best management practices, workshop resources, fact sheets, handbooks, and mercury pollution prevention information for hospitals and medical facilities.

Metal Finishing

Finishing.com, the Home Page of the Finishing Industry

Access: <http://www.finishing.com/>
This site provides information about surface finishing, from anodizing to powder coating.

Metal Finishing - The On-Line Finishers Resource

Access: <http://www.Metal-Finishing.com>
Metal Finishing is a resource for suppliers, metal finishers, engineers, end-users, specifiers and other professionals that need metal finishing information. This site contains searchable databases for

company and product data along with related information for the metal finishing industry. New features include web pages for on-line catalogs, new products, announcements for developments in technology, classifieds for used equipment, chemicals, and metals, and much more.

The National Metal Finishing Resource Center

Access: <http://www.nmfrc.org/>
The National Metal Finishing Resource Center was created to serve the needs of the metal finishing industry and their technical assistance providers. The Center offers pollution prevention and compliance assistance information, and creates a forum for information exchange.

Mining **INFO-MINE**

Access: <http://www.info-mine.com/>
INFO-MINE is a commercial site geared to the mining industry and investors. Although registration appears to be required for full access, there is a great deal of information available without registration, much of it updated daily.

Petroleum Products

Petroleum Technology Transfer Council (PTTC)

Access: <http://www.msc.edu/pttc/>
PTTC was formed by the U.S. oil and gas exploration and production (E&P) industry to improve technology transfer to producers. It facilitates the transfer of E&P technologies for uses in environmental compliance.

Plastics

Polymers DotCom Home Page

Access: <http://www.polymers.com/dotcom/home.html>
Polymers DotCom performs an ongoing search of the internet to locate and index polymer/plastic resources, and to coordinate and publish the results of the searches in an easy to use WWW interface. It consists of a triumvirate web site formed from PDC Magazine, PolyContent and PolyLinks.

Printing

EnviroSenSe Printing Industry Content Guide

Access: <http://www.seattle.battelle.org/es-guide/print/print.htm>
This Content Guide provides you with several ways to navigate printing-related information contained in EnviroSenSe, including a list of Frequently Asked Questions (and answers!); a visual "road map" of the printing-related information in EnviroSenSe; and a subject index to pollution prevention information for printers. This guide identifies some of the key documents related to pollution prevention in printing and graphic arts. The Content Guides have been developed for EnviroSenSe by Pacific Northwest National Laboratory and Battelle Seattle Research Center.

GardnerWeb

Access: <http://www.gardnerweb.com>
GardnerWeb is the homepage of Gardner Publications. GardnerWeb provides access to its metal working and finishing industries related publications. Modern Machine Shop, Automotive

Production, and Products Finishing Vendors information, industrial events, and access to Hanser Gardner Bookstore are also available from this site

Pollution Prevention P2 for the Printing Industry

Access: <http://cmit.unomaha.edu/epa/epa.htm>

This site provides links to printing organizations and other printing resource for pollution prevention including ATSDR's list of chemicals with synonyms and a searchable Index of Material Safety Data Sheets (MSDS).

Printers' National Environmental Assistance Center (PNEAC)

Access: <http://www.inhs.uiuc.edu/pneac/pneac.html>

The Printers' National Environmental Assistance Center (PNEAC) was established in 1995 to provide environmental assistance to the printing industry. The main approach used by PNEAC is to improve communications and coordination among environmental technical assistance organizations and key printing industry associations.

RadTech International

Access: <http://www.radtech.com>

RadTech International North America is a nonprofit trade association with members from companies that supply UV/EB equipment, raw materials and formulated products, and other individuals interested in or involved in UV/EB curing technology.

Ribbon-Jet Tech, Online Printer Cartridge Recycling Instructions

Access: http://ie.uwindsor.ca/ccdm_info/recycle.html

Ribbon-Jet Tech is a Colorado company that supplies information on how to recycle printer ribbons, ink jet cartridges, and some Laser Jet toner cartridges.

Pulp and Paper-making

Alliance for Environmental Technology (AET)

Access: <http://aet.org/>

AET is an international alliance of chemical manufacturers and forest products companies dedicated to advancing the environmental performance of pulp and paper manufacturing. AET supports scientific research and educational efforts aimed at achieving a better understanding of--and developing solutions to--the environmental challenges facing the world's pulp and paper industry. Information includes on-line fact sheets, news releases, scientific studies about P2 technology in the pulp industry, and more.

Pollution Prevention in the Pulp and Paper Industry

Access: <http://aet.org/science/5reasons.html>

On this site, the Alliance for Environmental Technology (AET), provides a 1995 paper "Five Great Reasons Why We Care: The Pulp and Paper Industry's Virtual Elimination Strategy." The paper highlights and defines the industry's pollution prevention methodology; shows the implementation of the strategy to virtually eliminated dioxin loadings to the Great Lakes; documents eco-system recovery; and discusses prospects for continued progress. 800-476-5465

Pulp & Paper Magazine website

Access: <http://www.pulp-paper.com>
Pulp & Paper Magazine and its related newsletters, market research reports, factbooks, directories, and conferences are the most complete and up-to-date information sources available on the global pulp and paper industry today. It contains the latest technical data from pulp and paper mills, complete market statistics, or analysis of financial information on pulp and paper producers worldwide.

Pulp and Paper Industry Supplier Companies & Research Organizations

Access: <http://www.pulpandpaper.net>
Pulp and Paper.Net is designed to be an information and communication resource for pulp and paper producers. It offers product, chemical/additive, service, and supplier information specific to the pulp and paper industry.

Technical Association of the Pulp and Paper Industry (TAPPI)

Access: <http://www.tappi.org>
TAPPI is the world's largest technical association for the paper and related industries. Its primary goals are to advance technology in paper-related industries and to improve the performance of these industries' professionals. Information about TAPPI, memberships, services, events, and a publications listing (including on-line articles from the TAPPI Journal) is available.

Wood Use Reduction Campaign

Access: http://www.ran.org/ran/ran_campaigns/rain_wood/wood_con/index.html
This site contains information on wood alternatives, tree free paper, and green sources of construction materials.

Solvents

SAGE--Solvent Alternatives Guide (U.S. EPA)

Access: <http://clean.rti.org/>
SAGE (Solvent Alternatives Guide) provides information on solvent and process alternatives for parts cleaning and degreasing. It includes a comprehensive listing of existing and new cleaning technologies, ideas for minimizing waste, a listing of state technical assistance providers, and a process conversion checklist. SAGE is also accessible through EnviroSenSe.

Steel and Foundries

BASF Steel Drum Recycle Program

Access: <http://www.basf.com/chemicals/recycle.html>
This site contains information about how to participate in BASF Steel Drum Recycle Program through BASF Chemical Division and its distributors.

