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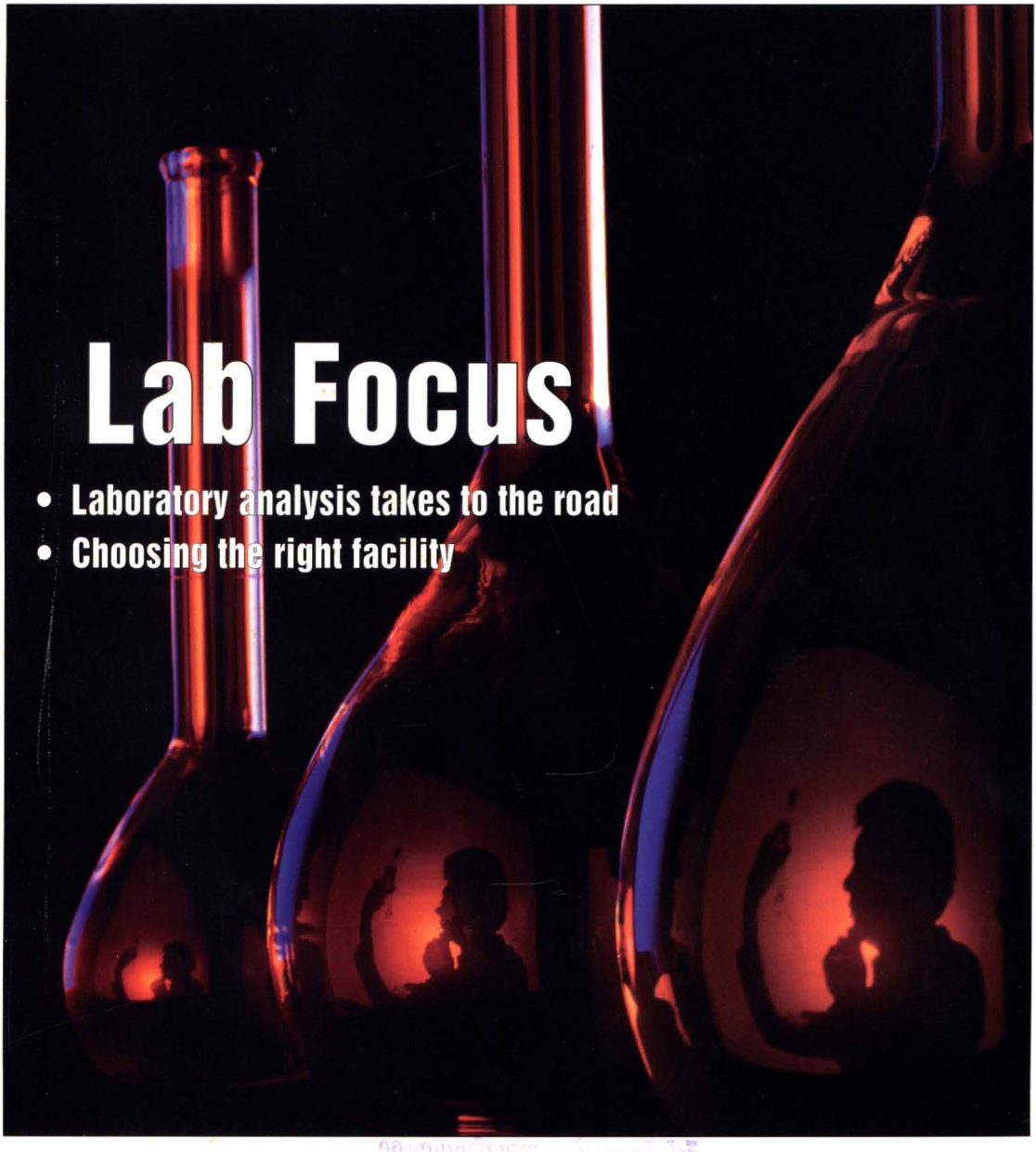

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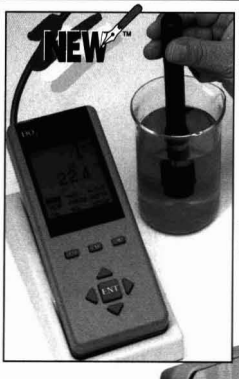

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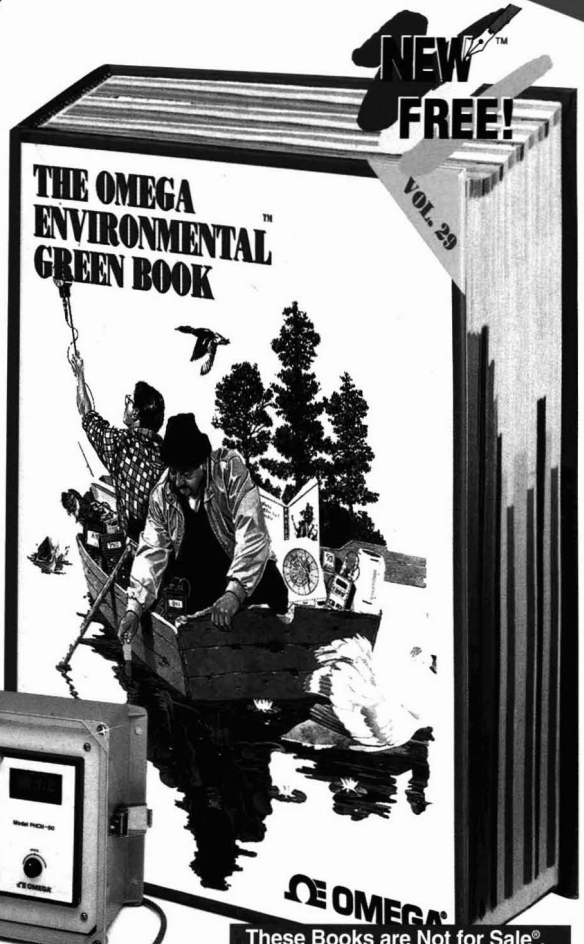

