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Management and Problem-Solving for Environmental Professionals

APRIL 1997

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What's Causing Your Indoor Air Problem?

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Dissolved Oxygen Analyzer



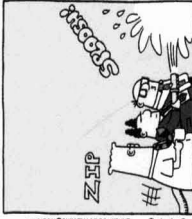
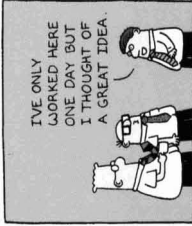
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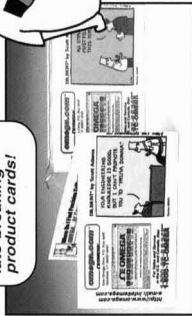


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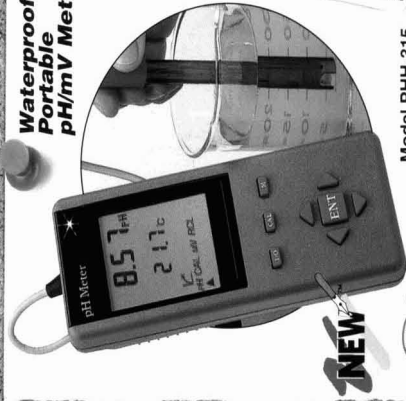


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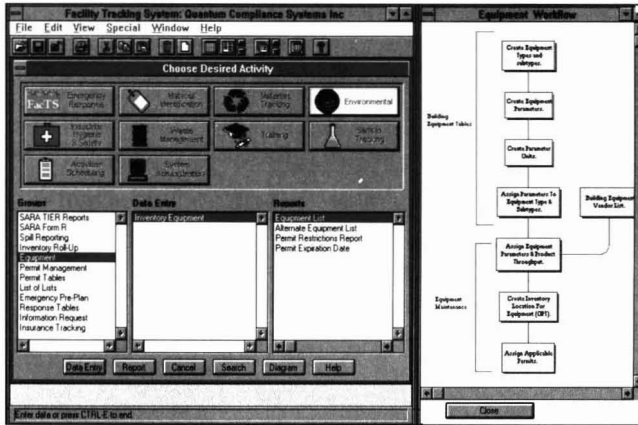
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About the cover:

The Occupational Safety and Health Administration estimated five years ago that as many as 1.2 million buildings and 70 million workers in the United States suffer from poor indoor air quality (IAQ). With new hermetically sealed buildings being constructed at a record pace, the number of occupants affected by sick building syndrome and building-related illnesses will certainly continue to grow. Two of this issue's articles focus on dealing with unhealthy IAQ, *Prevent "Sick Building Syndrome"* (page 14) and *Indoor Air Quality Problems Associated with Groundwater* (page 16).

Illustration by Mary Dewalt

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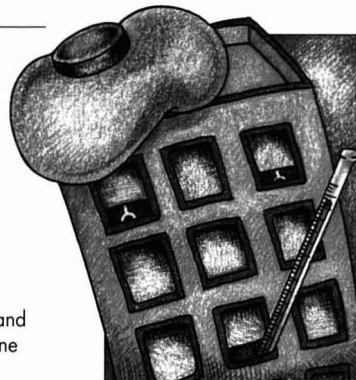
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Making House Calls on Ailing Buildings

Architects may soon need to take the Hippocratic oath, the ethical code physicians must follow in caring for their patients.

The reason? The epidemic of unhealthy buildings throughout the country with poor indoor air quality (IAQ) that adversely affects occupants. In today's society, we typically spend up to 90 percent of our time indoors, which is an estimated 70 percent of our entire life span. Many scientists now believe bad IAQ may pose a more serious health threat than outdoor air pollution, where traditional control efforts have been targeted.

Indoor pollution can be manifested in several ways. Sick building syndrome (SBS) is the condition in which at least 20 percent of the building occupants display symptoms of illness for more than 2 weeks and the source of the illness can't be positively identified. In contrast, building-related illness (BRI) is a condition in which the symptoms' cause is known, can be traced to a specific building source and is characterized by a distinguishable set of symptoms. Perhaps the most well-known BRI is Legionnaire's disease.

Most IAQ problems can usually be traced back to the energy efficient building designs of recent decades. In these buildings, indoor contaminants—like asbestos, chemicals from building materials, pesticides and cigarette smoke—are not diluted with fresh air and, consequently, their impact on people's health is compounded.

Sick buildings are costly for a number of reasons. Lost productivity and absenteeism often occur because employees don't want to work under such conditions.

But the greatest potential cost can result from building owners and managers being sued by plaintiffs who claim they've been harmed by indoor pollution. Some leading personal injury lawyers predict the present lack of federal statutes and Occupational Safety and Health Administration (OSHA) standards covering IAQ will lead to an increase in litigation and workers' compensation claims because injured parties will have no other recourse.

Currently, the prospect for federal IAQ legislation is slim and it's uncertain whether the OSHA standards on IAQ proposed in 1994 will be adopted any time soon. The only other protection for workers that now exists is the Occupational Safety and Health Act's general duty clause that requires employers to provide workplaces free of recognized hazards.

In light of potential lawsuits by injured occupants, it's best for building owners to have experts conduct an investigation immediately when a building-associated outbreak happens. Even though it's a construction-related problem, architects alone may not be able to successfully diagnose the cause and find a cure. Ideally, an investigation team should have professionals with expertise in architecture, mechanical engineering and industrial hygiene.

The IAQ investigation is normally divided into two phases: the facility and personnel investigation, which focuses on identifying possible sources, and the sampling and analytical strategy, which emphasizes characterizing the hazard level and determining the actual exposure of the occupants.

As IAQ problems continue to increase during the coming years, investigative teams will undoubtedly stay busy making house calls and prescribing remedies to take sick buildings off the critical list.

Angela Neville

Angela Neville, JD, REM
Editor, *Environmental Protection*

Environmental PROTECTION

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Environmental Protection

1997

Salary Survey

Please check the appropriate boxes and mail or fax back your response by May 31, 1997 to Angela Neville, Editor, Environmental Protection, P.O. Box 2573, Waco, Texas 76702-2573 • FAX (817) 662-7075.

All responses are confidential. Thank you for participating.

If you are willing to be interviewed for an article on salaries, add your name and phone number.

Which of the following job titles best describes your current position?

- Project Manager
- Trainer
- Scientist
- Engineer
- Health/Safety Supervisor
- Regulatory Compliance Specialist
- Consultant
- Other (please specify): _____

Which of the following describes your workplace?

- Manufacturing
- Utility
- Government
- Water Treatment Facility
- Municipal Landfill
- Academia
- Consulting Firm
- Other (please specify): _____

As part of your job, do you specialize in one of the following environmental areas?

- Hazardous Waste
- Solid Waste
- Air
- Water/Wastewater

- Health/Safety
- Other (please specify): _____

State in which you work:

Are you:

- Male
- Female

Age:

- 29 or younger
- 30-39
- 40-49
- 50 or older

How long have you been with your present company?

How long have you been in your current position?

What was your job title just prior to your current position?

How long did you work in this previous position?

What will your annual gross salary be for 1997? (Please estimate if you are not sure.)

Do you expect to receive a bonus/incentive for 1997?

- Yes
- No

If so, what do you estimate the amount of the bonus/incentive to be? (Please give a range if you are not sure.)

\$ _____

How many full-time personnel do you supervise?

- 1-5
- 6-10
- 11-20
- 21-50
- 51 or more

Certifications:

- PE
- PG
- REM

Name: _____

Telephone Number: _____

- CHMM
- CET
- CIH
- CSP
- REA
- CEP
- Other (please specify): _____

Highest educational degree:

- High school
- Bachelors
- Masters
- Doctorate
- Other (please specify): _____

Please state how many years of environmental work experience you have:

- 0-5
- 6-10
- 11-20
- 21 or more

Give us your comments about current trends you see impacting environmental professionals' salaries.

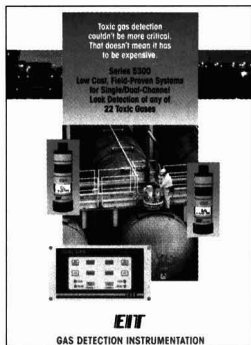
Check out some of EP's favorite catalogs, brochures, books and reports available this month.

SIMPLIFIED METHODS,
prepared reagents and



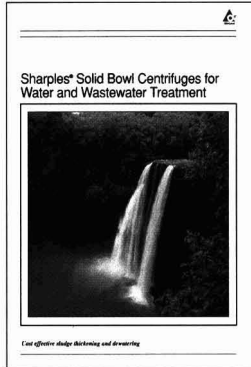
descriptive literature are the hallmarks of Hach products and catalogs. The 50th anniversary edition of the 1997 *Products for Analysis* catalog features products for water quality testing and new methods for simplified analysis. **Hach Co.**
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EIT PUBLISHED A PRODUCT
bulletin on its Series 5300



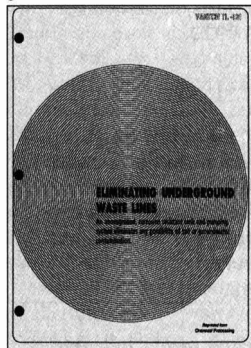
leak detection systems—an economical alternative for sites that do not require monitoring of gas concentration levels. Each piece of equipment in a typical 5300 system is profiled in the bulletin. **EIT.**
Circle 56 on card.

THE ENVIRONMENTAL Engineering Division of Alfa Laval Separation is offering a



16-page brochure that describes the Sharples® line of stainless steel solid bowl centrifuges for industrial wastewater treatment. It contains information on construction and design of the entire line of Sharples decanters. **Alfa Laval Separation Unit Inc.**
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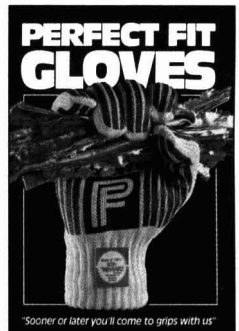
ELIMINATE SOIL or
groundwater contamination



with all-plastic, aboveground tank, pump system and underground waste piping. **Vanton Bulletin TL-131** provides a full description of the system, which includes a series of 250-gallon polypropylene double-wall tanks, heavy duty centrifugal pumps and more. **Vanton Pump and Equipment Corp.**
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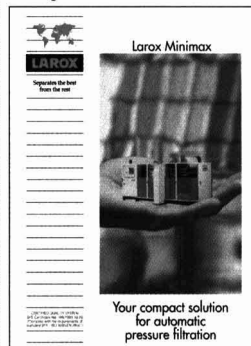
THE EQUIPMENT Technology Group at Scott Specialty Gases published a Custom Gas Distribution Systems brochure that details gas

THE LATEST IN GLOVE technology, hand protection, quality and comfort for a broad spectrum of industrial applications is available in Perfect Fit's new catalog. Seamless knit gloves of 100 percent DuPont Kevlar® Brand Fiber, Spectra®, PVC and nitrile, leather reinforcements, glove customization and more included. **Perfect Fit Glove Co.**
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delivery systems. High-quality components and performance testing preserves the purity and integrity of the gases to provide years of trouble-free operation. **Scott Specialty Gases.**
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“LAROX MINIMAX: Your Compact Solution for

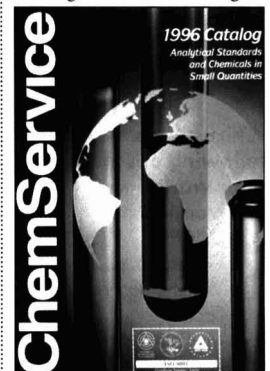


Automatic Pressure Filtration,” is a new, full-color, illustrated 8-page publication describing all the features and benefits of the Larox Minimax pressure filter. It dewateres up to 8,000 dry pounds per hour. **Larox Inc.**
Circle 60 on card.

PREPARE FOR A CLEAN AIR Act Title V operating permit application with a new brochure from ERM Group. It is a step-by-step approach to an air quality facility self-assessment and permit

application. It explains how a company can update its air emissions inventory, conduct an initial compliance audit and certification and establish a recordkeeping system through the actual submission of the permit application to the state agency. **Environmental Resources Management Group.**
Circle 61 on card.

CHEM SERVICE CHEMICALS
Catalog lists over 7,000 high-



quality chemical standards and lab chemicals, all available individually in neat, solution, mixture and kit formats. The 420-page publication offers a full lineup of environmental standards, pesticide/metabolite standards, inorganic solution standards and more. **Chem Service Inc.**
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Reformulated Gasoline

Driving to Cleaner Air

Cleaner Burning Fuels Mean Healthier Air

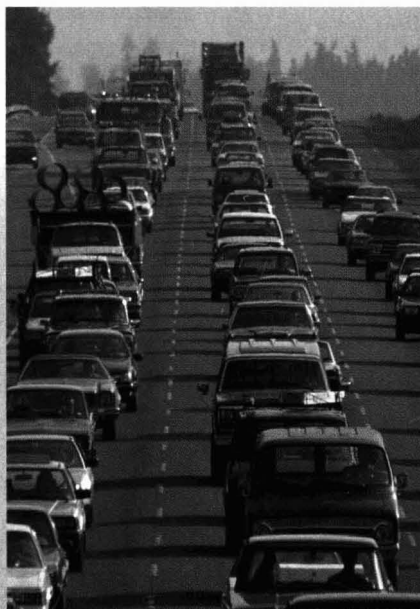
Smog, which is ground level ozone pollution, is a serious local and regional air quality concern because it causes respiratory problems. Right now, 127 million Americans live in areas with poor air quality, according to the EPA. A proven way to reduce ozone pollution is by using cleaner burning gasolines, often called reformulated gasoline (RFG).

Cleaner Burning Fuels Reduce Cancer, Heart and Lung Diseases

Using cleaner burning fuels (RFG) has reduced carcinogens in gasoline emissions by 20 to 40%. Other diseases caused, at least in part, by air pollution include asthma, emphysema, heart disease and osteoporosis.