EnviroSenSe Iron and Steel Foundry Content Guide

Access: <http://www.seattle.battelle.org/es-guide/iron/iron.htm>
This Content Guide provides you with several ways to navigate printing-related information contained in EnviroSenSe, including a list of Frequently Asked Questions (and answers!), a visual "road map" of the foundry-related information in EnviroSenSe, and A list of "core" pollution prevention documents of value to foundry operators. This guide identifies some of the key

documents related to pollution prevention in foundries. The Content Guides have been developed for EnviroSense by Pacific Northwest National Laboratory and Battelle Seattle Research Center.

Steel Making Resources On The Internet

Access: <http://www.mlc.lib.mi.us/~stewarca/steelmaking.html>

This site provides a list of steelmaking non-profit and government organizations, research centers, steelmakers, and steelmaking equipment suppliers.

WeldNet - Edison Welding Institute (EWI)

Access: <http://www.ewi.org>

Edison Welding Institute maintains its home pages for various programs within the Institute, as well as access to the WeldNet databases. EWI provides practical welding and joining solutions to the automotive, appliance, welding equipment, heavy manufacturing, electronics, medical aerospace, defense, primary metals, plastics, power generation and process industries.

Utilities

Electric Power Research Institute (EPRI)

Access: <http://www.epri.com/>

The mission of EPRI is to discover, develop, and deliver high value technological advances through networking and partnership with the electricity industry. It includes a list of technical business groups, databases, news, and links to other related information sources.

MSDS SITES

Chemical Safety Data

Access: <http://www3.uchc.edu/~safety/ehs/msds-1.html>

This site contains information on EPA Chemical Fact Sheets, MSDS Sheets for hundreds of chemicals, and the Environmental Health and Safety technical reference library.

MSDS On-line

Access: <gopher://gopher.chem.utah.edu/11/MSDS>

This site contains information on specific chemicals, the database is organized alphabetically.

University of Kentucky's MSDS

Access: <http://www.chem.uky.edu/resources/msds.html>

This site provides a listing of internet links related to Material Safety Data Sheets (MSDS).

DESIGN FOR ENVIRONMENT (DFE) & SUSTAINABLE DEVELOPMENT SITES

Carnegie Mellon University Green Design Initiative Home Page

Access: <http://www.ce.cmu.edu/GreenDesign/>

The Green Design Initiative is a major interdisciplinary research effort to make an impact on environmental quality through green design. The central idea of the initiative is to form partnerships with companies, government agencies and foundations to develop pioneering design, management and manufacturing processes that can improve environmental quality and product quality while enhancing economic development.

Center for Neighborhood Technology (CNT)

Access: <http://www.cnt.org/>

CNT, based out of Chicago, that promotes public policies, new resources and accountable authority which supports sustainable, just and viable urban communities. Program areas at CNT include transportation/air quality, sustainable manufacturing and recycling, and community energy.

CERES Global Knowledge Network

Access: http://www.cerc.wvu.edu/ceres/ceres_index.html

The primary mission of the CERES-GKN (CERES, for the Roman goddess of the Earth, and GKN for Global Knowledge Network) initiative is the creation of a loosely interconnected, globally distributed, and locally administered set of knowledge bases on environmentally sound product development processes to promote environmental sustainability. The GKN will be accessible through a variety of user interfaces to accommodate the diverse user community and will provide gateways to pay-for-use, proprietary knowledge sources. Once such a network is in place, it will enable any person involved in any stage of product/process development, regardless of geographic location, to make the most environmentally sound and economically justifiable choices. A prototype of CERES-GKN, based on the INTERNET and the World Wide Web (WWW), is currently under development by a consortium of universities, research laboratories and industrial organizations from around the world.

Global Futures Foundation

Access: <http://www.quiknet.com/globalff/globalfu.html>

This non-profit foundation focuses on systematically integrating programs that lead to source reduction, pollution prevention, low-cost market development, and market driven regulatory structures that tend to reduce both economic and environmental costs. It includes online articles and a publications listing.

IISDnet - International Institute for Sustainable Development

Access: <http://iisd1.iisd.ca/>

IISD works at the "cutting edge" tracking and collecting information about sustainable development activities, initiatives, and projects around the world. The Institute provides definitions, news, and a sourcebase for sustainable development.

Institute for Local Self-Reliance (ILSR)

Access: <http://www.ilsr.org/>
A nonprofit research and educational organization that provides technical assistance and information on environmentally sound economic development strategies. ILSR has information and publications on such issues as replacing petrochemicals with biochemicals and "green taxes."

National Cleaner Production Database (Australia)

Access: http://kaos.erin.gov.au/human_env/industry/ACPD2.html
Provides case study information on cleaner production measures used in a wide variety of industries in Australia. Database targets small to medium-sized businesses. Also see:
http://kaos.erin.gov.au/human_env/industry/ACPD.html.

Pollution Prevention by Design Project

Access: <http://p2.pnl.gov:2080/DFE/>
The U.S. Department of Energy, EM-77, Office of Pollution Prevention, Pollution Prevention by Design project, developed an integrated set of tools to help engineers, designers, and planners incorporate pollution prevention (P2) strategies into the design stage of new products, processes, and facilities. P2 by Design is managed through the Pacific Northwest National Laboratory (PNNL), which is operated by Battelle Memorial Institute for the U.S. Department of Energy (DOE).

Resource Renewal Institute (RRI)

Access: <http://www.rri.org>
RRI promotes Green Plans, which are long-term comprehensive environmental strategies, as the path to a sustainable environment and economy. RRI promotes partnerships between government and industry.

UC Berkeley Consortium on Green Design and Manufacturing

Access: <http://www.me.berkeley.edu/green/cgdm.html>
The Consortium on Green Design and Manufacturing (CGDM) is an interdisciplinary research initiative at the University of California, Berkeley and an industry/government/university partnership to develop linkages between manufacturing and design and their environmental effects and to integrate engineering information, management practices and government policy-making.

University of Windsor Environmentally Conscious Design and Manufacturing (ECDM) Infobase

Access: http://ie.uwindsor.ca/ecdm_info.html
This site includes links to the International Journal of ECDM, conference programs, publications, other "green engineering" www pages, email lists on environmentally conscious design, and an online abstract archive.

Yellow Mountain Institute for Sustainable Living

Access: http://www.pointcom.com/gifs/reviews/8_14b013.htm
This site offers an introduction to low-cost, sustainable building techniques, such as rammed-earth tire, straw-bale, and cordwood construction, and to a variety of alternative energy systems for builds

ISO SITES

14000 - IAS Environmental Management Systems (EMS) Registration and ISO 14000

Access: <http://www.gasweb.org/gasweb/ias/iso14000.htm>
This site provides an overview of the International Organization For Standardization (ISO) and the U S Technical Advisory Group (TAG). The page also explains ISO 14000, ISO 14001, and the Environmental Management System (EMS), and discusses the similarities and differences between ISO 14000 and ISO 9000. Other guidance documents, mission statements, work estimation processes and registration information are also provided.