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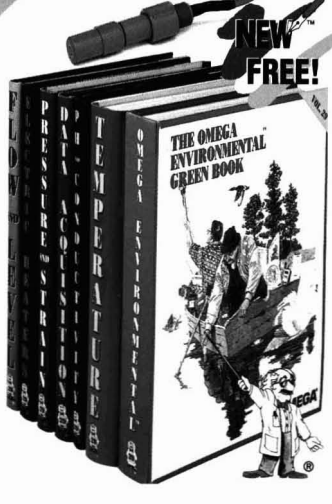

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1. Function which best describes your activity in Pollution Control (check only one):

A ☐ Corporate responsibility for Pollution Control
B ☐ Manage all Pollution Control Operations at this location
C ☐ Supervise sub-group in Pollution Control Operations
D ☐ Provide professional consulting service on Pollution Control
E ☐ Provide staff environmental service on Pollution Control
Z ☐ Other (please specify) _____

2. Type of Business (check only one):

A ☐ Manufacturing. If manufacturing, please check the appropriate SIC (check only one):

☐ (20) Food
☐ (21) Tobacco
☐ (22) Textile
☐ (23) Apparel
☐ (24) Lumber & Wood
☐ (25) Furniture
☐ (26) Paper
☐ (27) Print/Publish
☐ (28) Chemicals
☐ (29) Petrol. & Coal
☐ (30) Rubber/Plastic
☐ (31) Leather
☐ (32) Stone/Clay/Glass
☐ (33) Primary Metal
☐ (34) Fab. Metal
☐ (35) Mach., except Elect.
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☐ (39) Miscellaneous Mfg.

B ☐ Mining
C ☐ Agriculture
D ☐ Engineering & Contracting
L ☐ Consulting
M ☐ Insurance
E ☐ Utilities, public, private & cooperative
F ☐ Govt. including municipal or district sanitary water or wastewater trmnt. sys. or plants

Type of Govt:

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I ☐ State J ☐ Federal
K ☐ Transportation
N ☐ Labs O ☐ Training P ☐ Real Estate
Z ☐ Misc. Services _____ (please specify)

3. Approximate number of employees at this address (check only one):

A ☐ 1-19
B ☐ 20-49
C ☐ 50-99
D ☐ 100-249
E ☐ 250-499
F ☐ 500-999
G ☐ 1000-1499
H ☐ 1500-2499
I ☐ 2500 and up

4. In your job function do you recommend, specify or purchase? (check all that apply):

A ☐ Pollution Control Equipment
B ☐ Instrumentation
C ☐ Chemicals
D ☐ Parts & equipment for maintenance operation and control
E ☐ Services/Consulting
F ☐ None of the above _____ (please specify)

5. What types of Pollution Control are you responsible for? (check all that apply):

A ☐ Air
B ☐ Water
C ☐ Noise
D ☐ Solid waste disposal
E ☐ Industrial hygiene
F ☐ Toxic & hazardous material
G ☐ Energy control/energy conservation
H ☐ None of the above _____ (please specify)

6. Which of the following publications do you receive personally addressed to you? (check all that apply):

A ☐ Pollution Engineering
B ☐ Environment Today
C ☐ Hazmat World
D ☐ Pollution Equipment News
E ☐ The National Environmental Journal
F ☐ Water Environment & Technology
G ☐ None of the above _____ (please specify)

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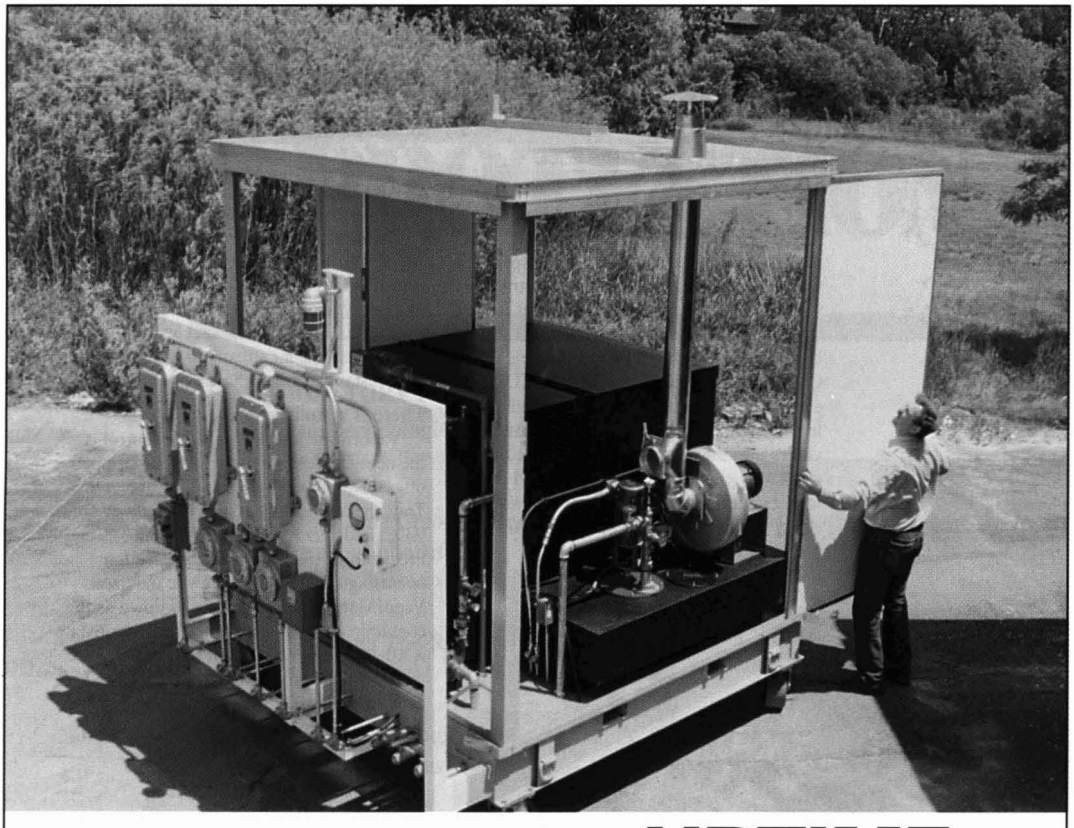