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Cleaner burning fuels use oxygenates that are made from domestic natural gas and corn. These oxygenates (MTBE and ethanol) displace a certain percentage of gasoline, actually as much as 12%. This means we are using less foreign oil.



Cleaner Burning Fuels Are Cost Effective and High Performers

Ford, General Motors and Chrysler recommend using reformulated gasolines so you can be sure these fuels will perform well in your vehicle. They are easy to use because you fill your car's tank as you always have. And the cost is only 2 to 4 cents more per gallon, a small price to pay for cleaner, healthier air.

Cleaner Burning Fuels Exceed Expectations

Beyond taking the equivalent of 7.5 million cars off America's roads each year, cleaner burning fuels also reduced toxic emissions by 20%.

For more information on this important issue including legislative, health, product safety, research studies, auto performance or environmental (air/water) issues, call 1-800-GO-TO-RFG.

*Support cleaner burning fuels in your region,
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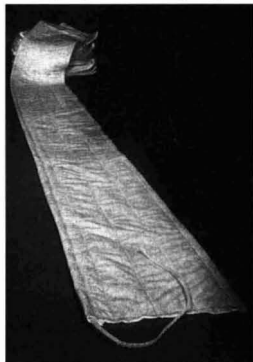
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roleum-based spills on water. Its blue coverstock does not come apart when handled in diverse conditions. Absorbs up to 25 times their weight in petroleum-based products. Sorbent Products Co. Circle 64 on card.

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Fuel Leaks

Oil, fuel or hydraulic fluid leaks can be emulsified to reduce odor and flammability using ADP-7. The solution is easily flushed off of hard surfaces into topsoil where it attracts native bacteria

already at the spill site and rapidly biodegrades the hydrocarbon in place. Petro-Green Inc. Circle 74 on card.

of at least 110 percent.

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Absorbent Mats

Oil-Only PIG® Mat and Light-Duty Oil-Only PIG®



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Custom Kits

Waterproof, softside kits feature GREEN STUFF®



Absorbent has the capacity to absorb virtually any chemical

up to 15 times its own weight. Kits can be customized with absorbent socks, pillows, pads and disposable bags. Easily stowed in trucks or vehicle response vehicles. Green Stuff Absorbent Products Inc. Circle 68 on card.

Spill Containment

The multi-purpose container is ideal as a portable secondary containment vessel, as a temporary storage container



for emergency response, as a drum pumping station and as an in-plant transport container for batteries and other smaller containers of hazardous, corrosive materials. Chem-Tainer Industries Inc. Circle 69 on card.

Absorbents

To learn more about a complete line of pholic foam granular absorbent and contained absorbents for general and petroleum-only uses, see the new catalog from Green Stuff. Green Stuff Absorbent Products Inc. Circle 70 on card.

EPA Creates Three New Offices

Washington, D.C.—U.S. Environmental Protection Agency Administrator Carol M. Browner announced an agency restructuring to create three new offices. The new offices are the Office of Children's Health Protection, the Office of Reinvention and the Office for Environmental Information and Statistics.

Browner said the three new offices will monitor the EPA's highest priorities: protecting children from environmental hazards, making the agency more efficient and increasing the public's access to environmental information.

Design-Build Acceptable Delivery Method

Natick, MA—Zweig White & Associates surveyed environmental consultants and found that design-build is becoming one of the more popular delivery methods for architectural, engineering and planning (A/E/P) firms and environmental consultants.

Wildlife Conservation Groups Support New CRP Rule

Washington, D.C.—The new Conservation Reserve Program rule that makes wildlife conservation a factor in enrolling CRP land was supported by 24 conservation groups during a review of the new law at a U.S. House Agriculture Subcommittee on Forestry. Previously, soil and water conservation were the primary concerns of the CRP.

The new rule will also enroll additional wetlands and the Prairie Pothole Region, a major waterfowl breeding area extending down from the Canadian prairies into North Dakota, South Dakota and parts of Montana and Minnesota. The rule was endorsed by Ducks Unlimited, National Wildlife Federation, National Rifle Association, North American Outdoor Group and other organizations.



neering and planning (A/E/P) firms and environmental consultants.

With the design-build approach to

projects, design firms and construction firms work together from beginning to end on a project. Under the traditional

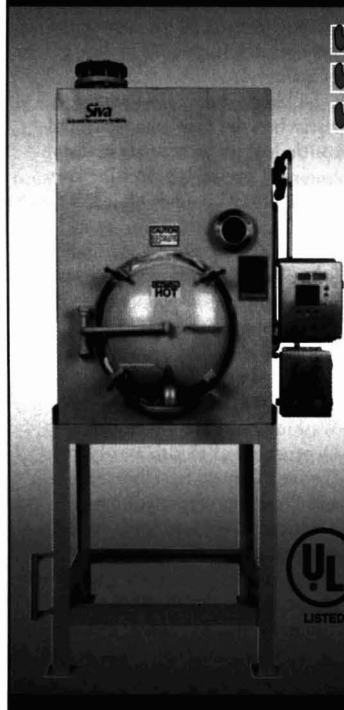
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- ✓ Improve Your Waste Generation Status

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design-bid-build delivery system, the design and the construction aspects of a project are completely separate with little or no communication between participating firms.

The acceptance of design-build was one of the questions asked by Zweig when the management information firm was compiling the results of its monthly survey ZWEIG 100. The survey states that 76 percent of the A/E/P and environmental consulting

industry said design-build is gaining acceptability. Some firms indicated that design-build could surpass the traditional design-bid-build within a decade.

1996 EPA Enforcements Set Record

Washington, D.C.—Two hundred sixty-two criminal enforcements were undertaken by the U. S. Environmental Protection Agency last year. The EPA also took in a record number of crim-

inal, civil and administrative fines and penalties during 1996.

In all, \$76.7 million in criminal fines, \$66.3 million in judicial penalties and \$30 million in administrative penalties were collected.

The agency also found that polluters had agreed to pay \$1.49 billion to correct violations, clean up hazards and make additional environmental improvements.

Researchers Dispute EPA Dust Emissions

College Station, TX—Researchers at Texas A&M University have disputed the U. S. Environmental Protection Agency's estimate of dust emitted from feed mills.

While the EPA found that the total suspended particulate emission factor for processing a ton of grain is 9.8 pounds of dust, A&M agricultural engineers said the EPA's methodology was inaccurate. A&M researchers argued the EPA erroneously included emissions that occur while grain is still inside a feed mill.

The EPA agreed that dust emissions at feed mill operations would occur only when the grain was received and later loaded. Their figures were subsequently revised and the new emissions were set at 1.15 pounds of dust per ton of grain.

Still leery of the EPA findings, A&M researchers did their own study and concluded that an accurate emission factor for feed mills processing corn should be 0.05 pounds of dust for each ton of grain.

If the EPA accepts A&M's findings, feed mills would no longer be considered major sources of air pollution, making them exempt from emission fees.

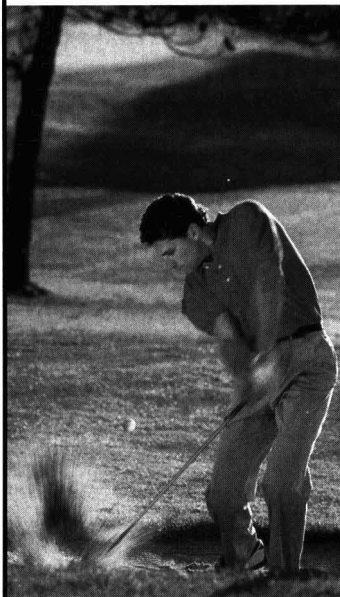
Blood Lead Levels Still Declining

Washington, D.C.—The U.S. Department of Health and Human Services' Centers for Disease Control and Prevention reported that American blood lead levels have declined dramatically.

Unfortunately, the good news does not pertain to all Americans. The organization also reported that children of low-income parents still have higher blood lead levels than most Americans. It is believed that low-income chil-

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sources of contamination that may interfere with the evaluation.

Five investigations were conducted in three cases over the past year.

Case 1: A house situated near a gas station where a gasoline spill had occurred.

Case 2: A store situated near a gas station where a gasoline spill had occurred.

Case 3: An apartment building situated near a gasoline station's former site one year after the station had relocated.

Air samples both inside and outside each facility were collected. A trip blank and method blank were also analyzed. American Industrial Hygiene Association (AIHA)-accredited laboratories performed the sample analysis using a gas chromatography-mass spectrometry (GC-MS) technique. The samples were thermally desorbed. The detection limit was 0.002 micrograms (μg) per sample.

The samples were analyzed for up to 11 compounds associated with gasoline. These compounds were chosen to represent a gasoline fingerprint as the source under investigation.

Choosing the Right Criteria

Many state agencies have developed exposure concentrations for air contaminants to protect public health, including the Massachusetts Department of Environmental Protection (MDEP) Threshold Effects Exposure Level (TEL) and the Maine Bureau of Health Ambient Air Guidelines.

Air sampling results of three sites were compared to four criteria:

- The Reference Concentration (RfC) from the U.S. Environmental Protection Agency database Integrated Risk Information System (IRIS). The RfC is the inhalation exposure concentration to which daily exposure of a human population, including the sensitive population, is likely to be free of appreciable effects.

- Massachusetts Allowable Threshold Concentration (ATC). The ATC is a concentration of a chemical in air not expected to result in adverse non-carcinogenic health effects. The ATC values were derived by the MDEP and consider acute and chronic threshold health endpoints, including reproductive effects.

- Massachusetts 24-hour average Threshold Effects Exposure Limit (TEL). The TEL is the exposure concentration for air contaminants developed by the MDEP. The TEL value represents 20 percent of the ATC.

- Indoor air background data from the

National Ambient Compounds VOC Database Update (EPA Project Report EPA 600/3-88/010(a)).

Results and Difficulties

VOCs detected inside the house (Case 1) represent gasoline. The concentration of the contaminants found were below the EPA RfC, MDEP ATC and TEL, and the EPA National VOC Database concentrations. Hydrocarbon concentrations found in the house did not significantly exceed outside concentrations.

The concentrations detected inside the store (Case 2) were below all four criteria. The source of gasoline compounds found in the indoor air of the store could have been vapors originating from the gasoline plume under the building and/or the emission of VOCs from porous surfaces that absorbed gasoline compounds. Based on the concentrations found and the duration of potential exposure, the VOCs detected did not present a significant risk to store employees or to the general public.

Three sets of samples were collected at a six-month interval in an apartment building basement (Case 3). The second set of samples showed an elevated level of benzene, toluene, and m-, p- xylene. The Cashins industrial hygienist concluded that a small supply of chemicals stored in the basement—paint, cleaning chemicals and detergents—contributed to the elevated levels. The third set of samples collected after the chemicals were removed indicated that the VOC levels were lower than previously reported.

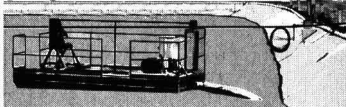
It is extremely difficult, if not impossible, to state conclusively that low-level contamination in a structure is caused by groundwater contamination. To develop a more definitive answer relative to the source of contamination, it may be necessary to either bore through the basement floor and collect air samples in the air space below the bottom of the foundation or develop methods of conducting a headspace analysis above the basement floor by covering a portion of the floor and allowing VOCs emanating from below the floor to be trapped and tested.

Robert F. Cashins, CIH, is vice president and Evelina A. Vaughan, Ph.D., is an industrial hygienist at Cashins & Associates Inc. in Reading, Mass.

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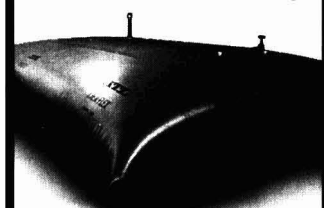
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PROMINANT COMMUNITY MEMBER

Instead of being hidden from public view like most wetland conservation areas, this site is a highly visible part of the community.

By Thomas J. Denbow and Thomas Evans, ASLA

Most wetland mitigation sites are often located as far as possible from public view. For that reason, they are generally constructed in out-of-the-way locations that are inaccessible to the public and provide limited mitigation objectives.

The Wetlands Conservation Area (WCA) in New Albany, Ohio, is a notable exception. It stands as a unique, high-visibility demonstration that wetland mitigation can be an integral multi-purpose element in land planning and may even be planned as an attractive centerpiece to surrounding development.

Deliberately located at the primary expressway interchange entrance to a new community, the WCA is a prominent open-space area that establishes a strong natural theme for the New Albany community. Commercial, residential and school developments have been designed around all sides of the WCA. The site also provides an important link by having a community hike/bike trail system.

The WCA is the first constructed wetlands project of significant size undertaken by the Ohio Department of Transportation (ODOT) in Central Ohio. Sited and designed within a tight time frame to mitigate the wetland impact created by the nearby New Albany Expressway, it provides more than 13 acres of replacement wetlands with buffer to create a 30-acre park.