EPA Standards Network

Access: <http://es.inel.gov/partners/iso/iso.html>
Produced as part of the EnviroSense program, this site offers an insight into the ISO standards from the US EPA. The site includes basic information on the ISO standards and their impact in the US. Also included are contacts for more information on the ISO.

Exploring ISO 14000

Access: <http://www.mgmt14k.com>
A primer to the ISO 14000, this site is produced by Management Alliances Inc.. Including features like FAQs, full text articles and the popular ISO 14001 pizza, the site covers ISO 14000 in depth and touches on ISO 9000 as well.

International Approval Services (IAS)

Access: <http://www.gasweb.org/gasweb/ias/iso14000.htm>
Environmental Management Systems (EMS) Registration Program and ISO 14000 Page
International Approval Services (IAS) Environmental Management Systems (EMS) Registration Program and ISO 14000 Page. IAS is an independent, third party registrar for ISO 9000 / QS 9000 and ISO 14000 management system standards.

ISO (International Organization for Standardization)

Access: <http://www.fokus.gmd.de/iso/entry.html>
ISO is a non-governmental organization consisting of national standards bodies from 100 countries. The mission of ISO is to promote the development of standardization and related activities in the world with a view to facilitating the international exchange of goods and services. ISO's work is published as International Standards.

ISO 14000 Info Center - Sponsored by Environmental Industry Web Site

Access: <http://www.iso14000.com/> or <http://www.iso14000.org>
In addition to an ISO 14000 Overview, this site provides a list of acronyms commonly used for ISO 14000, relevant articles and publications, business opportunities, discussion lists, and education and training information. The site also offers a list of certified companies and ISO Organizations.

Quality Management Institute (QMI)

Access: <http://www.pic.net/qmi/>
QMI, a division of Canadian Standards Association (CSA), has offered quality system registration services in North America since 1979. It has an internationally recognized auditor certification program that is compatible with RAB/IQA criteria.

Stoller ISO 14000 Home Page

Access: <http://www.stoller.com/iso.htm>
This site provides more information on ISO 14000 including "road map" diagrams, standards overview and description, issues and concerns, papers and presentations, training, and links to ISO 14000 resources.

Tom Tibor's ISO 14000: A Guide to the New Environmental Management Standards

Access: <http://www.brunel.ac.uk/depts/chem/advanced/resource/law.htm#stan>
Excerpted from a 1995 publication by Irwin Publishing, this document offers a clear overview of the topic and includes detailed information on the development of the standards.

AIR POLLUTION WEB SITES

Air and Waste Management Association (A&WMA)

Access: <http://www.awma.org/>
A&WMA is a nonprofit technical and educational organization with more than 16,000 members in more than 65 countries. It provides a neutral forum where all viewpoints on environmental management issues (technical, scientific, economic, social, political, and public health) receive equal consideration. Information about membership, publications, meetings, news, public outreach and more is available.

Air Pollution Database--AIRS

Access: <http://www.epa.gov/docs/airs/airs.html>
AIRS is a computer-based repository of information about airborne pollution in the United States and various World Health Organization (WHO) member countries. AIRS contains air quality, emissions, compliance, and enforcement information that EPA's Office of Air Quality Planning and Standards (OAQPS) and state agencies need to carry out their respective programs for improving and maintaining air quality.

Air Pollution Prevention Programs (e.g., Green Star)

Access: <http://www.epa.gov/docs/GCDOAR/OAR-APPD.html>
This site presents information on energy efficiency and P2 programs (e.g., Green Lights and Energy Star programs); also contains information on Methane Outreach programs; fact sheets and publications listing are available. A listing of US EPA's gopher resources is also available.

Atmospheric Pollution Prevention Division

Access: <http://www.epa.gov/docs/GCDOAR/OAR-APPD.html>
This site contains information on energy efficiency and P2 programs (e.g., Green Lights and Energy Star programs). It also contains information on Methane Outreach programs. Fact sheets and a publications listing are available.

Clean Air Act Amendments (CAAA)

Access: <http://www.rahul.net/sufive/enviro/cleanAir/CAAA.html>
This site provides information about the 1990 Clean Air Act Amendments including descriptions of Title I through Title V. Information about regulations regarding ozone, carbon monoxide, particulates, tail pipe emissions, emission reductions, and more is presented here.

The Wilson Group--Air Pollution

Access: <http://www-wilson.ucsd.edu/education/airpollution/airpollution.html>
This site provides a variety of information on air pollution including sources and effects.

WATER CONSERVATION SITES

WaterNet

Access:

<http://waternet.com/>

This site provides access to the online publications of *International Ground Water Technology* and *Water Technology*. Contains information on water-related equipment, services, software viewing tools, and water forums.

WaterWeb

Access:

<http://www.waterweb.com/>

WaterWeb is designed to provide water professionals around the world with a host of information regarding all facets of the water technology community.

WaterWiser (Water Efficiency Clearinghouse)

Access:

<http://www.waterwiser.org>

WaterWiser is a major source for water efficiency and water conservation information that includes a publications listing and links to other water-related resources on the Internet.

Woods Hole

Access:

<http://bramble.er.usgs.gov/intro/woodshole/whwebserver.html>

This site features information and links to New England's Woods Hole scientific community, including the Marine Biological Laboratory and the National Marine Fisheries Service.

RECYCLING & MATERIALS EXCHANGE SITES

Environmental Recycling Hotline

Access: <http://www.1800cleanup.org/>

On this site, information about recycling programs is organized by zip code.

Global Recycling Network

Access: <http://grn.com/grn/ora.html>

A comprehensive Internet recycling information resource that includes recycling directories, a reference library on recycling, and a stock page.

Green Sources of Construction Materials

Access: http://www.ran.org/ran/ran_campaigns/wood_con/wood_sources.html

A directory of listings for suppliers of innovative building materials and recycled/salvaged lumber, certification of "sustainably" produced lumber, and alternative housing builders.

Jay Stimmel's Recycling List

Access: <http://perseus.lanl.gov/PROJECTS/RECYCLE>

This site, maintained by Los Alamos National Laboratory (LANL), contains information on the recycling program at LANL, including batteries, cardboard, circuit boards, drums, film, Freon, gas cylinders, lead, fluorescent lights, mercury, metals, paper, photofinishing products, radioactive materials, rags, smoke detectors, solvents, telephone books, tires, toner cartridges, and wood pallets.

King County Recycled Procurement Program

Access: <http://homer.metrokc.gov/oppis/recyclea.html>

This site contains information on King County, Washington's recycling program, including information on their program, policy, and resource; construction and landscaping materials; office and automotive products; product experience; and links to related sites.

National Materials Exchange Network

Access: <http://www.earthcycle.com/g/p/earthcycle/>

This site provides a free local and international online marketplace for trading and recycling used and surplus materials and goods. With over 10,000 listings, the Network allows state waste exchanges and industrial and consumer users to immediately list or search among thirty categories of available and wanted items including scrap metal and surplus chemicals. There is no charge for the listing.