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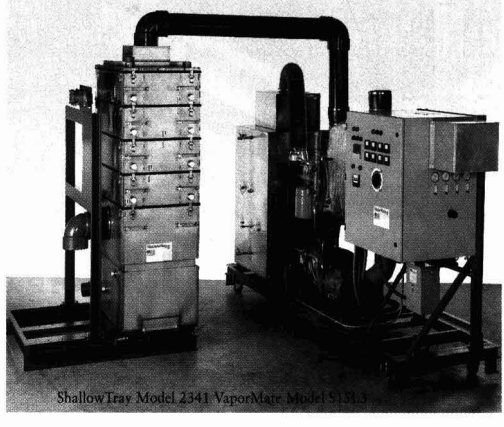
The Smart Way to Treat Water and Air

If you use Granulated Activated Carbon (GAC) to treat VOC contaminated groundwater, chances are you'll spend way too much money. GAC looks attractive with its lower up front cost. But costs don't take long to soar. Carbon is only 10% efficient – at best with – BTEX compounds. Chlorinated hydrocarbons, such as TCE, are even harder to adsorb, making carbon even less efficient. Often, within a matter of days you're into the messy and costly cycle of constantly changing out the GAC and then facing either disposal as a hazardous waste, or regeneration. Either way, you end up paying and paying and paying.



ShallowTray Model 2341 VaporMate Model S15L3

There is a better way.

ShallowTray low profile air strippers have changed the way engineers think about air stripping. When the ShallowTray technology was first introduced in 1988, packed towers were the standard. Now, nearly 8 out of 10 air strippers sold in the groundwater remediation market are low profile. The patented ShallowTray process has proved to be economical and extremely efficient for the usual VOCs like BTEX and TCE. Moreover, 99.99% removal of hard-to-strip compounds like Methyl Tert Butyl Ether (MTBE) is now commonplace.

But what to do with the offgas?

Air stripper discharge is normally dilute and at 100% relative humidity. The dilute stream makes the capital and operating cost of a catalytic oxidizer exorbitant. And to get anywhere near 20% efficiency with GAC, you need to heat the air stream and still deal with the constant costs and hassle of changeouts.

There is a smarter way.

VaporMate low energy VOC control is the new, efficient way to treat your stripper offgas. Developed by the makers of ShallowTray, the VaporMate system operates at only 93°C, and gets 95-99% destruction. Predictably. ***And, low energy means low operating costs.*** Unlike catalytic oxidizers, VaporMate's operating costs go down as the contaminant levels go down. And VaporMate is safe. There is no ignition source anywhere in this unique process that uses ozone and a catalyst to destroy VOCs. Combine ShallowTray with VaporMate and you have the smartest way to treat water and air.

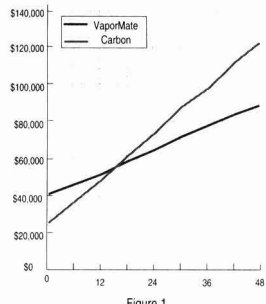


Figure 1

Figure 1 shows GAC costing more than ShallowTray and VaporMate after just 16 months of operation. After four years, the GAC costs are higher by more than $33,000. Skid mounted VaporMate can be easily trailer mounted and moved from site to site. Cost assumptions used: Site has 20 ppm total BTEX at 15 gpm for a yield of 3.6 lbs/day of BTEX. ShallowTray model 2331-P and VaporMate model S15L2 capital cost of $40,076 and monthly operating costs of $1,035. GAC capital cost for two 3000 lb vessels and piping $24,300 and operating cost (6% efficiency = 60 lbs carbon/day at $1.15 per pound) of $2,070 per month.

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VaporMate™
low energy VOC control

North East Environmental Products, Inc.
17 Technology Drive, West Lebanon, NH 03784.

from the makers of ShallowTray

*The VaporMate process is patented. Other patents pending.

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February 1995 Vol. 6, No. 2

Environmental PROTECTION

Cover:
A host of innovations, including new analysis tools, field 'hardened' technologies and productivity-enhancing efforts are transforming the environment lab industry. Our special laboratory focus begins on page 14. ©Daryl Benson/ Masterfile.

FEATURES

Page 14

DEPARTMENTS

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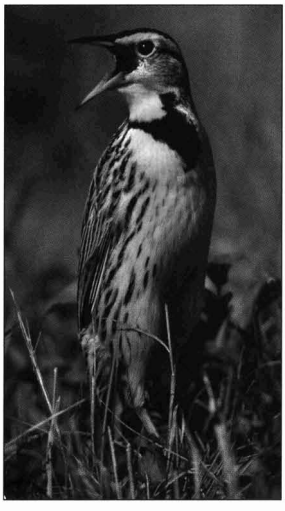
From The Editor



© Priscilla Connell/Photo/NATS

The bottom line never tells the whole story.

That is the wisdom of this month's article on choosing the right laboratory. Of course cost matters, but not any more than quality data. Without accurate information, your "cost saving" decision could result in higher expenditures and erase any savings you expected from the lowest bidder.

The fundamental element is accurate information. EPA is doing its part this month by gathering representatives from the laboratory community, regulators and other organizations Feb. 14-16 at the National Environmental Laboratory Accreditation Conference (NELAC) in Arlington, Va. The agency hopes to propel a program draft into a national system that will improve the quality and efficiency of laboratories across the United States.

Two federal advisory bodies have recommended the system include performance evaluation tests, on-site and data audits and outlined detailed standards (see Part 4, of the Dec. 2, 1994, *Federal Register* or call (202) 512-1800 for a copy). The accreditation conference plans to use these standards as its operational framework. (For information on the conference, contact Daniel Dozier at TLI Systems Inc., (301) 718-2270.)

According to Jeanne Mourrain, executive secretary of NELAC, EPA has been interested in developing a third advisory group since 1992. The Clinton administration discouraged the establishment of so many federal advisory committees, but the agency has since discovered that such a body may be acceptable if it were established for a limited timeframe, Mourrain explained. A charter has been drafted and in January was being considered by the Office of Management and Budget. Should approval be granted, EPA will be looking for a broad spectrum of representatives, including laboratory personnel, regulators and environmental groups.

Before you volunteer to participate, browse through this issue and find out what technologies have graduated from the laboratory to the field, such as laser opacity monitors, Fourier transform infrared spectrometry and ion mobility spectrometry. In keeping with the laboratory focus, *Environmental Protection's* newest department, Stock Watch, profiles the analytical instrumentation sector of the market.