Unique Features

Several features were required to enhance hydrology and manage the uncertainties of wetland construction at this location, including:

- Compacted clay liner to reduce soil permeability;
- Fully adjustable control structure to allow for water levels changes and drawdown rates designed to handle both low and peak flows;
- Varied topography that contains peninsulas, islands and pools, and

Biological benchmarks, in the form of an existing wetland, provided a basis for design for portions of the site. Three ecologically different wetland types were planned— emergent wetland, emergent with open water, and a wooded vernal pool area.

provides a wide variety of habitats and wetland types;

- Circuitous flow path to enhance stormwater filtration; and
 - Contract provisions for supplemental plantings after hydrologic stabilization.
- The design process required gaining

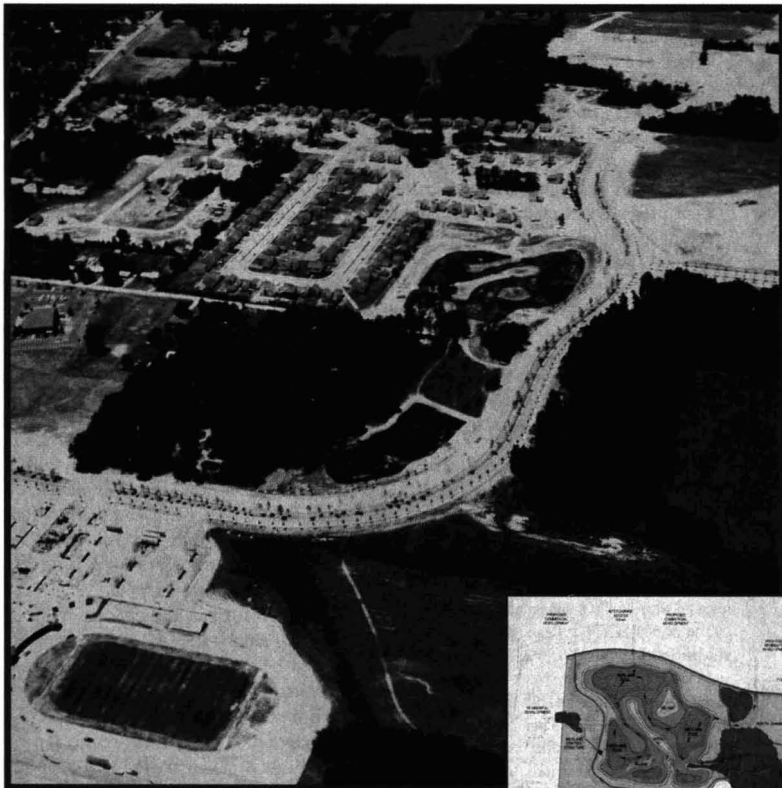
approval from the Huntington District of the U.S. Army Corps of Engineers and the Ohio Environmental Protection Agency. It also involved the cooperation of the Village of New Albany, the New Albany school system, and the adjacent land developers, the New Albany Co. Permit compliance required equaling or exceeding the wetland functions and values of the impacted wetlands.

Surmounting Complexities

Constructing replacement wetlands at a difficult, urbanized site presented a number of unusual design problems. Permeable soils underlain by a shallow bed of fractured sandstone resulted in potentially excessive infiltration. The contributing drainage area was less than desired. Rapid development of the surrounding areas would dramatically increase erosive peak stormwater discharges and pollutant loadings to the WCA. Public access posed the potential for excessive wear and vandalism.

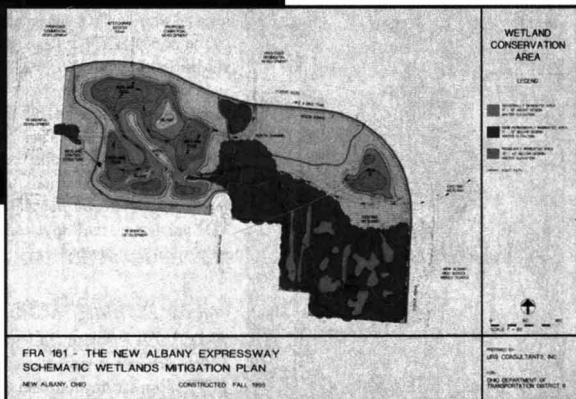
These difficulties were addressed with innovative design elements. URS Greiner, the project consultant, designed a clay liner to minimize infiltration losses. The consultant also developed hydrologic modeling techniques to test both the existing and proposed wetlands' ability to stay wet during the growing season. An adjustable rate drawdown line was designed to provide a slower drawdown rate and enhance wetland hydrology. After extensive hydrologic modeling, URS Greiner designed the control structure to handle the "full buildout" peak discharge from the rapidly developing surroundings.

Biological benchmarks, in the form of



Left: Aerial view of the Wetlands Conservation Area, located at an expressway interchange entrance to a new community.

Right: The Wetlands Conservation Area in New Albany, Ohio, is situated near a school and commercial and residential developments and boasts a hike and bike trail.



an existing wetland, provided a basis for design for portions of the site. Three ecologically different wetland types were planned—emergent wetland (a wetland consisting of grasses, sedges and other non-woody plants), emergent wetlands with transition zones to open fresh water and seasonally wet wooded vernal pool areas. The combination of these types on one site constitutes an important aspect of creating an ecologically diverse site.

Community Benefits

In addition to fulfilling wetland mitigation requirements, the WCA also provides additional benefits to the community.

- **Stormwater purification:** The WCA is designed to trap sediment and purify pollutants from stormwater runoff from

the adjacent commercial center and nearby residential developments. The circuitous flow pattern, forebay and varied topography were designed to enhance the effects of purification.

- **Stormwater management:** The large volume of stormwater storage provided by the WCA safely stores and dramatically reduce peak storm discharges from the adjacent developments. Control structures were designed to be hidden from sight or located in unobtrusive areas of the landscape.

- **Wetland park:** Once post-construction monitoring requirements are satisfied, the ODOT plans to turn over WCA ownership to the Village of New Albany for a passive park. Hike/bike trails around the perimeter link homes,

stores and schools. Trails within the WCA provide safe access to a variety of natural environments.

- **Education and research:** The new \$28 million New Albany High School and Middle School have developed a curriculum that will make full use of the wetland and nearby wooded areas that form a 50-acre nature preserve. The curriculum, formulated in cooperation with professors from the Ohio State University School of Natural Resources, will provide vocational education training in environmental management. Bill Resch, manager of the nature preserve, says he looks upon it "as being a part of every classroom in the New Albany schools. Three distinct ecological zones offer an extraordinarily rich educational resource."

Prominent Community Member

On a wider scale, the WCA is attracting attention as a site for research projects for other area high school and university students throughout central Ohio. The use of a wetland-mitigation area as an outdoor learning laboratory is drawing notice from schools around the state.

• **Watershed protection:** Careful planning protected an intermittent swale, enhanced an existing wetland and preserved a wooded area, all located in the center of the growing community. Additional public investment in the area—a \$1 million transportation enhancement (ISTEA)

grant—preserved an upstream woodland, which became part of the nature preserve, valued at an estimated \$3.5 million.

• **Open space:** One of the first sights a visitor sees when entering the New Albany area via the recently completed interchange is the large, natural expanse of the WCA. A carefully designed grading plan preserved numerous trees and the setting's tranquil appearance. The development company has featured the WCA, the nature preserve and community trail system as "a natural habitat for learning" in its advertisements.

Future Applications

The design features developed for the WCA are being applied to the next generation of wetland mitigation projects. All aspects of the project—design criteria, design elements, hydrologic modeling techniques, design details, wetland construction specifications, construction procedures and post-construction monitoring processes—are being used as a guide for other wetland mitigation projects. The design is also being evaluated as a prototype for other stormwater treatment wetlands.

Wetland construction is especially sensitive to weather conditions and poses unique construction requirements. The enforcement of grading tolerances, for example, is critical in establishing the correct water depths and required replacement acreage. An as-built survey submittal was specified and used to document the need for grading revisions, an approach adopted by ODOT for other wetland mitigation projects.

Using constructed wetlands as outdoor learning laboratories for adjacent schools is also being considered by other school districts for subsequent wetlands projects.

Both the new expressway and the New Albany schools opened in the fall of 1996. At a WCA ribbon-cutting ceremony, ODOT Director Jerry Wray described the project as "a model of ODOT's ability to coordinate with local agencies as well as providing an outstanding example of its environmental sensitivities." Mr. Resch, speaking of the nature preserve, said, "It's a very important part of the learning community because every age, from toddlers to 90-year-olds, can come in and enjoy this reserve area in the center of the village."

The WCA demonstrates that careful planning and design, along with interagency coordination, produces a wetland mitigation project that delivers social as well as environmental benefits.

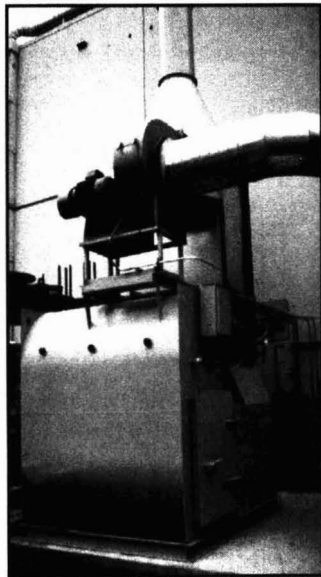
In February 1997, the WCA project received an Honor award from the Ohio Chapter of the American Society of Landscape Architects. It is the highest design award given in the landscape architecture profession. **EP**

Thomas J. Denbow is project manager and Thomas Evans, ASLA, is a landscape architect with URS Greiner Inc. in Cleveland, Ohio.

For more information on URS Greiner, circle 72 on card.

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P2

Special Report

Developing a Pollution Prevention Plan

Well-written pollution prevention plans can keep your company proactive and ahead of regulations.

With regulations getting stricter and more confusing, companies would like to ensure their environmental stability for the future. Crucial in providing a secure future is writing and implementing a comprehensive pollution prevention plan, a feat not easily achieved since guidelines to assist environmental managers are hard to find. The process of writing a comprehensive pollution prevention plan is very detailed and time consuming. If written properly, the plan can last for three to four years and exist as a "working document" to provide environmental plans and goals that will keep your company proactive and ahead of the regulations. The environmental manager setting up a pollution prevention plan should follow a simple five-step process: research, set goals, write the plan, obtain feedback and put the plan in action. Having the help of someone not involved in the process is wise, as he or she provides an objective point of view.

Research

Performing an environmental audit of your company is the easiest way to research information for your pol-

lution prevention plan. Outside consultants or federal, state and local authorities are good sources, but internal staff is the easiest starting point. If you use outside consultants, make sure they are familiar with your industry or half your money will be spent educating them.

If written properly, the plan can last for three to four years and exist as a 'working document' to provide environmental plans and goals that will keep your company proactive and ahead of the regulations.

The most accurate auditing is achieved by using internal staff and following up with local and/or state authorities. Several states have pollution prevention agencies that provide assistance to companies by performing site visits or audits that are non-confrontational and used only to provide objectivity.

One good example is the Pennsylvania Department of Environmental Protection's Office of Pollution Prevention and Compliance Assistance (PADEP-OPPCA) <http://www.dep.state.pa.us>). The agency has implemented site visits, partnerships and published booklets to assist businesses in auditing their environmental programs. PADEP-OPPCA has published *An Environmental Self-Evaluation for Small Business Guide* (publication 0200-BK-DEP2029) as an auditing tool, which is a step-by-step inspection checklist for environmental managers.

Set Goals

After auditing your company, document

BY DAVE SCHELL

Developing a Pollution Prevention Plan

the results and use them as a benchmark. Define where your company wants to be in the future. Do you want to stay up-to-date or exceed regulations? For an effective plan, involve employees in definition creation and post the definition everywhere, making sure the definition is easy to read, understand and obtain. If the strategic planning process begins by defining an unrealistic future, the plan is doomed for failure.

An example of a good definition is: *(Company Name) shall be defined as a company that exceeds all environmental*

regulations, prevents pollution, promotes recycling and minimizes wastes. We will self-audit our internal practices and look for additional ways to reduce waste and prevent pollution. We will hold informational meetings with the public to keep them informed of our progress.

Once you define where the company wants to be, specific goals for the future should be set that are clearly defined, understandable and obtainable. They should be achievable through positive actions of the employees or by actual business process changes, and should not be set on

business fluctuations or market trends. Setting goals encourages employees to change their work habits and become proactive. Setting goals to business fluctuations or market trends will lead to false results and invite challenges to your environmental record. The goals should involve all areas of company operations—getting only one area of the company involved is not enough to ensure success. If possible, tie the goals to a money- or percent-change amount. These are not only easy to manage but are a visible sign of improvement. For example, some goals to list in the plan might include:

- Reducing municipal waste by 30 percent by incorporating a recycling program;
- Reduce landfill wastes to 10 percent of total waste generated;
- Recycle 80 percent of our office papers;
- Reuse 30 percent of our process water; and
- Find alternative uses for certain wastes.

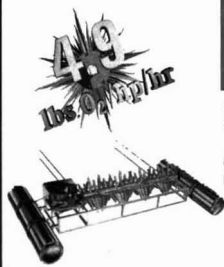
The last step in writing goals is to decide how to publish the results and inform everyone of progress. Posting results on bulletin boards, in restrooms, in lunchrooms and conducting department meetings are the best ways to spread the news. Hold small appreciation parties when crucial goals are achieved.

Writing the Plan

After setting goals, make plans to achieve the goals. What steps are required to reduce stack emissions? How can water be recycled in the cleaning process? To achieve goals, proper efforts must be mapped out. When discussing pollution prevention, make sure land, water, air and noise issues are covered. Follow all regulated permits and plan to exceed them.

Flowcharting all processes, indicating the amounts of raw materials used and the amount of waste generated at each step is one good method to incorporate waste source reduction. Look for the areas that generate the most waste and determine if the step can be modified to reduce the amount of raw material used or the amount of waste generated. Keep good records and document your efforts. An opportunity for employee participation is to develop a suggestion program for workable waste reduction ideas. One incentive is to provide a monetary award based on a percentage of waste costs saved.

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Incorporating recycling programs is perhaps the easiest method of advancement. Local municipalities are eager to increase the number of recycling businesses and may provide a business drop-off point to stimulate interest. Participate in the community by working with civic organizations to organize recycling drives using your business as the drop-off point. Offer employees the opportunity to collect aluminum cans or newspapers for their own benefit. Another idea is to provide a rotation for all departments to host a drop-off point and then use the money for a department party or lunch.

Energy bills and individualized monitoring devices can help determine which department uses the most energy. Common methods of energy conservation—turning off lights or not heating unused rooms—can help reduce energy consumption. Turn to the U.S. Environmental Protection Agency's Green Lights program to conserve electricity. Bring in your local energy suppliers (electric, natural gas, oil) to evaluate your efforts and propose suggestions for conserving energy. Conserving water is also another way to reduce energy bills.