National Oil Recyclers Association (NORA)

Access: <http://www.webcom.com/~infoserv/customer/nora/welcome.html>

NORA encourages and promotes the proper recycling of used oil, oil filters, used antifreeze, and other automotive and industrial materials through education and the development of legislation and regulations at the federal, state, and local levels. Information about memberships, conferences, and regulatory alerts is available at this site.

The Ohio Recycling Information and Communications System (ORICS)

Access: <http://han6.hannah.com/ODNR/mainmenu.htm>

The Ohio Recycling Information and Communications System (ORICS) is a service of Rotunda, Inc. under an agreement with the Ohio Department of Natural Resources Division of Recycling and Litter Prevention. ORICS provides information on recycled-content products, recycling markets, and recycling publication.

Pacific Northwest Laboratory's Guide To Buying Green

Access: <http://www.pnl.gov:2080/esp/greenguide/>

This site contains the Pacific Northwest National Laboratory's *Green Guide*. The Green Guide provides user information, cost benefit assessment forms, glossary, recycled products and suppliers, reduce, reuse, recycle information, and regulations.

Recycler's World

Access: <http://granite.sentex.net:80/recycle/>

This site provides information on secondary or recyclable commodities, by-products, used and surplus items or materials, collectible items, exchange services and publications.

STATE GOVERNMENT SITES

California Environmental Protection Agency (Cal / EPA)

Access: <http://www.calepa.cahwnet.gov>
p2 info: <http://www.cahwnet.gov/epa/tox13.htm>
This site provides files, data, and information provided by Cal / EPA and affiliated organizations
Pollution prevention information is listed under the Department of Toxic Substances Control

California State Government Bulletin Board Services

Access: <http://www.ca.gov/gov/bbs.html>
This site contains a listing of descriptions of state bbs resources including the Air Resources Board, the CA Energy Commission and CA EPA. These bbs sites contain a variety of regulatory information, reports and directories.

California, Santa Barbara County Air Pollution Control District, Innovative Technologies Group

Access: <http://www.apcd.santa-barbara.ca.us/~apcd/itg.html>
ITG promotes the development, testing, and application of clean fuels and energy projects to reduce air pollution in Santa Barbara County. Projects are funded through cooperative partnerships involving various private and public participants. Information on various projects in this program (such as using compressed natural gas in buses) is available at this site.

Connecticut DEP's Bureau of Waste Management

Access: http://dep.state.ct.us/Waste_Management/index.htm
This site lists the Bureau's pollution prevention and source reduction responsibilities on the "Program Activities" page.

Environmental Council of States (ECOS)

Access: <http://sso.org/ecos/ecosweb.htm>
ECOS is the national non-profit, non-partisan association of state and territorial environmental commissioners. The mission of ECOS is to improve the environment of the United States by: providing for the exchange of ideas, views and experiences among states and territories; fostering cooperation and coordination in environmental management; and articulating state positions to Congress and the Environmental Protection Agency on environmental issues.

Georgia Department of Natural Resources - Pollution Prevention Assistance Division (P2AD)

Access: <http://www.state.ga.us/Departments/DNR/P2AD/>
The Georgia Pollution Prevention Assistance Division is a non-regulatory agency that helps Georgia companies reduce waste and increase efficiency through pollution prevention. This site includes draft reports, online newsletters, and a staff directory.

Hawaii High Technology Development Corporation (HTDC) Web Server

Access: <http://www.htdc.org/~dnr/divisions.html>
HTDC actively markets and promotes Hawaii as a site for high-technology applications, gives advice on policy and planning, and is a source of information on high technology activity in the State. HTDC is an agency of the State of Hawaii.

Illinois Environmental Protection Agency (IEPA), Office of Pollution Prevention (OPP)

Access: <http://www.epa.state.il.us/>

IEPA Office of Pollution Prevention provides technical and regulatory support to many Illinois companies to encourage pollution prevention efforts. Presently, this link only contains a description of OPP.

Illinois Waste Management and Research Center

Access: <http://www.hazard.uiuc.edu/wmrc/>

The Illinois Waste Management and Research Center (WMRC) is a division of Illinois' non-regulatory environmental agency, the Department of Natural Resources. WMRC is located in the Hazardous Materials Laboratory on the University of Illinois, Urbana-Champaign campus. WMRC's services include: clean manufacturing and pollution prevention technical assistance; research (basic and applied) support; information clearinghouse; waste management databases; and analytical laboratories.

Kansas State University Engineering Extension Pollution Prevention Institute

Access: http://www.oznet.ksu.edu/dp_nrgy/ppi/ppihome.htm

The goal of the Pollution Prevention Institute (PPI) is to assist small businesses efficiently and economically reduce and control their wastes. The institute uses a variety of tools to accomplish this goal. Through training seminars, workshops and presentations to industry groups, PPI staff deliver the philosophy and general techniques of pollution prevention to broad audiences. Through free, nonregulatory assistance, including confidential on-site assessments, institute specialists help businesses apply the philosophy and techniques to their specific situation. PPI specialists focus on cost-saving opportunities through a variety of strategies.

Kentucky Pollution Prevention Center

Access: <http://www.louisville.edu/groups/kppc-www/>

The Kentucky Pollution Prevention Center is Kentucky's statewide program helping small and medium-sized manufacturers to identify and implement pollution prevention. Their legislative mandate is to provide information and technical assistance to help Kentucky manufacturers to voluntarily reduce hazardous waste 25% by 1997.

Maine Department of Environmental Protection, Office of the Commissioner, Pollution Prevention and Permit Assistance

Access: <http://www.state.me.us/dep/p2home.htm>

This site appears to be under construction. It does include a P2 resource list containing information on solvent alternatives, vendor info, case studies, technology transfer, and more.

Massachusetts DEP - Toxics Use Reduction Program

Access: <http://www.magnet.state.us/dep/bwp/tura>

This site includes information on Massachusetts's Toxic Use Reduction Act. The site includes program information, program data, software, and other relevant program information. This site is part of the larger Massachusetts DEP site (<http://www.magnet.state.us>).

Michigan Department of Environmental Quality (DEQ) - Environmental Assistance Division (EAD)

Access: <http://www.deq.state.mi.us/ead/>
EAD's site contains a section on pollution prevention that includes information on the Great Printers Project, the Lake Superior P2 initiative, pollution prevention in the Great Lakes, and pollution prevention training.

Minnesota Technical Assistance Program

Access: <http://www.umn.edu/mntap>
The Minnesota Technical Assistance Program (MnTAP) is a free non-regulatory program that assists Minnesota businesses and industries with their environmental protection challenges.