You may want to attend Pittcon '95 where the latest in analytical tools will be on exhibit March 5-10 in New Orleans. Of particular note is the symposium titled, "Can Ion Trap Mass Spectrometry Be Used For Official EPA Methods?" According to the conference update, this symposium notes that new ion traps offer improved sensitivity and flexibility over traditional mass spec methods. This raises a number of questions – will EPA accept this new technology, will it be used to lower regulated levels and will some jobs be easier? Representatives from academia, EPA and laboratories plan to share their answers on March 7.

With all the current activity on laboratories, the job of getting accurate data can only improve.

Lisa K. Neal

Lisa Neal

Environmental PROTECTION

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"Contract" proposals speed through Congress

Republican proposals to limit the cost of new regulations and squelch so-called 'unfunded mandates' are barrelling through both Houses of Congress at a pace that is surprising even the lawmakers themselves.

Bills that would boost requirements for cost-benefit analyses of proposed regulatory laws and restrict Congress from passing laws that impose uncompensated costs on states and localities – two key components of the Republican "Contract with America" – were moving toward floor votes with such momentum that Democrats complained they could become law before their impacts are fully understood.

And a measure that would impose a moratorium on new regulations until July 1, introduced the first week of the 104th Congress by House Majority Whip Tom DeLay (R-Texas), appeared to be picking up support on both sides of the aisle – despite being condemned as a "blunderbuss" by Office of Management and Budget Director Sally Katzen. Among major environmental rules that would be delayed by the moratorium is the Clean Air Act's enhanced monitoring rule and California's clean air implementation program.

Concern over unforeseen consequences of the Republican reform initiatives was underscored at Senate hearing last month, when Sen. Carl Levin (D-Mich.) brandished a letter from waste hauler Browning-Ferris Industries decrying the unfunded mandates bill as an unfair competitive boost to public-sector competitors. The bill "would severely skew the marketplace in favor of government rather than private-sector services" by shifting the compliance cost burden, argued BFI Vice President Richard Goodstein in the December letter.

The bill was approved by the committee despite the concern – and was reported to the Senate floor before staffers could finish the accompanying committee report. "I think we're in just a little too big of a hurry," said Sen. Robert Byrd (D-W.Va.) of the Republican rush.

EPA has called the proposed risk assessment bill, which would lower the threshold for requiring cost-benefit analyses of new regulatory proposals to bills costing $25 million, down from the current $100 million threshold, an "inflexible requirement" that cannot easily be applied to complex environmental laws.

Number Of Permits Granted Under Statute

Statute	Category	# of Permits
Clean Water Act	Major/minor discharges	65,000
General Permits	-	10,000
Industrial Stormwater	-	100,000
Sludge	-	20,000
Clean Air Act	Title V	350,000
	New sources, review modifications	40,500 per year
Resource Conservation and Recovery Act	Operating permits	2,425
	Post closure	1,834
Underground Injection Control	-	404,344
Toxic Substances Control Act	PCB disposal	53

EPA Works to Improve Permit Process

EPA held five national roundtable discussions last fall on how to improve the environmental permitting process due to complaints concerning the quality of present tactics.

The meetings were held in five of the 10 regions under the auspices of the EPA, and the stakeholders who were present included representatives from the general public, regulators, environmentalists and others interested in the environmental permitting process.

According to EPA, the purpose of the discussion was to "obtain advice from individuals on how to improve the quality, certainty and timeliness of the permit decision process; provide for earlier and better public participation ... and to enhance the use of innovative technologies and pollution prevention incentives."

Lance Miller, the Permits Improvement Team executive director, said that the meetings provided a "tremendous amount of information" that EPA is now trying to sort through. Six individual task forces have been proposed to address specific concerns: alternatives to individual permits, administration streamlining, enhancing public participation, pollution prevention incentives, training and performance measures.

Some of the problems in the permitting process included complaints that permits were not timely enough, public comments were received too late in the permitting process, requirements for each permit were unclear and there was a lack of flexibility once the permits were issued, i.e. the permit modification process is too long.

The stakeholders proposed several ways to improve the permitting process. First, alternatives to individual permits, such as permits by rule, may be helpful in reducing the amount of individual permits that are issued. A permit by rule involves an outline of operation conditions. If the facility meets conditions set by EPA, it does not need a permit; if not, the facility will face EPA enforcement. The use of permit by rule allows smaller organizations to comply with EPA standards without having to obtain individual permits.

According to Miller, the large amount of permits presently issued limits staff time that could be used to research innovative technologies. A cut in the number of individual permits would relieve some of these time constraints.

A second goal is to develop a reference, or "toolbox" for EPA of permitting processes that have been successful in the past. For example, the Schering-Plough Corp. in New Jersey was issued the first single environmental permit covering all of a manufacturing facility's environmental regulatory requirements in December 1994 from the state of New Jersey. The permit emphasized pollution prevention and replaced more than 60 individual permits required in the past.

– By David Garber, Editorial Assistant

Study: Environmental Mandates Do Not Cost Jobs

A new study of recent economic reports reveals that, contrary to claims by some Beltway conservatives, environmental regulations do not come at the expense of jobs.

The report by the Washington-based Economic Policy Institute found that environmental rules actually provide a small boost to employment figures, according to author Eban Goodstein.

"Just because something costs a lot doesn't mean it costs the economy jobs, said Goodstein, an economics professor at Skidmore College in Saratoga Springs, N.Y. "Reducing environmental regulations will not create jobs."

The report, "Jobs and the Environment: The Myth of a National Trade-off," is available from EPI by calling 1-800-537-9395.

Agency Phasing Out UST Clean-up Funds

EPA Region 5 has begun phaseout of federal funding for Illinois' leaking underground storage tank clean-up program. EPA will be forced to cease funding the program this month if Illinois does not correct a September 1993 law that did not meet federal requirements concerning leaking underground storage tanks.

The agency is considering withdrawing approval of the state's tank trust fund which has been used as a means of meeting federal tank financial assurance requirements. In this case, tank owners will have to get their own insurance or potentially pay penalties for failure to meet federal requirements.