Natural resources conservation is an often overlooked point in environmental plans. Is there a way to reduce the use of "virgin" materials in your facility? Recycled paper can be used in offices for copying, printing or letterhead. Obtaining cardboard boxes with a recycled content for packaging and printing without a paper overlay on cardboard boxes conserves trees. Investigate any raw materials coming into the company and ask if there is a viable recycling alternative. Remember not to substitute a product just because it is recycled. If it increases waste or produces a lower-quality end product, don't bother. Cost-benefit analysis should be performed on any changes before implementing them.

Feedback and Implementation

After writing the plan, review it with your employees, state and local agencies and an outside source. Listen to concerns and suggestions. Modify your plan and incorporate ideas to make the plan more comprehensive. Then publish it and begin to implement the methods.

Through proper strategic environmental planning and by developing a proactive pollution prevention plan, you may find some extra assistance from the local and state authorities when new permits

are required. If the plan is focused correctly, it will save money through decreased waste and energy costs, and paybacks from recycling. Raw material costs may decrease by using less or using less-expensive recycled materials. Employee morale may reach a new high due to the feeling of participating in a program aimed to advance the company through their support and efforts.

Don't be surprised by the amount of phone calls you receive from other businesses wanting to follow in your footsteps.

You may even get complaints that you are making other businesses look bad.

Just remember—you aren't making others look bad, you are leading the business community into the future and protecting your assets. **EP**

Dave Schell is the environmental specialist at The Wilton Co. in Mount Joy, Pa. He is currently making plans to write a book on environmental planning for industry.

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FLAMELESS THERMAL DESTRUCTION OF VOCs

New technology controls VOC emissions with high destruction efficiencies.

By Howard M. Hohl

Traditional flame-based abatement technologies have certain limitations in dealing with variable or batch vent emissions of volatile organic compounds (VOCs). In choosing an appropriate VOC abatement technology for these emissions, companies must weigh a variety of factors, including the safety and reliability of the technology, the facility's siting and permitting requirements, the composition and variability of the waste stream, the destruction/removal efficiencies (DREs) of the abatement technology and the relative costs of the available options.

Thermatrix Inc. of San Jose, Calif., has developed a field-proven flameless thermal oxidation (FTO) technology capable of destroying over 99.99 percent of a wide range of organic air pollutants. This patented technology is being used to control VOC emissions at more than 50 chemical, petroleum, pharmaceutical, pulp and paper and medical sterilization facilities in the United States, Europe and the Pacific Rim. Commercial FTO units have current capacities ranging from one standard cubic foot per minute (scfm) to over 30,000 scfm.

FTO Technology

The heart of the Thermatrix technology is a packed-bed reactor containing an inert matrix of ceramic pieces (Figure 1). In the FTO process, a waste stream containing organic air pollutants is transferred through inlet piping into the oxidation unit where it is premixed, as needed, with air. As the mixed fume travels upward into the matrix, it is quickly heated to oxidation tempera-

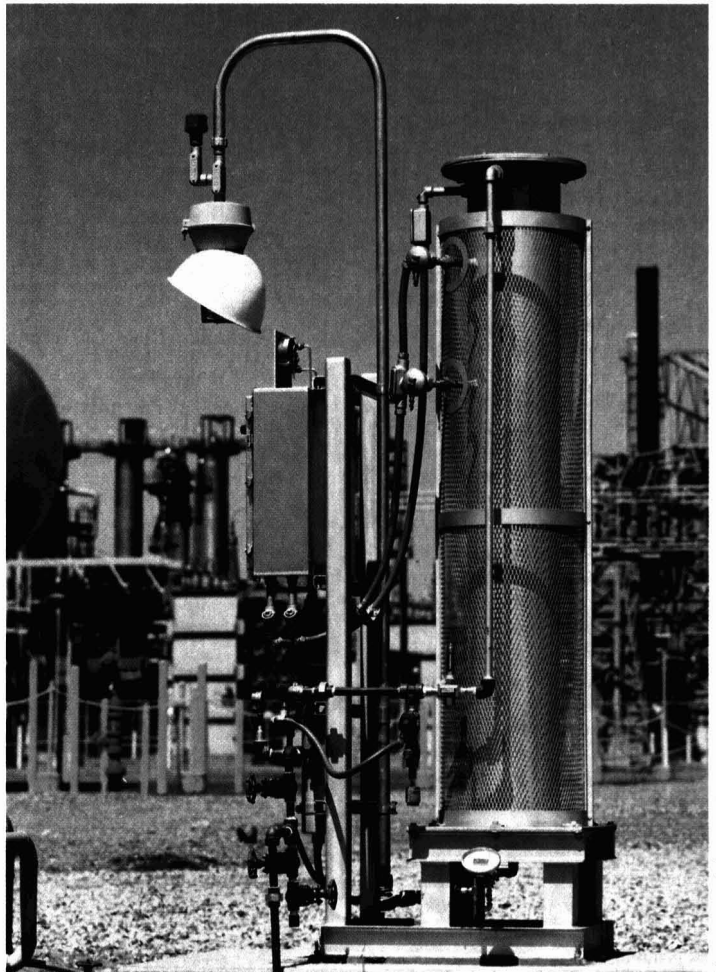


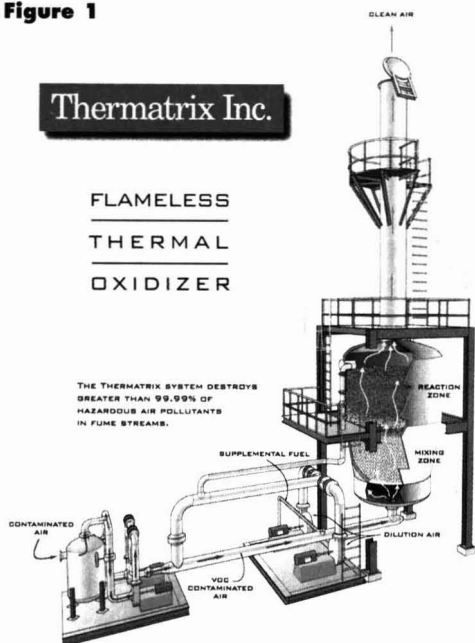
Photo courtesy of Thermatrix Inc.

The Thermatrix system destroys more than 99.99 percent of hazardous air pollutants in fume streams.

Figure 1

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tures that are maintained in the range of 1,600 to 1,800 degrees Fahrenheit. In this reaction zone, the VOCs are oxidized to form carbon dioxide and water. If the fume stream contains chlorinated, fluorinated or sulfonated VOCs, the oxidizer will produce acidic emissions, which are then removed with conventional scrubbing technologies.

Once the system is preheated, the oxidation process is self-sustaining as long as the waste stream maintains an energy content of at least 10 BTU/scf. Thermocouples inside the reactor monitor the internal temperature and alert the control system to add supplemental fuel or air as needed to maintain the temperature level. If changes in the composition, concentration or flow rate of the waste stream start to affect the temperature of the reaction zone, the control system adds supplemental energy or air to maintain the temperature.

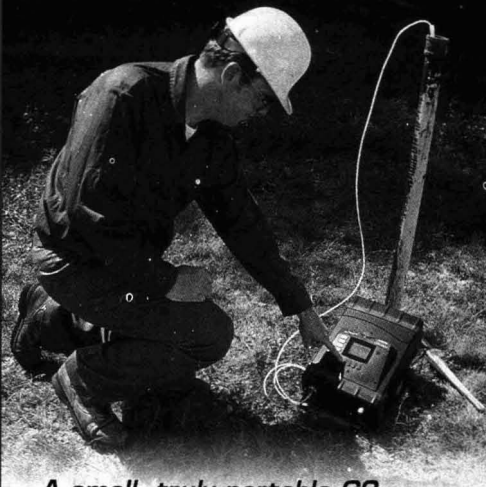
The ceramic packed-bed reactor can retain heat during relatively long periods of inactivity—as much as 24 hours, depending on reactor size and local operating conditions. As a result, the system can be maintained in a “ready-idle mode” at plants that operate intermittently or produce batch- or variable-flow waste streams. The high heat retention of the packing helps to extend system life by reducing thermal cycling.

High Destruction Efficiencies

Third-party tests have shown that FTO units achieve DREs of 99.99 percent or more for a wide variety of VOCs, at concentrations ranging from 400 parts per million by volume (ppmv) to 30,000 ppmv. Since the oxidizer's operating temperature is well below the threshold for thermal formation of nitrogen oxides (NO_x), FTO units produce very low NO_x emissions. (Thermal NO_x formation increases considerably above 2,500 degrees Fahrenheit.) In comparison, the much higher temperatures

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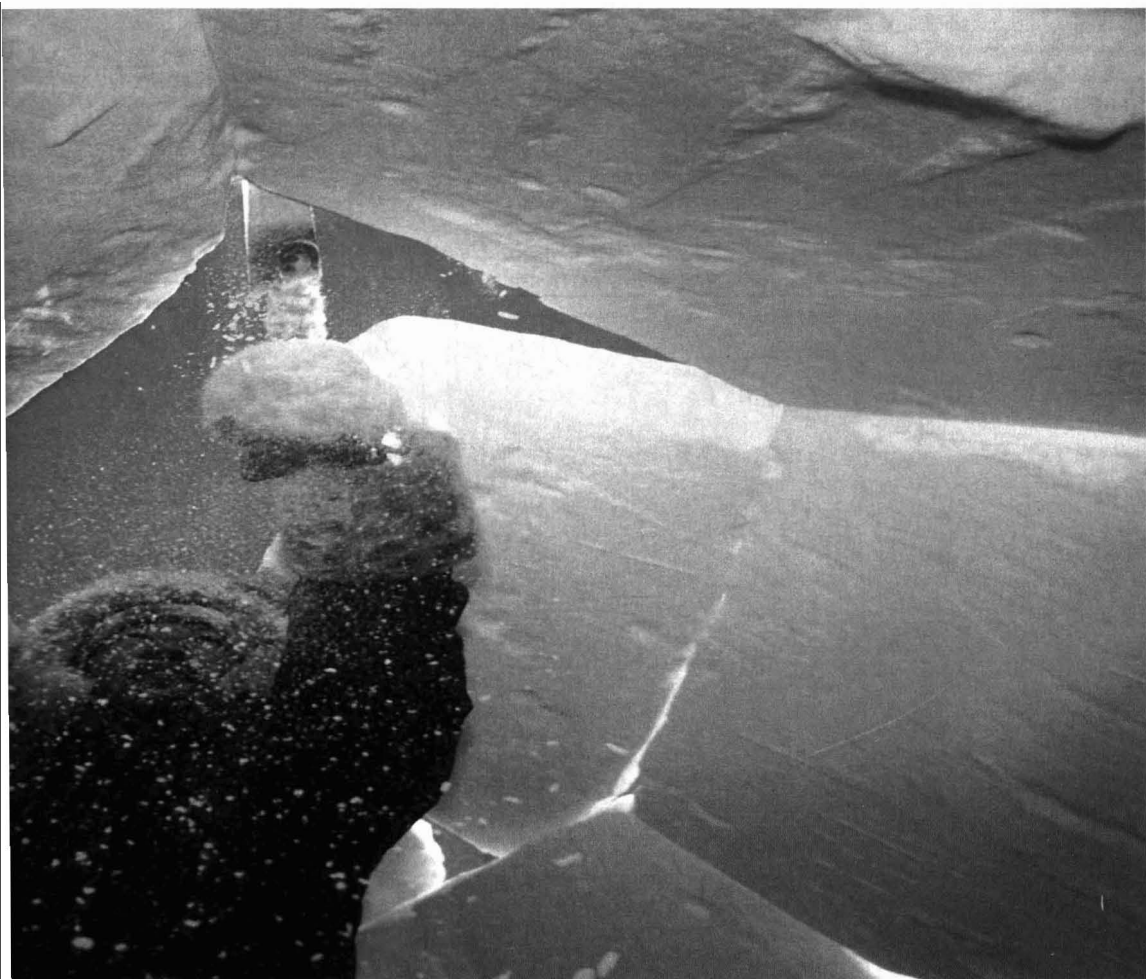


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reached in flame incinerators can lead to significant thermal NO_x formation. The formation of products of incomplete combustion, such as carbon monoxide, is kept to a minimum in FTO units, because the fume stream is premixed with air and the plug flow design forces all emissions to pass through the oxidizer's reaction zone before exiting the system.

VOCs in Wastewater from Chemical Manufacturing

Wastewater produced during chemical manufacturing is a common source of

VOC emissions. One major chemical company has used an FTO system for over three years to destroy emissions from a wastewater stream formed by the condensation of steam from jet educators used in chemical production. The condensed steam is contaminated with approximately 500 parts per million (ppm) of ethyl chloride, as well as other chlorinated and nonchlorinated VOCs. The company contracted Thermatrix to supply a FTO unit with a design capacity of 100 scfm for the project. The FTO unit was integrated into an abatement system

that also included an air stripper, knock-out pot and a hydrogen chloride (HCl) scrubbing system.

About 50 gallons per minute (gpm) of wastewater enters the air-stripping column, which produces 100 scfm of moist off-gas containing the VOCs. The off-gas passes through a knock-out pot and demister before entering the Thermatrix FTO, where the VOCs are oxidized to form carbon dioxide, water and HCl. The hot gases are quenched and conveyed to the scrubbing system, which removes 99 percent of the acidic gas. The scrubber water is then routed to the plant wastewater system and the gases are vented from the scrubber to the atmosphere.