New Jersey Technical Assistance Program (NJTAP)

Access: <http://www.njit.edu/njtap>
The NJTAP Site has information on the NJTAP program and includes information on specific industries and the self assessment compliance guide. In addition, the site contains search engines for New Jersey TRI information and their environmental search engine ENVIRO DAEMON.

North Carolina Division of Pollution Prevention and Environmental Assistance (DPPEA)

Access: <http://owr.ehnr.state.nc.us/>
The DPPEA Site Index includes a search feature that searches all the electronic text of site pages, including handouts and reference documents. The site contains over 200 paper handouts (and links to some electronic versions.) and over 8000 documents in the reference collection. The site also includes an index of available grants, calendar of events, career opportunities, and newsletters.

North Carolina Waste Reduction Resource Center

Access: <http://owr.ehnr.state.nc.us/wrrc1.htm>
This site contains information about sections in the Division: Solid Waste, Hazardous Waste, Superfund, and the Resident Inspectors program. This site will also become an access point for the Waste Reduction Resource Center (WRRRC - contact: Rudy Moerbach, 1-800-476-8686).

Ohio Environmental Protection Agency (Ohio EPA), Office of Pollution Prevention

Access: <http://www.epa.ohio.gov/opp/oppmain.html>
Ohio EPA's Office of Pollution Prevention provides general information, fact sheets, industry guides, and primary documents (e.g., legislation text and EPA reports) related to pollution prevention activities in Ohio. P2 information on topics ranging from electronic circuit boards to solvents is available. Links to other governmental and P2 sites are provided.

company and product data along with related information for the metal finishing industry. New features include web pages for on-line catalogs, new products, announcements for developments in technology, classifieds for used equipment, chemicals, and metals, and much more.

The National Metal Finishing Resource Center

Access: <http://www.nmfrc.org/>

The National Metal Finishing Resource Center was created to serve the needs of the metal finishing industry and their technical assistance providers. The Center offers pollution prevention and compliance assistance information, and creates a forum for information exchange.

Mining **INFO-MINE**

Access: <http://www.info-mine.com/>

INFO-MINE is a commercial site geared to the mining industry and investors. Although registration appears to be required for full access, there is a great deal of information available without registration, much of it updated daily.

Petroleum Products

Petroleum Technology Transfer Council (PTTC)

Access: <http://www.msc.edu/pttc/>

PTTC was formed by the U.S. oil and gas exploration and production (E&P) industry to improve technology transfer to producers. It facilitates the transfer of E&P technologies for uses in environmental compliance.

Plastics

Polymers DotCom Home Page

Access: <http://www.polymers.com/dotcom/home.html>

Polymers DotCom performs an ongoing search of the internet to locate and index polymer/plastic resources, and to coordinate and publish the results of the searches in an easy to use WWW interface. It consists of a triumvirate web site formed from PDC Magazine, PolyContent and PolyLinks.

Printing

EnviroSenSe Printing Industry Content Guide

Access: <http://www.seattle.battelle.org/es-guide/print/print.htm>

This Content Guide provides you with several ways to navigate printing-related information contained in EnviroSenSe, including a list of Frequently Asked Questions (and answers!), a visual "road map" of the printing-related information in EnviroSenSe, and a subject index to pollution prevention information for printers. This guide identifies some of the key documents related to pollution prevention in printing and graphic arts. The Content Guides have been developed for EnviroSenSe by Pacific Northwest National Laboratory and Battelle Seattle Research Center.

GardnerWeb

Access: <http://www.gardnerweb.com>

GardnerWeb is the homepage of Gardner Publications. GardnerWeb provides access to its metal working and finishing industries related publications. Modern Machine Shop. Automotive

FEDERAL GOVERNMENT SITES

Environmental Protection Agency (EPA) Sites

ACCESS EPA: An Environmental Directory

Access: <http://earth1.epa.gov/Access/>
ACCESS EPA is a directory of U.S. EPA and other public sector environmental information resources. It is a pathfinder to many major information sources, such as clearinghouses, hotlines, records, databases, models, and documents. In addition to providing an overview of more than 300 information sources, ACCESS EPA can lead to additional environmental information that is available through the contacts list.

Envirofacts

Access: http://www.epa.gov/docs/enviro/html/ef_home.html/
This is a US EPA relational database that integrates data from four major EPA program systems: Permit Compliance System (PCS), Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), Toxic Release Inventory System (TRIS), and Resource Conservation and Recovery Information System (RCRIS).

EPA Gopher Server

Access: <gopher://gopher.epa.gov/>
This server, WWW accessible, contains a broad base of environmental information directly available to the public. It is currently running in a "pilot" mode providing Gopher, WWW, FTP, and WAIS access routes to the same information. It includes information on press releases, EPA offices and regions, rules, regulations and legislation, science, research and technology, newsletters and journals, and more.

EPA WWW Server

Access: <http://www.epa.gov/>
This EPA WWW Server is being run as a prototype system to provide public access to EPA information. Information accessible through this site includes: general information about the EPA; press releases, calendar, announcements, and speeches; EPA offices and regions; citizen information; EPA initiatives, policy, and strategy documents; rules, regulations, and legislation; environmental test methods and guidelines; science, research, and technology; newsletters and journals; and software and databases.

Voluntary Partnerships Programs

Access: <http://www.epa.gov/partners/>
This site describes an array of programs that represent cooperative partnerships between businesses and other stakeholders and the EPA. Programs include: toxics reduction; reporting and efficiency; agriculture; global climate change; energy efficiency and conservation; state and local; solid waste; and compliance.

Pulp & Paper Magazine website

Access: <http://www.pulp-paper.com>
Pulp & Paper Magazine and its related newsletters, market research reports, factbooks, directories, and conferences are the most complete and up-to-date information sources available on the global pulp and paper industry today. It contains the latest technical data from pulp and paper mills, complete market statistics, or analysis of financial information on pulp and paper producers worldwide.

Pulp and Paper Industry Supplier Companies & Research Organizations

Access: <http://www.pulpandpaper.net>
Pulp and Paper.Net is designed to be an information and communication resource for pulp and paper producers. It offers product, chemical/additive, service, and supplier information specific to the pulp and paper industry.

Technical Association of the Pulp and Paper Industry (TAPPI)

Access: <http://www.tappi.org>
TAPPI is the world's largest technical association for the paper and related industries. Its primary goals are to advance technology in paper-related industries and to improve the performance of these industries' professionals. Information about TAPPI, memberships, services, events, and a publications listing (including on-line articles from the TAPPI Journal) is available.

Wood Use Reduction Campaign

Access: http://www.ran.org/ran/ran_campaigns/rain_wood/wood_con/index.html
This site contains information on wood alternatives, tree free paper, and green sources of construction materials.

Solvents

SAGE--Solvent Alternatives Guide (U.S. EPA)

Access: <http://clean.rti.org/>
SAGE (Solvent Alternatives Guide) provides information on solvent and process alternatives for parts cleaning and degreasing. It includes a comprehensive listing of existing and new cleaning technologies, ideas for minimizing waste, a listing of state technical assistance providers, and a process conversion checklist. SAGE is also accessible through EnviroSenSe.