Region 5 Administrator Valdas V. Adamkus said his office is working closely with Illinois officials to correct the problem and that he hopes for solutions to both the funding and statutory deficiencies.

U.S., Canada Release Acid Rain Report

The United States and Canada reported significant progress in protecting the environment and public health by reducing emissions that cause acid rain and contribute to cross-border air pollution. Despite the optimistic appraisal, however, the second two-year progress report also showed increasing nitrate concentrations in many lakes and streams in the Adirondack and Catskill Mountains of New York and the mid-Appalachian region of the United States, Ontario and Quebec.

Also discussed were the harmful effects of sulfur compounds on buildings and on visibility in U.S. national parks. The report addressed new inroads in scientific and technical cooperation between the two countries, as well as emission inventories and data trends from 1980 to 2010 and atmospheric modeling, monitoring and pollution control technologies.

For copies of the report, contact the Acid Rain Hotline at (202) 233-9620.

CalEPA Offers Compliance Training

California EPA's Department of Toxic Substances Control (DTSC) and Bakersfield Community College's Environmental and

Safety Institute have begun a "compliance school" to provide hazardous waste training with practical applications for employees of businesses that produce, handle or dispose of hazardous waste in complying with basic hazardous waste laws. The school is open to anyone. However, facility operators or owners may be allowed to partially offset penalties for violations found during DTSC inspections by attending class and passing an examination.

Initially, classes will be held on one community college campus in Orange, Los Angeles and Santa Clara counties. Other campus sites will be added as funding and demand increase.

The schools will offer classes using sample formats of required environmental regulatory documents such as contingency plans, training plans, inspection schedules, logs and training records. Training will emphasize achieving and maintaining compliance, minimizing waste and learning pollution prevention concepts for hazardous waste facilities.

The complete curriculum consists of 22 hours of class training and an examination, for $100 plus materials. For more information, contact Ann Carberry at (916) 323-2274 or Bakersfield Community College at (805) 395-4552.

Air Rules To Reduce Seven Pollutants

A series of federal air rules are expected to reduce emissions of seven toxic pollutants while providing affected industries with common-sense options for compliance. One rule reduces emissions of chromium by almost 99 percent, or 173 tons per year. The four other final and two proposed rules will reduce emissions of ethylene oxide, benzene, xylene, formaldehyde and toluene.

EPA also proposed a rule reducing air toxics from off-site waste and recovery operations such as those used in hazardous waste treatment, storage and disposal; industrial wastewater treatment; industrial waste landfills and used oil recycling. Operations such as incinerators, municipal waste landfills, publicly owned sewage treatment works and Superfund clean-up activities would be exempt from this rule. The proposal would cut emissions by about 47,000 tons per year, an 80 percent reduction from current levels. The proposal would reduce air emissions of VOCs by about 59,000 tons annually.

The new national rules encompass a variety of methods of pollution reduction, although two rules – those that deal with gasoline distribution and the wood furniture manufacturing industry – rely primarily on pollution prevention options.

U.S. Chamber of Commerce Backs NIE Plan

The U.S. Chamber of Commerce has endorsed the establishment of a new federal science institute for the environment.

"For years, U.S. business has been burdened with costly environmental regulations based more on public opinion than credible science," Dr. Harvey Alter, manager of the U.S. Chamber of Commerce's research policy department. "American business needs the best scientific data available on a broad range of environmental problems, but federal environmental research is too often fragmented and inneffective."

The National Institute for the Environment will assess the condition of environmental knowledge and fund "policy-relevant" research in the natural and social sciences, engineering and other disciplines. EP

Justice For Health New Rallying Cry

A year ago, nearly 1,000 environmental activists met in Washington, D.C., to vent their frustration and anger at the U.S. government's environmental policies. They were not the mainstream activists concerned with wetlands, redwoods, endangered wildlife or whales.

These people were representatives of grassroots and community organizations, church and neighborhood groups worried about contaminated air and water, about disease and health problems they attributed to environmental conditions where they live, work and play. Their faces were those of the poor and minorities: African-Americans, Hispanics, Native Americans and Asians.

Many had never been to Washington before. Now they were the guests of the U.S. government, which covered some of their expenses.

They were there to tell officials from EPA, the Department of Energy, the National Institute of Environmental Health Sciences and other government agencies that poor and minority neighborhoods are bearing the brunt of waste disposal sites, treatment facilities, garbage dumps and exposure to hazardous emissions. And they don't like it.

A reporter who covered the "Symposium on Human Research and Needs to Ensure Environmental Justice" wrote that "this is not the environmental movement we reporters have learned how to cover in recent years. These are angry people who feel deserted by the government and ignored by national environmental groups."

At almost that very moment, with exquisite political timing, President Clinton issued an executive order that officially recognized environmental justice as an important issue and elevated it to the level of national policy. Within a few months, EPA Administrator Carol M. Browner announced that one of her top four priorities was to implement the principles of environmental justice.

But what is environmental justice? As defined by EPA and published in the *Federal Register*, it is "the fair treatment of peoples of all races, cultures and income with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Fair treatment means that no racial, ethnic or socioeconomic group should bear a disproportional share of the negative environmental consequences resulting from the operation of industrial, municipal and commercial enterprises and from the execution of federal, state and local and tribal programs and policies."

More succinctly, as defined by Professor Bunyan Bryant of the University of Michigan, "Environmental racism (justice) is those institutional policies or behavior that result in disproportionate impact of pollution on people of color."

The President's order established an interagency group to ensure that environmental policies and their implementation are nondiscriminatory, that minority and low-income groups have access to relevant information and can participate in formulating health and environmental policies. The group will issue a report in April.

Examples of grass-roots action to call attention to narrowly focused environmental degradation abound. Professor Robert Bullard of UCLA and an organizer of the Washington symposium has recorded the history of grassroots movements seeking redress of environmental grievances. The first major and highly visible protests occurred in 1982 in mostly rural Warren County, N.C., with a large concentration of African-Americans. The target was the proposed siting of a PCB disposal facility that would process PCBs from 14 other North Carolina counties. More than 500 demonstrators were arrested, including District of Columbia delegate Walter Fauntroy, Rev. Benjamin F. Chavis of the United Church of Christ and Rev. Joseph Lowry, head of the Southern Christian Leadership Conference.