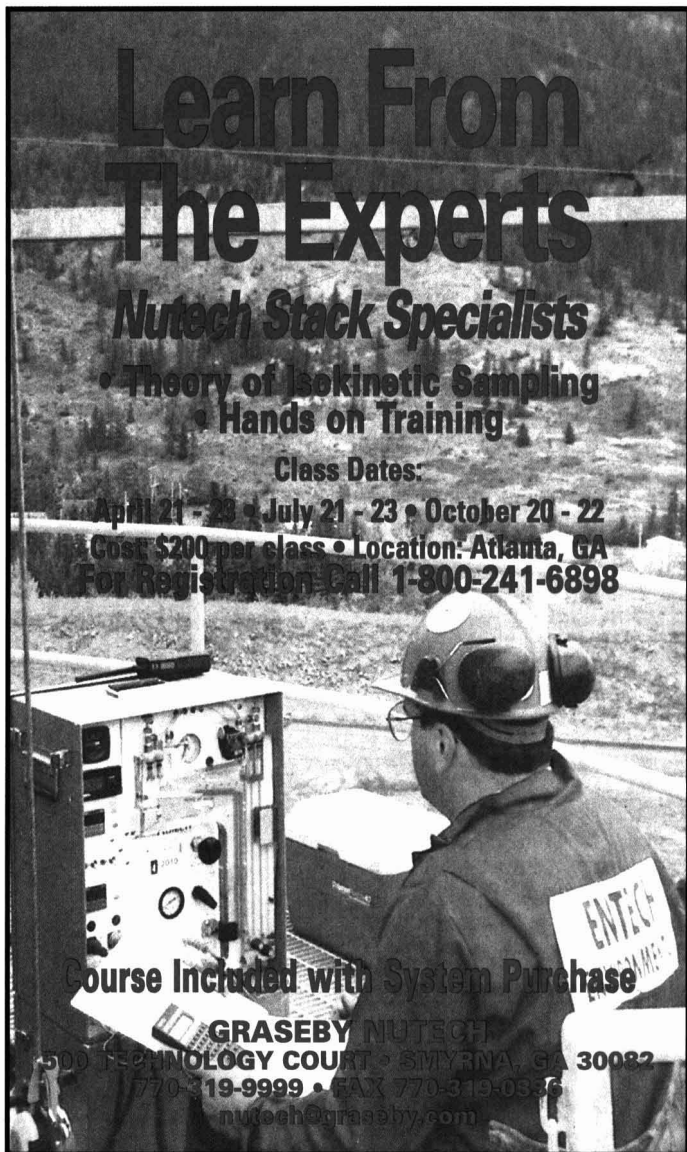
The entire abatement system was designed, constructed, installed and operational within 12 weeks to meet the company's emissions-reduction deadline. To minimize the time needed for on-site installation, the system was preassembled off site with all of the necessary instrumentation, piping and electric power equipment. The only steps required for installation were completing process piping tie-ins, connecting power and control cables and erecting the stripping and scrubbing towers. State authorities issued an air permit for the system in 30 days.

In compliance testing, the Thermatrix FTO system achieved an average DRE of more than 99.9 percent for total hydrocarbons—far surpassing the 95-percent DRE required under the air permit. The average emissions of carbon monoxide were 6.3 ppmv, compared to the permit limit of 100 ppmv. The HCl emissions of 0.00041 pounds per hour (lb/hr) were also well below the permit limit of 0.1 lb/hr.

Refinery Fugitive Emissions

The prospect of increasingly stringent emissions standards prompted a northern California refinery to install a series of 1-scfm and 5-scfm FTO units to control fugitive emissions from single-seal pumps used to handle light hydrocarbons. An internal assessment found that the VOC emissions from the refinery's 400 single-seal pumps totaled about 14,600 pounds per year (lb/year) (hexane equivalent).

The refinery evaluated several options for reducing these emissions. One approach involved replacing the single-seal pumps with magnetically coupled seal-less pumps. Another alternative called for the installation of suction lines to



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capture emissions from the existing single-seal pumps and then using small FTO units to oxidize the captured VOCs. Each FTO station would control the emissions from a pump bank containing up to 12 pumps.

Refinery officials selected the FTO option because their analysis showed that FTO units could practically eliminate the pump's VOC emissions at approximately one-fifth the cost of the replacement alternative. The projected cost of replacing the 400 single-seal pumps with new sealless pumps was estimated at \$7.2 million, plus an additional 30 percent—more than \$2 million—for non-equipment costs such as installation labor, foundations and instrumentation. The cost estimate also indicated if all 400 pumps were replaced the refinery's electricity bill would increase by nearly \$400,000 per year because the magnetically coupled pumps required more power than the single-seal pumps.

Using the Thermatrix approach, the refinery would need about 50 FTO stations to handle fugitive emissions from the 400 single-seal pumps. Suction lines would feed the combined emissions from each bank of pumps into a 1-scfm Thermatrix unit, which would destroy the VOCs. Because the units are flameless and operate safely in Class 1, Division 2 classified hazardous areas, the Thermatrix oxidizers could be installed adjacent to the pump banks. This design reduced costs by eliminating the need for hard-piping the fumes to a distant site for treatment.

The cost of building and installing 50 FTO stations was estimated at \$1.35 million—about 80 percent less than the projected costs of the 400 sealless pumps. The 50 FTO stations would use about \$55,000 of electricity each year, which is only about 15 percent of added energy costs estimated for the sealless pumps.

To date, the refinery has installed a total of 10 Thermatrix FTO units, which handle the fugitive emissions from approximately 100 single-seal pumps. The fume collection systems installed with the units have reduced VOC emissions at the pump seal housing from over 1,500 ppm to approximately 10 ppm. During performance tests, the Thermatrix oxidizers achieved DREs exceeding 99.99 percent at VOC concentrations between 1,200 and 15,600 ppm and flow rates between 1 and 3 scfm.

Thermatrix has determined if the

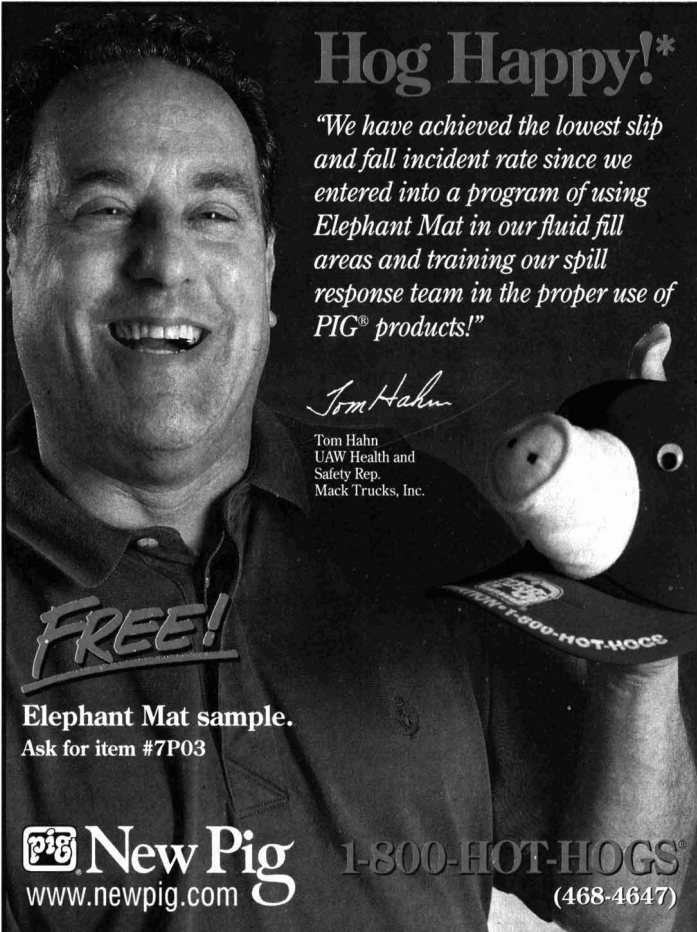
FTO stations were installed to handle the emissions from all 400 single-seal pumps, the refinery's fugitive emissions from the pump seals would total about 29 lb/year (hexane equivalent), while the VOC emissions from the Thermatrix units would be only about 1.5 lb/year. The combined VOC emissions of about 30.5 lb/year represent a 99.8-percent reduction from the original level of about 14,600 lb/yr. Plantwide use of the FTO stations would cut the pumps' VOC emissions to about one-fiftieth of the level permitted under the strict regional

emissions standards that will take effect in northern California during 1997.

In each of the case studies, the Thermatrix FTO system provided a solution that surpassed the regulatory requirements in a more cost-effective way than traditional abatement technology. **EP**

Howard M. Hohl is vice president of Thermatrix Inc. in San Jose, Calif. The author has a BS in civil and environmental engineering and an MBA.

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THE WETLAND WINDS OF CHANGE

Staying informed helps to keep your project from being blown off course.

By Glenn W. Laird, AICP, and Barbara Lemm Castille

Amidst much controversy, including praise by supporters of President Bill Clinton and nature advocates as well as complaints by the development community across the country, the U.S. Army Corps of Engineers (USACE) modified and reissued the General Permits. Also known as Nationwide Permits (NWP), they authorize a variety of activities regulated under Section 404 of the Clean Water Act. Media attention was unusually high on December 13, 1996, when the NWPs, which also regulate discharges of dredged and fill material into waters of the United States including wetlands—were published in the *Federal Register* (61 *Fed. Reg.* 65873).

Committed to Change

The USACE is committed to changing the new NWP program as efficiently and effectively as possible. Since all NWPs expired on January 21, 1997, and since the new NWPs took effect on February 11, 1997, no NWPs were in effect between these two dates. Many USACE districts across the country did not accept any NWP applications during this time. Nationwide Permit activities previously authorized and that include commenced actual work under the NWP process before January 21, 1997, must be completed by January 21, 1998. Activities authorized under the old NWP program but that did not commence before January 21, 1997, will be required to be re-coordinated with the USACE per the new permit conditions.

Developers and other property owners are primarily concerned about the most

radical change to the NWP program, which consists of the two-year phase-out of a significantly altered NWP 26. Nationwide Permit 26 authorizes various discharges of dredged or fill material into headwaters and isolated waters, including wetlands. Before January 21,

NWP 26, the maximum number of wetland acres that can be filled or otherwise impacted has been reduced from 10 acres to three acres. Additionally, fills between one-third acre and three acres will now require a preconstruction notification (PCN) to the USACE.

The USACE will authorize impacts between one-third acre and one acre and authorization for impacts involving one acre to three acres will also include coordination with other appropriate state and federal agencies. For the first time, discharges and fill of areas less than one-third acre will require notification to the USACE within 30 days of work completion. Ultimately, the Corps will phase out NWP 26 by December 13, 1998, which is two years from its reissue date.

Nationwide Permit 26 has been controversial since its issuance in the early 1980s. Environmental groups and natural resource agencies have almost universally considered it to be a major loophole that allows significant losses of wetlands and have pressured the U.S. Environmental Protection Agency and the USACE to change it. Over the years, under this ongoing pressure, the USACE has gradually tightened its practices regarding NWP 26, moving from low levels of scrutiny and little if any mitigation requirements to careful evaluation and almost mandatory mitigation for any losses over one acre.

Recent estimates of the effects of NWP 26 indicate that, with mitigation, there has actually been an increase in wetlands in the southeastern United States during the last few years.

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1997, NWP 26 was used to authorize dredge and fill activities in wetlands with impacts up to 10 acres in size; impacts up to one acre in size did not require USACE notification. Under the new

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Nationwide Permit Number and Designation	No Change	Minor Change	Major Change	New
1 - Aids to Navigation	X			
2 - Structures in Artificial Canals	X			
3 - Maintenance	X			
4 - Fish and Wildlife Harvesting, Enhancement and Attraction Devices and Activities		X		
5 - Scientific Measurement Devices		X		
6 - Survey Activities		X		
7 - Outfall Structures	X			
8 - Oil and Gas Structures		X		
9 - Structures in Fleeting and Anchorage Areas	X			
10 - Mooring Buoys	X			
11 - Temporary Recreational Structures	X			
12 - Utility Line Discharges			X	
13 - Bank Stabilization		X		
14 - Road Crossings		X		
15 - U.S. Coast Guard Approved Bridges	X			
16 - Return Water from Upland Contained Disposal Areas		X		
17 - Hydropower Projects	X			
18 - Minor Discharges		X		
19 - Minor Dredging		X		
20 - Oil Spill Cleanup	X			
21 - Surface Coal Mining Activities		X		
22 - Removal of Vessels	X			
23 - Approved Categorical Exclusions	X			
24 - State Administered Section 404 Program	X			
25 - Structural Discharges		X		
26 - Headwaters and Isolated Waters Discharges			X	
27 - Wetland and Riparian Restoration and Creation Activities		X		
28 - Modifications of Existing Marinas	X			
29 - Single-Family Housing				X
30 - Moist Soil Management for Wildlife				X
31 - Maintenance of Existing Flood Control Facilities				X
32 - Completed Enforcement Actions		X		
33 - Temporary Construction, Access and Dewatering		X		
34 - Cranberry Production Activities		X		
35 - Maintenance Dredging of Existing Basins		X		
36 - Boat Ramps	X			
37 - Emergency Watershed Protection and Rehabilitation	X			
38 - Cleanup of Hazardous and Toxic Waste		X		
39 - Reserved				
40 - Farm Buildings		X		

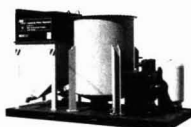
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The Wetland Winds of Change

However, a small, but vocal, minority of those submitting comments during the recent public comment period for the NWP re-issuance carried the day with the argument that thousands of acres lost through application of NWP 26 in the under-one-acre category have gone unreported and would actually account for a net loss of wetlands. This viewpoint appears to have driven the USACE's decision to limit the acreage application for NWP 26 to the minimum under consideration, introduce a new reporting requirement and eliminate the permit completely in two years.