Steel and Foundries

BASF Steel Drum Recycle Program

Access: <http://www.basf.com/chemicals/recycle.html>
This site contains information about how to participate in BASF Steel Drum Recycle Program through BASF Chemical Division and its distributors.

EnviroSenSe Iron and Steel Foundry Content Guide

Access: <http://www.seattle.battelle.org/es-guide/iron/iron.htm>
This Content Guide provides you with several ways to navigate printing-related information contained in EnviroSenSe, including a list of Frequently Asked Questions (and answers!), a visual "road map" of the foundry-related information in EnviroSenSe, and A list of "core" pollution prevention documents of value to foundry operators. This guide identifies some of the key

The Navy's Best Manufacturing Practices (BMP)

Access: <http://www.ornl.gov/orcmt.bmp/home.html>
The Navy's Best Manufacturing Practices (BMP) program team conducted a survey at the Department of Energy (DOE) - Oak Ridge Facilities operated by Martin Marietta Energy Systems, Inc. (MMES). The purpose of the Oak Ridge survey was to review and document its best practices and investigate any potential industry-wide problems. The BMP program will use this information as an initial step in a voluntary technology sharing process among the industry and government.

Department of Energy (DOE) Sites

Ames Laboratory Environmental Technology Development (ETD)

Access: <http://www.edt.ameslab.gov/>
As part of the U.S. 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.

DOE--Energy Efficiency and Renewable Energy Network

Access: <http://www.eren.doe.gov/>
This site offers hundreds of pages of information from the DOE's 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 technology. A search engine is provided.

DOE Office of Environmental Management (EM)

Access: <http://www.em.doe.gov/>
This DOE site features information and links to environmental management and pollution prevention at DOE. A direct link to pollution prevention information can be accessed at <http://www.em.doe.gov/polprev.html/>.

Office of Industrial Technologies (OIT) Home Page (U.S. Department of Energy)

Access: <http://www.nrel.gov/oit/oit.html> or <http://www.oit.doe.gov>
OIT is part of the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy. It creates partnerships among industry, trade groups, government agencies, and other organizations to research, develop, and deliver advanced energy efficiency, renewable energy, and pollution prevention technologies for industrial customers.

Office of Industrial Technologies (OIT) Chemicals Industry Team

Access: <http://www.nrel.gov/oit/Industries-of-the-Future/chemical.html> or <http://www.oit.doe.gov/IOF/chemicals/>
As part of OIT's Industries of the Future strategy, the Chemicals Industry Team was established as a partnership between OIT and the U.S. chemical industry to maximize economic, energy, and environmental benefits through research and development of innovative technologies.

MSDS SITES

Chemical Safety Data

Access: <http://www3.uchc.edu/~safety/ehs/msds-1.html>
This site contains information on EPA Chemical Fact Sheets, MSDS Sheets for hundreds of chemicals, and the Environmental Health and Safety technical reference library.

MSDS On-line

Access: <gopher://gopher.chem.utah.edu/11/MSDS>
This site contains information on specific chemicals. the database is organized alphabetically.

University of Kentucky's MSDS

Access: <http://www.chem.uky.edu/resources/msds.html>
This site provides a listing of internet links related to Material Safety Data Sheets (MSDS).

Environmental Pollution and Control WWW Sites

Environmental Pollution and Control

Access: <http://www.fedworld.gov/environ.htm>
A division of FedWorld, this site features links to various governmental agencies and laboratories.

FedWorld

Access: <http://www.fedworld.gov/environ.htm>
A one-stop location for locating and ordering U.S. government information. A service of the U.S. Department of Commerce's National Technical Information Service (NTIS), FedWorld provides a comprehensive central access point for locating and acquiring government information. A division of FedWorld, this site features links to various governmental agencies and laboratories related to environmental pollution and control.

Jet Propulsion Laboratory (JPL) Technology Transfer Home Page

Access: <http://www-techtrans.jpl.nasa.gov/>
This page includes the latest information on Jet Propulsion Laboratory Technology Transfer Programs, a directory of 825 technologies with 850 Technologists, 214 patents available for technology transfer and licensing, Technical Support Package listings, and new technologies available for technology transfer.

National Technology Transfer Center (NTTC)

Access: <http://www.nttc.edu/>
NTTC is the hub of a national network linking U.S. companies with federal laboratories to turn government research results into practical, commercially-relevant technology. Features include: gateways to federal laboratories and governmental agencies, and bulletin board services and databases relating to technology transfer.

Sandia National Laboratory

Access: http://www.sandia.gov/agil/home_page.html
This site allows government, industry, and academia to access and exchange information on the latest developments in agile and advanced manufacturing. Companies and organizations already participating in the site include Honeywell, General Electric, and University of California-Berkeley.

Space Power (SP-100) Technology for Commercial Applications

Access: <http://www.jpl.nasa.gov/sp100/sp100.html>
The SP-100 Project has recently completed the development of components for space reactor power systems. Although application of SP-100 is delayed until required for future NASA and/or Department of Defense missions, much of its technology is applicable to other commercial and military products. The devices include such varied items as high-conductivity heat transfer components, self-lubricating bearings, stress-relieving components, self-energized pumps, compact heat exchangers, high-strength bonding of ceramics to metals, high-temperature electrical coils, electrical insulators, thermometers, and high-temperature motors and generators.

Institute for Local Self-Reliance (ILSR)

Access: <http://www.ilsr.org/>
A nonprofit research and educational organization that provides technical assistance and information on environmentally sound economic development strategies. ILSR has information and publications on such issues as replacing petrochemicals with biochemicals and "green taxes."

National Cleaner Production Database (Australia)

Access: http://kaos.erin.gov.au/human_env/industry/ACPD2.html
Provides case study information on cleaner production measures used in a wide variety of industries in Australia. Database targets small to medium-sized businesses. Also see:
http://kaos.erin.gov.au/human_env/industry/ACPD.html.

Pollution Prevention by Design Project

Access: <http://p2.pnl.gov:2080/DFE/>
The U.S. Department of Energy, EM-77, Office of Pollution Prevention, Pollution Prevention by Design project, developed an integrated set of tools to help engineers, designers, and planners incorporate pollution prevention (P2) strategies into the design stage of new products, processes, and facilities. P2 by Design is managed through the Pacific Northwest National Laboratory (PNNL), which is operated by Battelle Memorial Institute for the U.S. Department of Energy (DOE).

Resource Renewal Institute (RRI)

Access: <http://www.rri.org>
RRI promotes Green Plans, which are long-term comprehensive environmental strategies, as the path to a sustainable environment and economy. RRI promotes partnerships between government and industry.