Although the demonstration did not deter authorities from locating the facility at the chosen site, the publicity pushed the environmental justice movement to the fore.

A subsequent study by the General Accounting Office, requested by Fauntroy, showed that in eight southern states where African-Americans constituted a fifth of the population, three-fourths of the hazardous waste landfills were located in predominantly African-American communities.

The report seemed to confirm that minorities were indeed subject to a "disproportionate share" of negative environmental consequences resulting from operations of various enterprises.

More recently, the Connecticut Department of Environmental Protection (DEP) convened an Environmental Equity Conference at the University of Hartford (with an $1,800 grant from EPA), the first of its kind at the state level. Some 350 participants from around the state recounted their experiences. The conference provided a cross-section of how-to workshops ranging from how to prevent lead poisoning to how to conduct door-to-door health surveys in one's community.

There also were numerous accounts of how grass-roots

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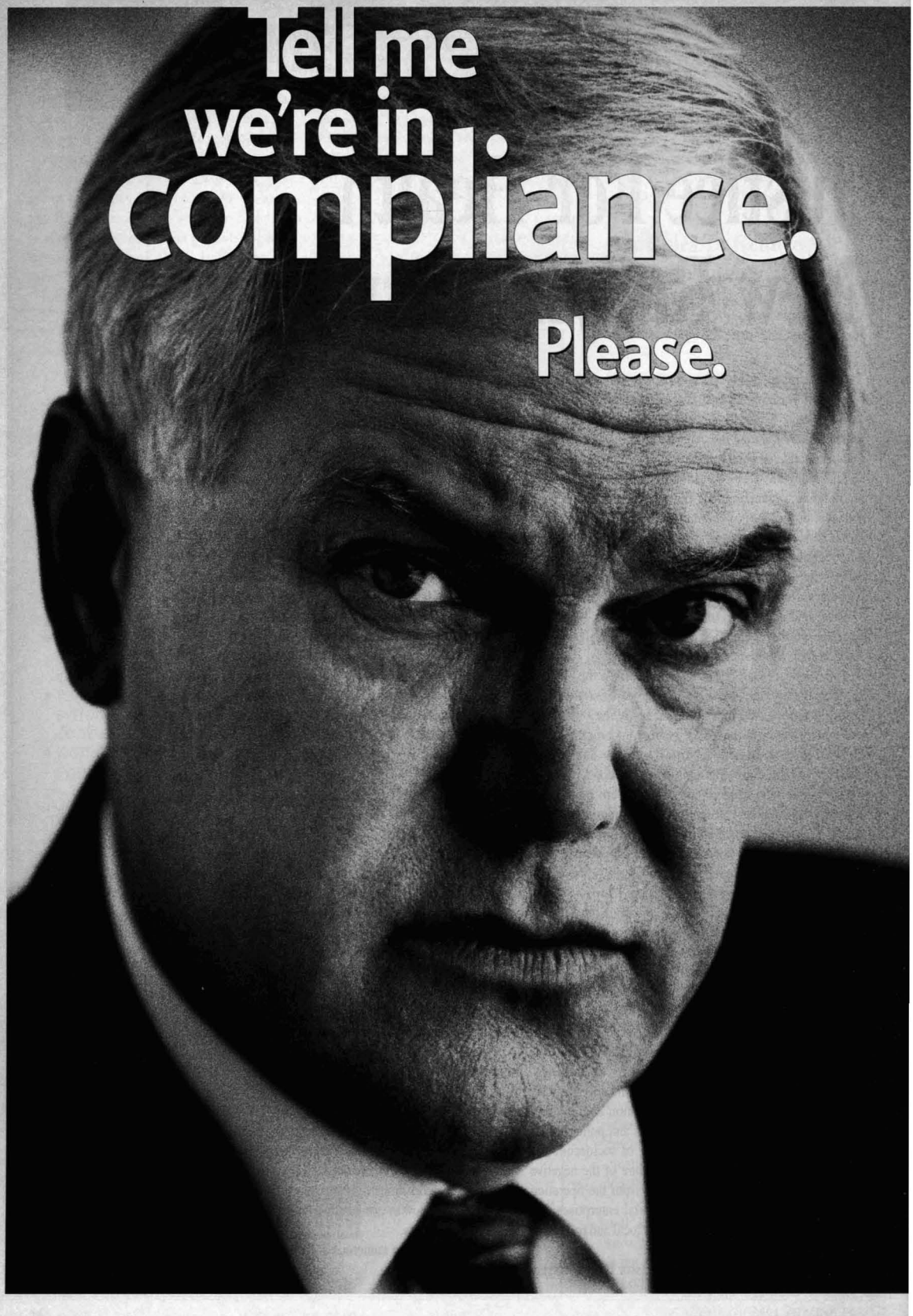
Whitman Bassow, PhD, is contributing editor of Environmental Protection.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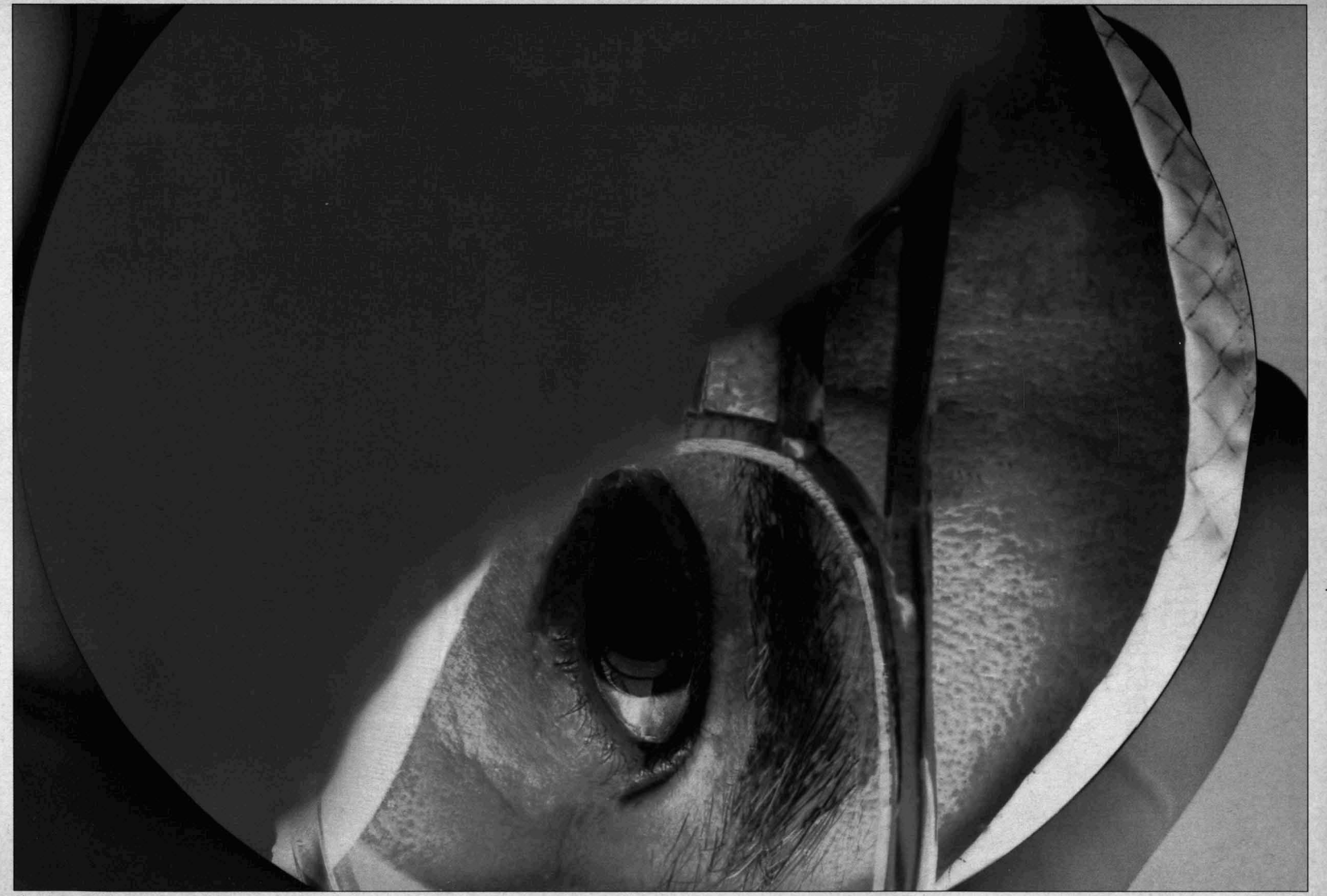