Activity-specific nationwide permits, such as NWP 29—which authorizes discharges of dredged or fill material for the construction or expansion of a single-family home and/or attendant features (i.e., garage, driveway, etc.)—are expected to replace NWP 26 in two years. The USACE is accepting ideas for activity-specific NWPs. Ideas may be submitted in writing to Mr. Sam Collinson or Mr. John Studt at the USACE headquarters in Washington, D.C.

NWP Stacking

Another change in the re-issued and modified NWPs includes the limitations on NWP "stacking." This also is discouraging to developers who in the past have been able to use multiple NWPs to authorize several tasks in a given project. USACE restrictions on the multiple use of NWPs and on what is considered a "single and complete project" will have serious repercussions on long-term construction projects such as master-planned developments and other phased construction projects, such as roadways.

When the use of any NWP 12 through 40 is combined with any other NWP 12 through 40 as part of a single and complete project, the permittee must notify the USACE in accordance with the NWP Notification General Condition. Any NWP 1 through 11 may be combined with any other NWP without notification to the Corps, unless notification is otherwise required by the terms of the specific NWPs. Two or more different NWPs can be combined

to authorize a single and complete project, but the same NWP cannot be used more than once for a single and complete project.

Whenever any other NWP is used in conjunction with NWP 26, the total acreage of impacts to waters of the United States for all NWPs combined cannot exceed three acres. Similarly, whenever any other NWP is used in conjunction with NWP 29, the total acreage of impacts to the waters of the United States, for all NWPs combined, cannot exceed one-half acre.

Corps-only PCN is required when any NWP 12 through 40 is combined with any other NWP 12 through 40 for a single or complete project. For example, if an applicant wishes to combine the use of NWP 14 for a road that does not involve fill in wetlands and NWP 13 for a bulkhead less than 500 feet in length, Corps-only notification will be required even though the use of these NWPs for the projects described does not require a PCN if constructed independently. Coordination with other re-

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source agencies is not required for Corps-only notifications, but may be done on a case-by-case basis when determined to be necessary by the USACE. Notification is not required to the USACE when any NWP 1 through 11 is combined with any other NWP.

Permit Certification

Another change to the NWP process requires that every permittee who has received a NWP verification from the USACE must submit a signed certification regarding the completed work and any required mitigation. This certification will include a statement that any required mitigation was completed in accordance with the permitted conditions (such a certification will also be required for Individual Permits).

Aside from significant changes to NWP 26, NWP 12 (which authorizes utility line discharges) has also undergone a major overhaul.

Two new NWPs issued in December, 1996, include NWP 30, which authorizes activities necessary to manage, con-

struct or maintain wildlife habitat on federal or state land, and NWP 31, which authorizes excavation and removal of sediment and vegetation for the maintenance of existing, authorized flood control channels.

How the re-issued and modified Nationwide Permits will affect the permitting process at the district level remains to be seen. Although some increases in workload are expected due to the tightening of NWP 26, the USACE plans to adhere to the 30-day notification period for all NWPs that require a PCN (except for NWP 26, which has a 45-day notification period). Another significant change in the notification process includes that for NWPs 12, 14, 18, 21, 26, 29, 34 and 38, the submitted PCN must also include a delineation of affected special aquatic sites, including wetlands. Additionally, various NWPs may require water-quality certification from the state regulatory agencies, as well as coordination with coastal management programs, as applicable.

The best way to keep on top of the changes to the Nationwide Permit program is to stay informed. The USACE plans to publish a guidance document soon to clarify many changes in the NWP program. Wetlands professionals and environmental attorneys may be the best sources of information. All concerned interests would be well advised to use the coming months to provide input to the USACE on activities that should be covered by new General Permits once NWP 26 is gone.

Keeping up to date on changes in the Nationwide Permit program will not only preserve wetland resources through avoidance, impact minimization and mitigation, but will keep existing and proposed projects that impact wetlands flowing smoothly. **EP**

Glenn W. Laird, AICP, is senior consultant and Barbara Lemm Castille is wetlands ecologist for Rust Environment & Infrastructure in Houston, Texas.

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Caribou Systems Corp. 251 Amberfield Dr. Mt. Laurel, NJ 08054 609-727-6940 FAX: 609-802-1431 Circle 125 on card.	Caribou	♦	♦	♦	♦	♦	♦	♦	♦	♦	Available	Available	Periodic	Relational database for facility and site environmental management and compliance monitoring. Tracks air, water, soil and waste issues. ISO 14000 compliant.
Computation Mechanics Inc. 25 Bridge St. Billerica, MA 01821 508-667-5841 FAX: 508-667-7582 Circle 126 on card.	Hydrotrack	♦									♦			Produces two models—water current and pollutant transport—to assist in determining pollutant movement in water.
	PRISE	♦												Calculates air or water-borne effluent dispersion.
Corbus, a division of Compliance Management Systems 206 C. Line Rd. Kennett Square, PA 19348 800-524-7096 FAX: 610-444-6461 Circle 127 on card.	Terms® Windows Safety and Environmental Software	♦									♦	♦	Available	Accommodates MSDS management and SARA Title III reports including Form R.
	MSDS Basic	♦									♦	♦	Available	Electronically manages MSDSs.
	MSDS Standard	♦									♦	♦	Available	Electronically manages MSDSs.
	i-Steps™ Air Tracking Software										♦	♦	Available	Helps prepare emission reports, and support Title V applications.
Counterpoint Publishing 84 Sherman St. Cambridge, MA 02140 800-998-4515 FAX: 617-547-9064 Circle 128 on card.	Code of Federal Regulations		♦								♦	♦	Available	CD-Rom and Internet.
	Federal Register and Archives										♦	♦	Available	CD-Rom and Internet.
	State Environmental/Safety Regulations										♦	♦	Available	CD-Rom and Internet.
	Super EH&S										♦	♦	Available	CD-Rom and Internet.
CPI Electronic Publishing 8399 E. Indian School Rd. Scottsdale, AZ 85251 800-808-3372 or 602-994-4560 FAX: 602-994-4456 Circle 129 on card.	FESA.com	♦	♦								♦	♦	Available	Regulatory compliance software. Provides CFR and Federal Register text, state regulations and agency compliance manuals on CD-Rom.
	FRNow.com										♦	♦	Available	Internet access to Federal Register (updated daily) plus automated daily search and notification based on customer-defined criteria.
	CFRselect.com										♦	♦	Available	One, all or any combination of the 50 CFRs on CD-Rom.
Dakota Software Corp. 7 Tobey Village Office Park Pittsford, NY 14534 716-381-8710 FAX: 716-381-1614 Circle 130 on card.	Dakota Software										♦	♦	Available	Manages compliance audit programs, helps conduct audits, does regulatory research, verifies corrected actions, prepares reports and trains personnel.

1997 HAZARDOUS WASTE SOFTWARE GUIDE

COMPANY	PRODUCT	Functionality										TRAINING	SUPPORT	UPDATES	DESCRIPTION
		Tracking	Threshold/Parameters	CFR/HAZ Database	Labeling	Remediation	Regulation Training	Com. RTK	DOT, HMR, 181	Being	CD-Rom				
Eagle Technology Inc. 10500 N. Port Washington Rd. Mequon, WI 53092 414-241-3845 FAX: 414-241-5248 <i>Circle 131 on card.</i>	Expert MSDS for Windows	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	Available	Annual	6 months	MSDS software stores and retrieves scanned MSDSs from any workstation. Includes federal regulations, chemical database and report writer.
Earth Soft 7171 Normandy Circle Littleton, CO 80123 800-649-8855 FAX: 303-932-1030 <i>Circle 132 on card.</i>	EquiS/Waste	♦	♦										Available	Available	Facility container and profile tracking and reporting system.
	EquiS for Windows	♦	♦	♦				♦	♦	♦			Available	Available	Remediation and monitoring data management and reporting system.
	HAZcad®														Integrated database with AutoCad to quantify, track and manage facility and field survey data of environmental hazards and materials.
EIS International Corp. 1401 Rockville Pike, Ste. 500 Rockville, MD 20852 301-738-6900 FAX: 301-738-1026 <i>Circle 133 on card.</i>	EHS/Life Cycle	♦	♦	♦	♦	♦		♦	♦	♦	Available	Annual	Annual	Comprehensive integrated EHS management system that combines data with maps, models, sensors and communications.	
EnviroMetrics Software Inc. 92 Read's Way New Castle, DE 19720 800-3554-9136 FAX: 302-324-9138 <i>Circle 134 on card.</i>	PlantWare®	♦											Available	Available	Comprehensive tracking software for air, water and solid waste emissions.
Environmental Software and Systems Inc. PO Box 1182 Bowling Green, OH 43402 419-353-8540 FAX: 419-353-8540 <i>Circle 135 on card.</i>	Chemmix				♦	♦	♦								Chemical reaction and incompatibility software.
	Solvent Alternatives Guide		♦				♦								Provides recommendations for solvent replacements in cleaning and degreasing operations.
	ARCHIE					♦	♦								Assessment procedure for hazardous material accidents.
	Geophysics Advisor Expert System						♦	♦							Helps non-geophysicists in applying geophysics to hazardous waste site investigation.
	Food Chain		♦				♦	♦							Calculates human daily pollutant intake through terrestrial food chain.
Environmental Systems and Technologies Inc. (ES&T) 2608 Sheffield Dr. Bucksburg, VA 24060 540-552-0685 FAX: 540-951-5307 <i>Circle 136 on card.</i>	ARMOS					♦		♦			Available	Available	Available	Groundwater flow and free phase hydrocarbon migration and recovery model.	
	BIOTRANS					♦		♦			Available	Available	Available	Multiphasic dissolved transport with oxygen-limited biodecay in fractured or porous aquifers.	
	BIOVENTING™					♦		♦			Available	Available	Available	Windows 95 program for air injection and extraction system design.	
	SPILLCAD					♦		♦			Available	Available	Available	Hydrocarbon spill assessment and remedial design model.	
	RBCA Tool Kit					♦		♦			Available	Available	Available	Risk-based corrective action analysis.	
EnviroWin Software Inc. PO Box 18110 Chicago, IL 60618-0110 800-454-0404 FAX: 773-244-1922 <i>Circle 137 on card.</i>	Fast Search Code of Federal Regulations on CD-Rom		♦							♦	♦		90 days	Quarterly	All 50 CFRs plus 12 months of the Federal Register. Complete regulations in folio format.
	Fast Search MSDS on CD-Rom									♦	♦		90 days	Quarterly	200,000 text-based MSDSs on CD-Rom. Complete 8- or 16-part format in folio.
	Fast Search TSCA on CD-Rom			♦						♦	♦		90 days	Yearly	The second edition 1996 TSCA inventory and 10 other key tables of hazardous chemical information.
	Generator Associate Hazardous Material Tracking	♦	♦	♦							♦		90 days		Waste tracker and management of hazardous material.
	Smartsigns				♦					♦	♦		90 days		Comprehensive hazcom label, tag and safety sign maker. Also pipmarker and chemical labeling system.
GreenWare Environmental Systems Inc. 145 King St. E. Ste. 200 Toronto, Ontario CN M5C-2Y8 416-363-5577 FAX: 416-367-2653 <i>Circle 138 on card.</i>	Waste Manager	♦	♦	♦	♦	♦					♦	Available	Available	Available	Comprehensive waste management system software that is flexible and easy to use.

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COMPANY	PRODUCT	Features										TRAINING	SUPPORT	UPDATES	DESCRIPTION						
		Tracking	Threshold Parameters	CFR/Haz Database	Labeling	Remediation	Regulation Training	Com - RTK	DOT HIR-181	Demo	CD-Rom					Network					
HazMat Control Systems Inc. 5199 E. Pacific Coast Hwy. Ste. 500 Long Beach, CA 90804-3307 310-597-7994 FAX: 310-597-9904 <i>Circle 139 on card.</i>	HAZWASTE™	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	Available	Available	Available	Tracks and manages hazardous waste manifests.					
IHS Environmental Information Inc. 855 Springdale Dr. Exton, PA 19341 610-594-4400 FAX: 610-594-4481 <i>Circle 140 on card.</i>	ENFLEX® EH&S Databases															Database containing current comprehensive coverage of federal, international and all 50 states' regulations. Available on the Internet.					
J.J. Keller & Associates Inc. 3003 W. Breeswood Ln. Neenah, WI 54957-0368 800-327-8868 FAX: 414-727-7516 <i>Circle 141 on card.</i>	Keller-Soft™ Compliance Information Manager	♦					♦	♦	♦	♦	♦			Available	Available	EPA, OSHA and DOT regulations and more than 250 compliance explanations and related documents. Folio® search engine.					
	Keller-Soft™ Chemical Reg-A-Dex													Available	Available	Contains data on 99 percent of the most commonly used chemicals. Notifies user if chemical is on one or more of 19 different chemical lists.					
	Keller-Soft™ for DOT HazMat Compliance	♦						♦	♦	♦				Available	Available	Easy access to current DOT hazmat regulations and E-Z Explanations™.					
	Keller-Soft™ Safety Plan Customizer													Available	Available	Helps determine site-specific safety plan needs and writes customized safety plans.					
Knorr Associates 10 Park Place Butler, NJ 07405 201-492-8500 FAX: 201-492-0453 <i>Circle 142 on card.</i>	Data Pipe	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	Available	Available	As modules change	Modular, multi-user Windows software for environmental, safety and occupational health needs in one integrated system.					
Logical Technology Inc. 5113 N. Executive Dr. Peoria, IL 61614 309-689-2900 FAX: 309-689-2911 <i>Circle 143 on card.</i>	Chemical Compliance Monitor™												♦	♦	♦	Available	Yearly	Quarterly	Comprehensive database of chemicals and regulatory lists.		
	The MSDS Solution™													♦	♦	♦	Available	Yearly	Quarterly	Comprehensive MSDS manager.	
	LOGITRAC™	♦	♦	♦	♦									♦	♦	♦	Available	Yearly	Quarterly		
	HAZMIN®	♦	♦	♦	♦									♦	♦	♦	Available	Yearly	Quarterly		
Modern Technologies Corp. 4032 Linden Ave. Dayton, OH 45432 937-252-9199 FAX: 937-252-9227 <i>Circle 144 on card.</i>	LINDEN Environmental Management System	♦	♦	♦	♦									♦	♦	♦	Available	1 year	Quarterly	Gate-to-gate management of chemicals and waste, including manifesting, RCRA reporting and waste cost analysis.	
Pacific Environmental Services Inc. 5001 S. Miami Blvd. Research Triangle Park, NC 27709 703-471-8383 FAX: 703-481-8296 <i>Circle 145 on card.</i>	i-Steps	♦	♦	♦	♦									♦	♦	♦	Available	Unlimited	Once or twice a year	Comprehensive multimedia environmental database management system. Links to CAD and process control systems available. Generates SARA, manifests and biennial reports.	
PARS Environmental Services 6 South Gold Dr. Ste. A Robbinsville, NJ 08691 609-890-7277 FAX: 609-890-9116 <i>Circle 146 on card.</i>	PARS HazWaste Monitor®	♦															♦	♦	Available	Waste tracking and management system that generates state and federal hazardous waste reports.	
Permit Tracker Software PO Box 033846 Indialantic, FL 32903-3846 800-365-3962 FAX: 407-723-6213 <i>Circle 147 on card.</i>	Permit Tracker	♦															♦	♦	Available	Windows-compatible system sets up and tracks user-defined lists of any permits and actions.	
Petroleum Information 1675 Broadway, Ste. 700 Denver, CO 80202 303-595-7500 FAX: 303-595-7505 <i>Circle 148 on card.</i>	HazSearch®																		1 year	Quarterly	Database on transported hazardous waste shipment records filed with state agencies and the EPA.
	AzProfile® Marketing System																	♦		1 year	Bi-monthly
Regulation Scanning One Executive Plaza, 330 Pine St. Ste. 300 Williamsport, PA 17701-6215 717-323-1010 FAX: 717-323-8082 <i>Circle 149 on card.</i>	RegScan™																	♦		Available	Full-text regulations for Windows and Mac. Federal regulations, environmental laws, Federal Register, regulations for all 50 states.
	RegScan Live™																	♦		Available	Downloadable full-text regulations on the Internet. Federal regulations, environmental laws, Federal Register, regulations for all 50 states. Search engine.