UC Berkeley Consortium on Green Design and Manufacturing

Access: <http://www.me.berkeley.edu/green/cgdm.html>
The Consortium on Green Design and Manufacturing (CGDM) is an interdisciplinary research initiative at the University of California, Berkeley and an industry/government/university partnership to develop linkages between manufacturing and design and their environmental effects and to integrate engineering information, management practices and government policy-making.

University of Windsor Environmentally Conscious Design and Manufacturing (ECDM) Infobase

Access: http://ie.uwindsor.ca/ecdm_info.html
This site includes links to the International Journal of ECDM, conference programs, publications, other "green engineering" www pages, email lists on environmentally conscious design, and an online abstract archive.

Yellow Mountain Institute for Sustainable Living

Access: http://www.pointcom.com/gifs/reviews/8_14b013.htm
This site offers an introduction to low-cost, sustainable building techniques, such as rammed-earth tire, straw-bale, and cordwood construction, and to a variety of alternative energy systems for builds.

INTERNATIONAL SITES

Australian Environment

Access: <http://kaos.erin.gov.au/>
A project of the Australian Department of the Environment, this site includes information on cleaner production and energy efficiency.

Central European Environmental Data Request Facility (CEDAR)

Access: <http://pan.cedar.univie.ac.at/>
CEDAR provides computing and Internet links to support international data exchange with the Central and Eastern European environmental community. It includes databases and links to other European environmental Web sites.

Ecologica E-TIP Database

Access: <http://ecologia.nier.org/index/html>
ECOLOGIA has designed the Environmental Technical Information Project (E-Tip) website as an annotated collection of the best environmental information resources on the Internet. The E-Tip User Guide describes the layout of the server and how best to locate information using E-Tip. Also available: an overview of E-Tip, criteria for inclusion in E-Tip, contact information for the various E-Tip offices, and answers to frequently asked questions about ECOLOGIA and E-Tip. This site is a guide to technical environmental information on the Net using keywords assigned by ECOLOGIA, including topics as toxic substance information, environmental health, waste management and pollution prevention, environmental legislation and policy, international treaties and global issues, environmental education, radiation issues, energy-related technologies, miscellaneous resources, and links to other information providers.

Environment Canada, Atlantic Region

Access: <http://www.ns.doe.ca/how.html>
This site provides information on Canada's environmental policies and programs (including P2).

Great Lakes Pollution Prevention Centre

Access: <http://www.cciw.ca/ppc/>
This site contains information on Canadian pollution prevention projects and contacts.

Material Management Institute (MMI)—Canada

Access: <http://www.globalx.net/mmi/>
MMI is the national organization in Canada dedicated to serving the professional development interests of Material Management professionals who are employed in the Federal Public Service. It is a forum for the exchange of ideas and experiences among material managers and others in government. Material management includes contracting, purchasing, material administration, inventory control, and warehousing.

Quality Management Institute (QMI)

Access: <http://www.pic.net/qmi/>
QMI, a division of Canadian Standards Association (CSA), has offered quality system registration services in North America since 1979. It has an internationally recognized auditor certification program that is compatible with RAB/IQA criteria.

Stoller ISO 14000 Home Page

Access: <http://www.stoller.com/iso.htm>
This site provides more information on ISO 14000 including "road map" diagrams, standards overview and description, issues and concerns, papers and presentations, training, and links to ISO 14000 resources.

Tom Tibor's ISO 14000: A Guide to the New Environmental Management Standards

Access: <http://www.brunel.ac.uk/depts/chem/advanced/resource/law.htm#stan>
Excerpted from a 1995 publication by Irwin Publishing, this document offers a clear overview of the topic and includes detailed information on the development of the standards.

GENERAL ENVIRONMENTAL INFORMATION SITES

Amazing Environmental Organization Directory

Access: <http://www.webdirectory.com/>
Amazing Environmental Organization Web Directory is a large exclusively environmental organization directory on the Web and includes sites from over 100 countries.

American Society for Quality Control (ASQC)

Access: <http://www.asqc.org/about.html>
ASQC is the leading quality improvement organization in the U.S. Its vision is to be the world's recognized champion and leading authority on all issues related to quality. Most of the quality methods now used throughout the world, including total quality management, were initiated by ASQC members.

CAMP (Cleveland Advanced Manufacturing Program)

Access: <http://www.camp.org>
CAMP supports manufacturers in the Great Lakes region by providing research, technology development and deployment, training and business assistance.

Canadian Institute of Chartered Accountants of Canada's Environmental Resources

Access: <http://www.cica.ca/new/pa/environ/envires.htm>
This site provides an annotated list of sites available on the World Wide Web that provide useful environmental and/or environmental accounting information.

The Cygnus Group

Access: <http://conch.aa.msen.com:70/0h/vendor/cygnus/about-cygnus-gopher.html>
The Cygnus Group helps businesses and other organizations integrate environmental concepts into their strategic planning, marketing, and communications activities. Particular emphasis is on helping companies successfully develop and effectively promote waste-preventing strategies, products, and packaging. Their Web site is designed to provide individuals and organizations with information regarding the most efficient and effective ways to reduce and conserve resources.

Ecogopher--Environmental Library Gopher

Access: <http://ecosys.drdr.virginia.edu/ecogopher.html>
A gopher server providing various environmental information.

EcoNet

Access: <http://www.econet.apc.org/econet/>
EcoNet serves organizations and individuals working for environmental preservation and sustainability. It contains subject categories ranging from acid rain to wildlife. Each category provides links to organizations related to the respective category.

WATER CONSERVATION SITES

WaterNet

Access:

<http://waternet.com/>

This site provides access to the online publications of *International Ground Water Technology* and *Water Technology*. Contains information on water-related equipment, services, software viewing tools, and water forums.

WaterWeb

Access:

<http://www.waterweb.com/>

WaterWeb is designed to provide water professionals around the world with a host of information regarding all facets of the water technology community.

WaterWiser (Water Efficiency Clearinghouse)

Access:

<http://www.waterwiser.org>

WaterWiser is a major source for water efficiency and water conservation information that includes a publications listing and links to other water-related resources on the Internet.

Woods Hole

Access:

<http://bramble.er.usgs.gov/intro/woodshole/whwebserver.html>

This site features information and links to New England's Woods Hole scientific community, including the Marine Biological Laboratory and the National Marine Fisheries Services.

Environmental Systems Research Institute, Inc. (ESRI)

Access: <http://www.esri.com/>
ESRI is dedicated to provide the leading geographic information systems (GIS) technology and services for public, private, and educational organizations. Along with product information, they also provide an explanation of GIS technology, including desktop mapping. A free GIS demo package is also available.

Environ/Net

Access: <http://www.teleport.com:80/~environ/>
Environ/Net provides an electronic index of companies and organizations engaged in providing leading technologies for environmental applications. The listing includes providers of products and services for environmental assessments, engineering, land use planning, hazardous waste cleanup, and other environmental requirements.