Photo courtesy of Fisher-Rosemount

Lab Technologies Migrate To Field

By Richard A. Hovan and G. Vinson Hellwig

When the Clean Air Act was passed in 1970, it was possible to measure gas emissions in the parts per million range. Two decades later, with advances in analytical chemistry, physics, monitoring hardware and software, many substances can be measured in the parts per billion range. Even more impressive, monitoring data can be processed, on a real-time basis, on small computers, where once a mainframe would have been required.

Environmental regulators have taken advantage of these new capabilities. For example, until the 1990 Clean Air Act Amendments, requirements for continuous emissions monitoring (CEM) for new combustion sources basically focused on the SO_x-NO_x-CO_x trilogy. New regulations for municipal waste combustors add lead, mercury, cadmium, hydrogen chloride, dioxins and furans to the pollutants to be continuously monitored. These requirements are possible by advances in analyzer technologies.

The symbiosis between technological measurement capabilities and regulatory requirements promises to continue. One of the less discussed aspects of this relationship is the "migration" of laboratory analytical technologies into the world of emissions monitoring. Technologies that orginally were developed for laboratory or research and development use are increasingly being applied in the field for ambient and emission source monitoring, because of their inherent capability to detect compounds at levels far lower than traditional emissions analyzers can. This has meant, of course, that the laboratory technologies have had to be "hardened" or made more rugged to withstand the harsh process, smokestack and ambient environments in which they must operate. Three recent developments in the application of laboratory technologies to the continuous emissions monitoring field illustrate this trend.

Laser Opacity Monitors

First is the appearance on the market of laser opacity monitors for use in demonstrating compliance with EPA regulations. Twenty-five years ago, it was typical for opacity to be measured by the human eye. Technicians were trained to become certified "smoke observers," comparing plumes from smokestacks with shades on a chart representing varying percentages of particle content. Over the ensuing years, a number of technology based opacity monitors came onto the market; the most recent of these applies laser technology to opacity measurement.

The basic principle is straightforward. A low-power helium-neon laser beam is directed through the gas stream to be measured from a transmitter to a receiver. Through a light attenuation – light absorbed by or scattered from particles in a beam bath – the concentration of particles can be determined through a mathematical calculation that can be automatically performed by a data handling and acquisition system (DAHS). The basic equation that expresses the opacity percentage is:

$$O_p\% = (I - I_x/I_o) \times 100$$

where I_o is the light source intensity and I_x is the received light intensity across the stack.

Laser opacity monitors offer several advantages over more traditional technologies. They are low-weight, easy to install and operate and provide reliable measurements of low and high concentrations. Perhaps best of all, they are very low maintenance – a valuable long term benefit where the cost of parts, materials, monitor downtime and labor are considered.

There are several variations of the basic laser model. For the opacity monitoring required by EPA to satisfy Performance Specification 1, a model operating at a wavelength of 543 nm, in the middle of the green spectrum, is used. For dust monitoring, a red gas laser is generally preferable in relatively high dust environments. (> than 100 mg/m^3). This has made it the choice for such applications as pulp mills, recovery boilers and lime kilns. The semiconductor laser is used in relatively low dust environments or where space restrictions apply. And monitors using a superled light source are often the choice where the length of the measuring beam is short (< 2 m) or where price is of primary importance.

Fourier Transform Infrared Spectrometry

A second development is the potential for using Fourier Transform Infrared (FTIR) technology in compliance monitoring demonstrations in place of the single pollutant analyzers that have traditionally been used. FTIR is a multi-component system capable of monitoring traditional and more exotic pollutants; it holds the promise of replacing most existing CEM technology.