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COMPANY	PRODUCT	Functionality								TRAINING	SUPPORT	UPDATES	DESCRIPTION	
		Tracking	Threshold Parameters	CFR/HAZ Database	Labeling	Remediation	Regulation Training	Comp. RTX	DOT HM-181					Demmo
Resource Consultants 7121 CrossRoads Blvd. Brentwood, TN 37027 615-373-5040 FAX: 615-370-4339 Circle 150 on card.	CHEMTOX Database	♦	♦	♦	♦	♦	♦	♦	♦	♦	Available	1 year	Quarterly	Comprehensive source of all North American and European regulated chemicals.
	CHEMTOX Waste Management	♦	♦	♦	♦	♦	♦	♦	♦	♦	Available	1 year	Annually	Enterprise waste tracking and reporting solution.
Semcor Inc. 304 Harper Dr. Ste. 200 Moorestown, NJ 08057-3220 609-234-6600 FAX: 609-776-1639 Circle 151 on card.	CQ for Windows	♦	♦					♦	♦		Available	Available	Monthly	EHS Audit software that generates protocols, identifies areas of responsibility, helps conduct audits to uncover compliance concerns and tracks findings and corrective actions.
Tahoe Design Software PO Box 8128 Truckee, CA 96162 916-582-1525 FAX: 916-582-8579 Circle 152 on card.	Pumpbase									♦		Free	Quarterly	Advanced pump selection and specification.
	Hydroflo II									♦		Free	Yearly	Series/parallel pump system analysis.
	Hydronet 4									♦		Free	Yearly	Fluid network analysis.
Wixel 7936 E. Arapahoe Ct. Ste. 3200 Englewood, CO 80112 303-796-0045 FAX: 303-796-0043 Circle 153 on card.	ExecuTrax	♦		♦				♦	♦	♦	Available	Available	Available	Waste tracking and management for generators.
	ServiceTrax	♦		♦	♦			♦	♦	♦	Available	Available	Available	Waste tracking, management, quotation, invoicing, routing and lab packing for transportation.
	TSDTrax	♦		♦	♦			♦	♦	♦	Available	Available	Available	Total management software for TSD and recycling facilities.

the grapevine

Dames & Moore recently completed a groundwater evaluation for upgrading a wastewater treatment system in the Village of Fleischmanns, N.Y. The firm investigated geological and hydrogeological characteristics of two possible groundwater recharge areas for wastewater effluent.

DPIC Companies Inc. announced the creation of DPIC Management Services Corp. The independently operated subsidiary will provide management services to architectural, engineering and environmental consulting firms.

Engelhard Corp. has almost finished installing the largest volatile organic compound (VOC) abatement system in the auto industry at AutoAlliance International Inc. Using new technology, Regenerative Catalytic Oxidation (RCO), the system can destroy over 591 pounds of VOCs an hour.

Golder Associates Inc. named Russ

Browne, P.E., senior project manager. Browne will be concentrating on developing base and precious metal mines in the western United States.

For the latest scoop on the comings and goings of the Environmental Protection corporate field.

Thermo Jarrell Ash and the United States Navy joined forces to create a prototype of a continuous emission monitor used to analyze hazardous air pollutant metals in the effluent of boilers, incinerators and furnaces that eliminate the need for manual sampling and testing.

Church & Dwight's sodium bicarbonate process is now using EPR Inc.'s Aerodynamic Module (ADM), which uses aerodynamic forces to separate and capture particulates created from manufacturing activities.

EnviroMetrics Software Inc. opened a Houston, Texas office. Val Ward serves as regional technical sales representative and Neal Rosen is services engineer.

Jane Goodall, Birute Galdikas and George B. Schaller received the 1997

Tyler Prize for Environmental Achievement. The award, a cash prize of \$150,000 and gold Tyler Prize medallions, recognizes individuals who work to focus global attention on ecological problems.

CSR PolyPipe plans to build a new polyethylene pipe, fittings and valve production facility in Gainesville, Texas.

Sorbent Products Co. Inc. has acquired the Slikwik Sorbents business from The Andersons. Sorbent Products Co. now owns the Slikwik brand name, distribution network, trademarks, inventory and limited production equipment.

EnviroMetrics Software Inc., provider of client/server environmental, health and safety database applications, will acquire Travertine Environmental Inc., a consulting firm specializing in designing, implementing and supporting environmental information.

John Cashman will head the new Environmental Data Resources Inc. office in Houston, Texas. The company's second office will target southern Texas and Louisiana customers. **EP**

Multichannel Digitizer

The OMB-WAVEBOOK-512 is a portable, high-speed

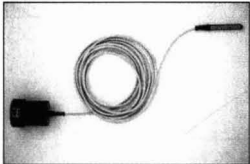


multichannel digitizer that easily attaches to notebook or desktop PCs. Its compact, all-metal construction and convenient BNC signal connections make it ideal for laboratory and field applications. Software included. Omega.

Circle 80 on card.

Water Logger

The WL14 provides a datalogger with water level sensor



for remote monitoring and recording of water level data. This highly reliable and accurate water level logger records 6,000 readings and is programmable from one reading per minute to one per hour. Global Water.

Circle 81 on card.

Water Pump

Simple, reliable inertial pump uses riser tube with a



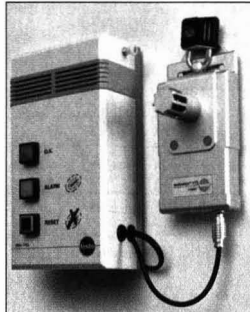
one-way foot valve and a surface pumping mechanism to raise groundwater samples from depths up to 200 feet. Sampling can be performed by

hand with the inexpensive hand-pump handle or with an electric or gasoline pump controller. Solinst Canada Ltd.

Circle 82 on card.

Alarm Logger

Monitor production conditions for temperature and hu-



midity with the 1722 electronic datalogger. Its integrated memory stores up to 55,000 data points and is programmable to take samples in any possible frequency. Collected data is viewed with a plug on display or printed on-site. Both the signal device and datalogger are waterproof, theft-proof and tamper-proof. Testo Inc.

Circle 83 on card.

Compactor

VersApak features a unique variable pressure hydraulic ram



system, which delivers 20,000 pounds of force to compact waste into cubic-yard and cubic-meter boxes without damaging the containers. It compacts wastes into drums and crushes empty drums. Rampactor Inc.

Circle 84 on card.

Sub-Soil Probe

The Sub-Soil Probe PLUS and Bosch Rotary Hammer



rapidly samples 0- to 20-foot depths. An electric hammer drives the sampling tube into the ground and a foot-operated jack retrieves it. Samples measure 3 feet by 1.3 inches captured in plastic or stainless steel containers. JMC Soil Investigation Equipment.

Circle 85 on card.

Ultrasonic Transmitter

The LU35 Echotouch™ sanitary ultrasonic level transmit-

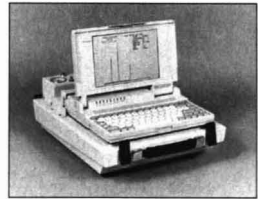


ter has a smooth, all-natural PVDF transducer with a 4-inch tri-clover process connection. It meets the elevated-temperature requirements for clean in-place installations. Its microprocessor electronics have a tight 6-inch deadband and a 24.5-foot measurement range. Flowline.

Circle 86 on card.

Portable GC

SCENTOSCREEN Portable GC checks oil for PCB contamination. It weighs ap-



proximately 30 pounds, including a detachable lap-top computer and internal carrier gas bottle. Simply inject a treated sample to obtain concentration levels and specific PCB from the comparison calibration library. Sentex Systems Inc.

Circle 87 on card.

MSDS Management

MIRS for Windows offers a flexible suite of software for



expediting MSDS tracking and maintenance with many options: inbound or outbound MSDSs, text or scanned image format, in-house or customer distribution and CMA Chemtrec database export. A V Systems Inc.

Circle 88 on card.

Portable Flowmeter

Take field measurements from any size closed pipe with



EIT's portable Doppler flowmeter. Rechargeable, sealed gel-cell battery provides long life even under continuous operation. Select operating period from 18 hours to 18 days using "battery save," "sleep" and "auto-off" power modes. EIT.

Circle 89 on card.

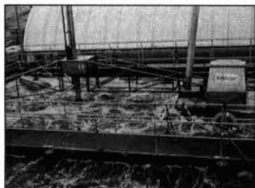
GIS and GPS

The PC5L-GPS-HP® is the first product to integrate GIS data collection and reliable sub-meter GPS technology with one-second occupation times. The 12-channel, continuous-tracking receiver provides 30-cm accuracy with post-processed differential correction. Corvallis Microtechnology Inc.

Circle 90 on card.

Aeration System

The 400 Series Biomixer Aeration System is an en-

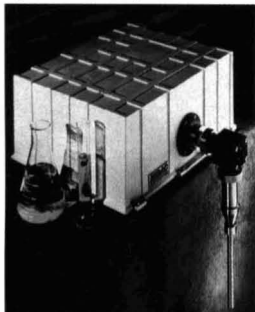


hanced aeration and mixing system with real-time process control. Achieves more than 50 percent greater efficiency than mechanical surface aerators and 100 percent greater-than-coarse bubble aeration. Biomixer Corp.

Circle 91 on card.

Spectrometer

The I Series Industrial FTIR Spectrometer Systems are de-



signed for on-line, at-line, near-line and QC applications. Ideal as fixed, single-point monitors, mobile analyzers or dedicated methods development and QC workstations. Sampling accessories attach to the front of the instrument. MIDAC Corp.

Circle 92 on card.

Portable Air Velocity Meters

Series 440 portable air velocity meters and Series 490 mini-

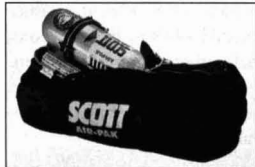


anemometers are handy, accurate and reliable instruments for industrial hygiene, HVAC and general-purpose measurements. Kurz Instruments Inc.

Circle 93 on card.

SCBA Carrying Case

Carry Air-Pak SCBA or other fire-related equipment

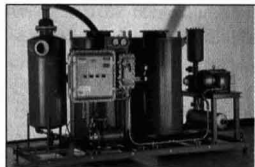


in a new soft-sided canvas case from Scott Health & Safety. It is 31 inches long, 15½ inches wide and 15½ inches deep. The padded bottom, shoulder and hand carrying straps and double zipper accommodate an entire set of turnout gear. Scott Health & Safety.

Circle 94 on card.

Integrated Systems

NEEP Systems is a UL-listed control panel shop that can



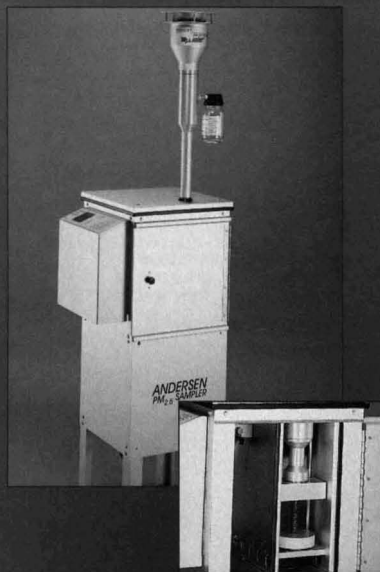
engineer and integrate a wide variety of technologies such as dual phase extraction, soil venting, GAC and oxidizers. Get custom-engineered and integrated environmental technologies that meet your needs effectively and realistically. North East Environmental Products Inc.

Circle 95 on card.