ESDX

Access: <http://www.esdx.org/esdhome.html>
ESDX is an industry association organized in 1990 on a nonexclusive, nonprofit basis to participate in setting standards for more cost-effective management information technology in environmental, health, and safety (EHS) activities. Member firms include software users and makers--all committed to the improved use of computer software and information technology in EHS applications.

Galaxy/EINET

Access: <http://galaxy.einet.net/>
Galaxy is a Webguide to worldwide information and services. It is divided into various topic areas including engineering/technology and government. It has links to thousands of sites.

Gil Friends and Associates - Journals and Newsletter

Access: <http://www.igc.apc.org/eco-ops/EQE/Periodicals/welcome.html>
This site is a list of "Journals and newsletters covering Clean Technology and Environmental Management, Pollution Prevention, and Total Quality Environmental Management.

Global Futures Foundation (GFF)

Access: <http://www.quiknet.com/globalff/globalfu.html>
GFF is an innovative environmental non-profit foundation. It focuses on systematically integrating programs that lead to source reduction, pollution prevention, low-cost market development, and incentive market driven regulatory structures that tend to reduce both economic and environmental costs. It features a publications listing and online articles.

Global Network for Environmental Technology

Access: <http://gnet.together.org/>
The Global Network of Environment and Technology (GNET) is the gateway to continually-updated information on innovative environmental technologies, business and news, with leads to marketing intelligence, financing and contracting opportunities. GNET seeks to promote sustainable development and environmental remediation through technological innovation, with a focus on commercializing U.S. Department of Energy Office of Science and Technology (OST), or EM-50, developed applications. Featuring moderated discussion forums as well as full-text search

The Ohio Recycling Information and Communications System (ORICS)

Access:

<http://han6.hannah.com/ODNR/mainmenu.htm>

The Ohio Recycling Information and Communications System (ORICS) is a service of Rotunda, Inc. under an agreement with the Ohio Department of Natural Resources Division of Recycling and Litter Prevention. ORICS provides information on recycled-content products, recycling markets, and recycling publication.

Pacific Northwest Laboratory's Guide To Buying Green

Access:

<http://www.pnl.gov:2080/esp/greenguide/>

This site contains the Pacific Northwest National Laboratory's *Green Guide*. The Green Guide provides user information, cost benefit assessment forms, glossary, recycled products and suppliers, reduce, reuse, recycle information, and regulations.

Recycler's World

Access:

<http://granite.sentex.net:80/recycle/>

This site provides information on secondary or recyclable commodities, by-products, used and surplus items or materials, collectible items, exchange services and publications.

Research Triangle Institute (RTI)

Access: <http://www.rti.org>
RTI is an independent research institute providing research and technical services to business and government. Environmental protection is one of their research priorities. Information about RTI's work in pollution prevention (including life cycle analysis and solvent alternatives), direct sulfur recovery process, and indoor air quality is available.

SOLUTIONS Software Corporation (SSC)

Access: <http://www.env-sol.com/>
SSC is an innovator in the publication of public-domain reference materials at low-cost while using state-of-the-art Search and Retrieval software. CD-ROM titles include TSCA Chemical Data Inventory, U.S. Code of Federal Regulations, and Chemical Substitutions and Chemical Compatibility Datafiles. Free online sites include U.S. Code and U.S. Federal Register

The Technology, Business and Environment Program at MIT

Access: <http://web.mit.edu/ctpid/www/tbe/>
The Technology, Business and Environment Program was founded to help companies meet the dual challenges of achieving environmental excellence and business success. The Program's mission is to elucidate a new preventive environmental management paradigm, centering on business practices and linking technological change with sound environmental management. Information is available on industrial ecology and design for environment.

The Whole Earth 'Electronic Link (The WELL)

Access: <http://www.well.com/>
The WELL is divided into 260 discussion areas called conferences on subjects including media, health, politics, and science. Full use of the WELL requires a paid membership.

World Library/GNET -Business and Industry - Companies: Environmental

Access: <http://www.scescape.com/worldlibrary/business/companies/enviro.html>
The World Library is an information service containing nearly 100,000 links. This specific portion of the library includes manufacturers of environmentally-friendly products, environmental consulting firms, manufacturers of pollution control equipment and more.

WWW Virtual Library - Environment

Access: <http://ecosys.drdr.virginia.edu/Environments.html>
This site provides a general subject listing that has links to several other environmentally-related sites. A specific listing of environmental sites is also available (<http://ecosys.drdr.virginia.edu/Envirlists.html>)

Illinois Environmental Protection Agency (IEPA), Office of Pollution Prevention (OPP)

Access: <http://www.epa.state.il.us/>
IEPA Office of Pollution Prevention provides technical and regulatory support to many Illinois companies to encourage pollution prevention efforts. Presently, this link only contains a description of OPP.

Illinois Waste Management and Research Center

Access: <http://www.hazard.uiuc.edu/wmrc/>
The Illinois Waste Management and Research Center (WMRC) is a division of Illinois' non-regulatory environmental agency, the Department of Natural Resources. WMRC is located in the Hazardous Materials Laboratory on the University of Illinois, Urbana-Champaign campus. WMRC's services include: clean manufacturing and pollution prevention technical assistance; research (basic and applied) support; information clearinghouse; waste management databases; and analytical laboratories.

Kansas State University Engineering Extension Pollution Prevention Institute

Access: http://www.oznet.ksu.edu/dp_nrgy/ppi/ppihome.htm
The goal of the Pollution Prevention Institute (PPI) is to assist small businesses efficiently and economically reduce and control their wastes. The institute uses a variety of tools to accomplish this goal. Through training seminars, workshops and presentations to industry groups, PPI staff deliver the philosophy and general techniques of pollution prevention to broad audiences. Through free, nonregulatory assistance, including confidential on-site assessments, institute specialists help businesses apply the philosophy and techniques to their specific situation. PPI specialists focus on cost-saving opportunities through a variety of strategies.

Kentucky Pollution Prevention Center

Access: <http://www.louisville.edu/groups/kppc-www/>
The Kentucky Pollution Prevention Center is Kentucky's statewide program helping small and medium-sized manufacturers to identify and implement pollution prevention. Their legislative mandate is to provide information and technical assistance to help Kentucky manufacturers to voluntarily reduce hazardous waste 25% by 1997.

Maine Department of Environmental Protection, Office of the Commissioner, Pollution Prevention and Permit Assistance

Access: <http://www.state.me.us/dep/p2home.htm>
This site appears to be under construction. It does include a P2 resource list containing information on solvent alternatives, vendor info, case studies, technology transfer, and more.

Massachusetts DEP - Toxics Use Reduction Program

Access: <http://www.magnet.state.us/dep/bwp/tura>
This site includes information on Massachusetts's Toxic Use Reduction Act. The site includes program information, program data, software, and other relevant program information. This site is part of the larger Massachusetts DEP site (<http://www.magnet.state.us>).