ANDERSEN

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Advanced PM2.5 Sampler is designed to:

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In the early nineties, new state and federal laws regulating moisture content in residual waste became a profound challenge for most municipalities. "Free Water" in residual waste was no longer permitted to be taken to conventional landfills or used for land applications.

Flo Trend™ Systems, Inc. has assisted some of these municipalities in answering this challenge by providing the patented CONTAINER FILTER™ to remove "Free Water" to an acceptable level for landfill disposal. Added bonuses are the elimination of double handling of residual waste and volume reduction of 20% (average) which leads to significant savings in waste management and transportation.

The FTS CONTAINER FILTER™ is an economical, one-step method in separating grit and debris from organic materials. Also, the CONTAINER FILTER™ is a means of dewatering residual waste to an acceptable compliance level of dryness for land application and landfill disposal. Vacuum enhancement will accelerate drainage and material dryness.

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Groundwater Remediation

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using Fenton-like chemistry to generate hydroxyl radicals. It reduces organic contaminants to the base state of carbon dioxide and water. Remediate chlorinated solvents, hydrocarbons, halocarbons, aromatic solvents, gasoline, fuel oil, tar and much more. CleanOX Environmental Services.

Circle 96 on card.

Environmental Monitor

The unique PHT-101 Environmental Monitoring and



Alarm Unit is a single-digital transmitter that accurately senses, displays, alarms and processes temperature, pressure, humidity and other environmental information for critical control situations. Thermo-Mizer Environmental Corp.

Circle 97 on card.

Drum Locks

DrumLoks from Taurus Precision are positive-locking devices designed to secure the contents of 55- and 30-gallon steel drums. Secure insecticides, solvents, toxic waste, oils, pure chemicals, waxes, poisons and more against spills, pilferage,



contamination and unauthorized use. Taurus Precision Inc. Circle 98 on card.

Spectrophotometer Ampoules

Self-filling Vacu-vials® ampoules can be used in most vis-



ible range spectrophotometers. Each ampoule contains a unit dose of liquid reagent sealed under vacuum to eliminate the need to measure and mix chemicals. CHEMetrics Inc.

Circle 99 on card.

Ultrasonic Flowmeter

The new TransFlection® ultrasonic flowmeter measures



flow in multiphase fluids such as raw sewage, sludge, slurries, tar sands, oil-water-gas mixtures, highly aerated fluids and other demanding applications. Correlation Transit-Time™ cleans liquids where Doppler-type meters cannot work. Panametrics Inc.

Circle 100 on card.

Container Handling

The Dumpster-Veyor™ is a patented container-handling



system designed to evenly distribute material into a roll-off container. The container is unloaded from a truck onto the Dumpster-Veyor™, then powered back and forth for even distribution. Reduce labor, operating, maintenance and building costs while improving safety. Cordell and Associates.

Circle 101 on card.

State Regs

As the EPA shifts regulatory authority to the state level, RegScan updates environmental regulations in all 50 states monthly and delivers them on CD-ROM and on the World Wide Web. Boolean, phrase and document searches allow users to view text of more than one state or both state and federal information at once. RegScan Inc.

Circle 102 on card.

Portable Centrifuge

The Liqua Pac™ HS Clarification System removes solids



down to 5 micron from coolants or oils. Features include a heavy-duty removable aluminum liner. It produces dry solid cakes for easy disposal to reduce waste volumes. Available options include feed or discharge pumps, corrosion-resistance and more. Sanborn Technologies.

Circle 103 on card.

Motor Pumps

The NC Series of canned motor pumps—FM-approved

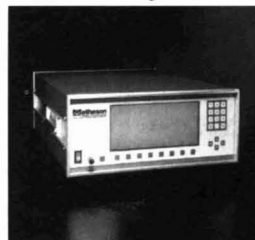


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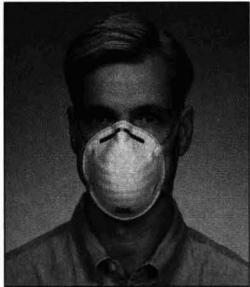
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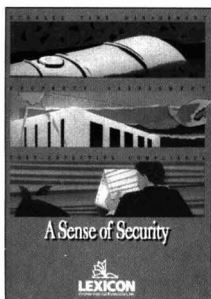
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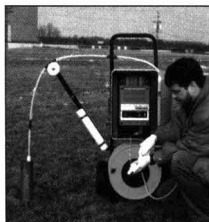


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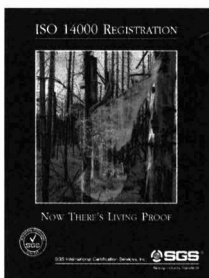
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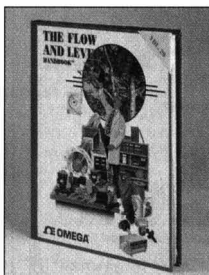
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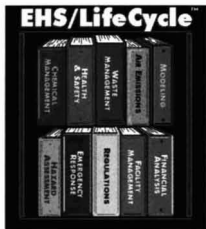
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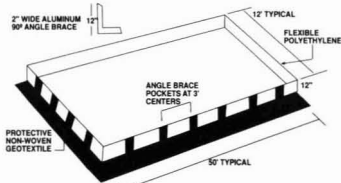
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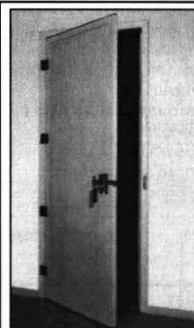
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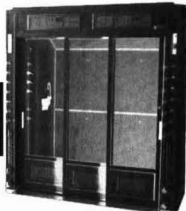
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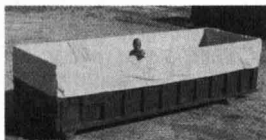
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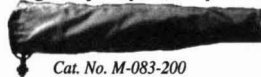


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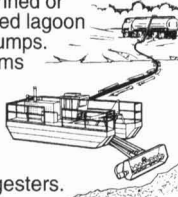
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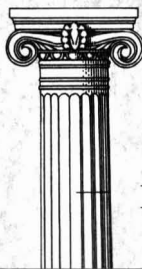
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816 Plant Upgrade
817 Replacement/Maintenance

C. What is your projected budget for the selected products/services? (Select one)

- 818 Over \$200,000
819 \$100,001-\$200,000
820 \$50,001-\$100,000
821 \$10,001-\$50,000
822 \$5,000-\$10,000
823 Under \$5,000

D. How immediate is your need for the selected products/services? (Select one)

- 824 0-3 months
825 4-6 months
826 7-9 months
827 10-12 months
828 over 12 months

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1	32	63	94	125	156	187	218	249	280	311	342	373	404	435	466
2	33	64	95	126	157	188	219	250	281	312	343	374	405	436	467
3	34	65	96	127	158	189	220	251	282	313	344	375	406	437	468
4	35	66	97	128	159	190	221	252	283	314	345	376	407	438	469
5	36	67	98	129	160	191	222	253	284	315	346	377	408	439	470
6	37	68	99	130	161	192	223	254	285	316	347	378	409	440	471
7	38	69	100	131	162	193	224	255	286	317	348	379	410	441	472
8	39	70	101	132	163	194	225	256	287	318	349	380	411	442	473
9	40	71	102	133	164	195	226	257	288	319	350	381	412	443	474
10	41	72	103	134	165	196	227	258	289	320	351	382	413	444	475
11	42	73	104	135	166	197	228	259	290	321	352	383	414	445	476
12	43	74	105	136	167	198	229	260	291	322	353	384	415	446	477
13	44	75	106	137	168	199	230	261	292	323	354	385	416	447	478
14	45	76	107	138	169	200	231	262	293	324	355	386	417	448	479
15	46	77	108	139	170	201	232	263	294	325	356	387	418	449	480
16	47	78	109	140	171	202	233	264	295	326	357	388	419	450	481
17	48	79	110	141	172	203	234	265	296	327	358	389	420	451	482
18	49	80	111	142	173	204	235	266	297	328	359	390	421	452	483
19	50	81	112	143	174	205	236	267	298	329	360	391	422	453	484
20	51	82	113	144	175	206	237	268	299	330	361	392	423	454	485
21	52	83	114	145	176	207	238	269	300	331	362	393	424	455	486
22	53	84	115	146	177	208	239	270	301	332	363	394	425	456	487
23	54	85	116	147	178	209	240	271	302	333	364	395	426	457	488
24	55	86	117	148	179	210	241	272	303	334	365	396	427	458	489
25	56	87	118	149	180	211	242	273	304	335	366	397	428	459	490
26	57	88	119	150	181	212	243	274	305	336	367	398	429	460	491
27	58	89	120	151	182	213	244	275	306	337	368	399	430	461	492
28	59	90	121	152	183	214	245	276	307	338	369	400	431	462	493
29	60	91	122	153	184	215	246	277	308	339	370	401	432	463	494
30	61	92	123	154	185	216	247	278	309	340	371	402	433	464	495
31	62	93	124	155	186	217	248	279	310	341	372	403	434	465	496

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Name _____

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Company _____

Address _____ Home Bus.

City _____ State _____ ZIP _____

Bus. Phone _____ FAX No. _____

YES, I would like to receive/continue to receive Environmental Protection.

NO, I'm not interested at this time.

Signature _____ Date _____

A. Which of the following Sludge Drying and Disposal product(s)/services do you plan to purchase in the next 12 months?(Select all that apply)

- | | | |
|--|---|---|
| 800 <input type="checkbox"/> Belt Filter | 805 <input type="checkbox"/> Sludge Incinerator | 810 <input type="checkbox"/> Sludge Level Meter |
| 801 <input type="checkbox"/> Vacuum Filter | 806 <input type="checkbox"/> Wet Air Oxidation System | 811 <input type="checkbox"/> Sludge Dryer |
| 802 <input type="checkbox"/> Screw Press | 807 <input type="checkbox"/> Fluid Bed Incinerator | 812 <input type="checkbox"/> Biosolids Treatment System |
| 803 <input type="checkbox"/> Filter Pres | 808 <input type="checkbox"/> Bulk Bags | 813 <input type="checkbox"/> Flocculant |
| 804 <input type="checkbox"/> Centrifuge | 809 <input type="checkbox"/> Odor Control | 814 <input type="checkbox"/> Land Application Vehicles |

B. What is your reason for purchasing the selected products/services? (Select one)

- 815 New Construction
816 Plant Upgrade
817 Replacement/Maintenance

C. What is your projected budget for the selected products/services? (Select one)

- 818 Over \$200,000
819 \$100,001-\$200,000
820 \$50,001-\$100,000
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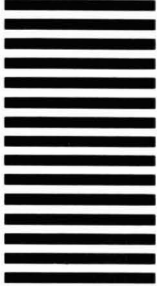
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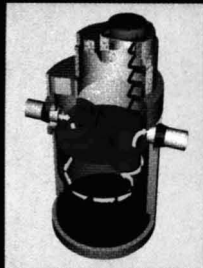
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ARE YOUR STORM DRAINAGE POLLUTANTS BEING SWEEPED OUT OF SIGHT?



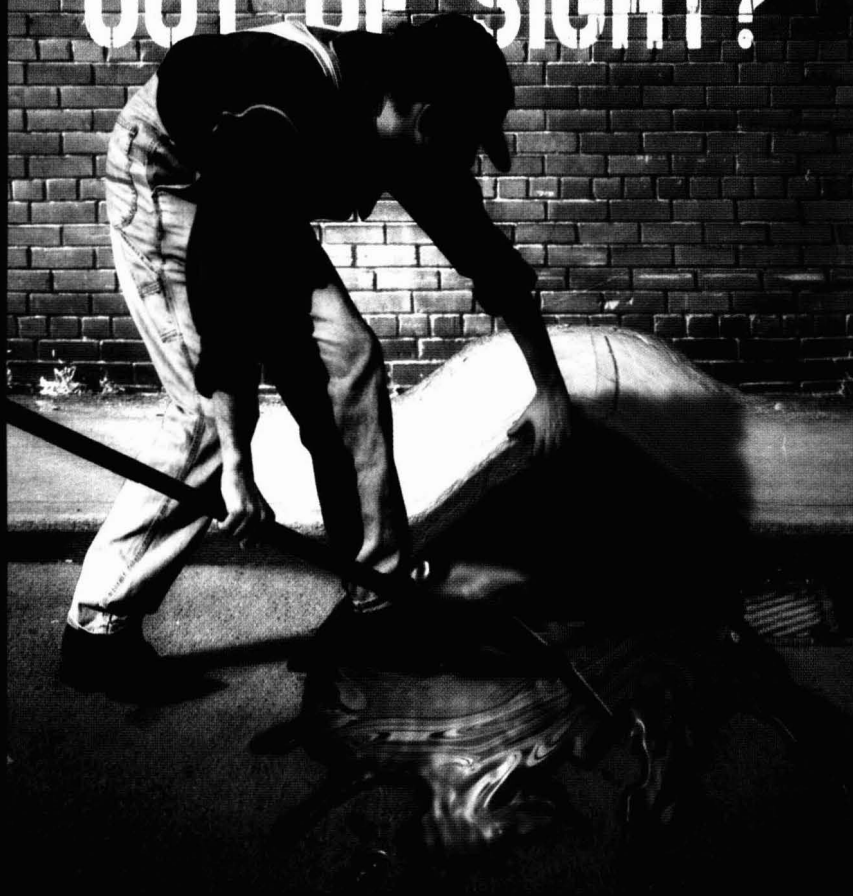
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SYSTEM IS THE
ENGINEERED
SOLUTION FOR
STORMWATER
QUALITY
IMPROVEMENT

APPLICATIONS:

COMMERCIAL
RESIDENTIAL
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INSTITUTIONAL
INFILL
RETROFIT
REDEVELOPMENT
MUNICIPAL

BENEFITS:

REMOVES OIL
TRAPS SEDIMENT
DOES NOT SCOUR
EFFECTIVE
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