FTIR monitors use infrared light absorption patterns to identify specific organic and inorganic compounds in liquids, solids and gases. The heart of the FTIR is an optical device called an interferometer that uses a beam splitter and mirrors to measure the infrared spectrum of a gas sample. The infrared source is split into a pair of beams that recombine in the device to form a pattern. A computer algorithm converts the pattern into quantitative data.

Unlike more traditional continuous emissions monitors, FTIR has the potential to measure thousands of components at a time. Currently, FTIR can measure up to 80 constituents at one time; 135 of the 189 hazardous air pollutants listed under Title III of the 1990 Clean Air Act Amendments can be measured by this technology.

Another FTIR advance lies in its intrinsic response time of less than one minute for typical gas sampling flows. Compared to the complex organic component mixtures in process stream and vent stack measurements, the SO_x-NO_x-CO_x calibrations required for general power plant application are quite straightforward. Even the additional calibrations for other substances (such as methane, phosgene, hydrogen fluoride, hydrogen chloride and hydrogen bromide) for municipal solid waste combustors and industrial waste incinerators are relatively simple. FTIR easily measures most volatiles in the low parts-per-million-by volume range, although it does have the limitation of being unable to measure heavy metals or parts-per-trillion toxics such as dioxins and furans.

Because FTIR analyzers are widely used in the harsh environments of industrial processing, they are very rugged, with maintenance requirements typically limited to a once-a-year light source changeout.

Ion Mobility Spectrometry

A third example is the development of Ion Mobility Spectrometry (IMS) technology. The IMS is a single component analyzer designed to measure exotic gases and work in series with existing technology for conventional pollutants.

The heart of an IMS analyzer is a cell with a semipermeable membrane on its outside, over which a gas sample is forced. Selected compounds enter the detection cell, where purified dry instrument air sweeps the membrane on the inside and delivers the sample to the reaction region. There the sample is ionized by a weak plasma formed by a small radioactive nickel source. Dopant materials can be added to enhance the ionization process and increase component specificity. The ionized sample molecules drift through the cell under the influence of an electric field. An electronic shutter grid allows periodic introduction of the ions into a drift tube, where they separate based on charge, mass and shape. Small ions move through the tube faster than larger ones and arrive at the detector, where a current created at that location is amplified and measured as a function of time. A unique spectrum is generated and evaluated by a microprocessor to identify the target component and determine its concentration.

Specificity is achieved through several mechanisms. The membrane is selected based on its ability to allow penetration of the target component at a greater rate than is possible for interferents. Most compounds form ions of only one polarity. By biasing the polarity of the electric field, either positive or negative ions are detected. Ions of the opposite polarity are not detected and thus do not interfere. Use of appropriate dopant materials increases specificity by altering the ionization process so that compounds

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Methylene Chloride Regulations Will Impact Laboratories

By Perry Goldschein, Esq.

On November 7, 1991, the Occupational Safety and Health Administration (OSHA) issued a notice of proposed rulemaking (56 FR 57036) to address the significant risks of adverse health affects posed by methylene chloride (MC), a widely used solvent in the environmental lab industry. The proposed rules require employers to reduce occupational exposure to MC and to institute ancillary measures, such as employee training and medical surveillance, for further protection of MC-exposed workers.

OSHA convened public hearings in September and October of 1992 and reopened the rulemaking record for public comment based on a National Institute for Cancer study, among other things, last March. An OSHA spokesperson told the Bulletin that the final rules have now been drafted and are going through committee review. Formal promulgation of the rules is expected by March, 1995. The rules propose a 20-fold cut in the permissible exposure limit (PEL) for MC. OSHA predicts that lowering the PEL from 500 ppm to 25 ppm averaged over eight hours will reduce cancer risk by 95 percent for more than 186,000 workers nationwide.

In addition to getting strong exposure limits, the proposed rules include provisions for monitoring employee exposures, medical surveillance, respiratory protection, the establishment of regulated areas in the workplace and informing employees of MC hazards.

Environmental labs use MC for extracting organic compounds from various matrices primarily during the performance of EPA Methods SW-846 3520, 3510 and 3540. Employee exposure to MC can occur during several procedures associated with these methods, including glassware washing and rinsing and adding MC to separatory funnels or liquid/liquid extraction apparatus. Exposures can also occur when drumming spent MC for disposal as hazardous waste. Thus, air monitoring will be necessary in these employee areas.

Once air monitoring results are received, the employer must notify the affected employees of these results in writing. Notification must be done within 15 working days after the results are received.

If the initial monitoring reveals employee exposure at or above the action level, but at or below both the eight-hour time weighted average (TWA) and the 15-minute short- term exposure limit (STEL), the employer must repeat the monitoring for each such employee at least every six months. In addition, the employer must institute a medical surveillance program for all employees who are or may be exposed to concentrations of MC at or above the action level for at least 30 days per year.

If the initial monitoring reveals employee exposure at or above the TWA ar the STEL, the employer must repeat the monitoring for each such employee every three months. In instances where the TWA or STEL are exceeded routinely, several other major provisions of the standard are applicable. In addition to the medical surveillance, the employer must:

(1) establish a regulated area wherever exposures exceed the permissible exposure limits;

(2) provide respirators where the PELs are exceeded;

(3) institute engineering controls and work practices to reduce and maintain employee exposure at or below the permissible limits; and

(4) where the PELs are exceeded, establish and implement a written compliance program to reduce employee exposure to or below the PELs.

Laboratories should remember that the rule is not yet final, and changes could still occur. However, lab managers may want to review the requirements of the proposed rule now to plan for the impact that it will have on their facility.

Perry Goldschein is a consulting attorney with the Dufour Group Sacramento, Calif.

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that may interfere simply are not ionized.

IMS only recently has been applied to CEM systems. It can accurately detect many compounds that cannot be measured easily by other methods. With part-per-billion detection capabilities, IMS allows direct monitoring of low-level gas concentrations virtually unachievable otherwise. Its superior sensitivity permits the use of dilution-type probes which greatly reduce sample transport problems. Other features, such as long-term reliability, ruggedness in harsh environments, low maintenance requirements with no need for consumables and minimal drifts, make it attractive to industry, which uses it to detect compounds such as ammonia, hydrogen chloride, hydrogen fluoride, chorine and chlorine dioxide.

Applications

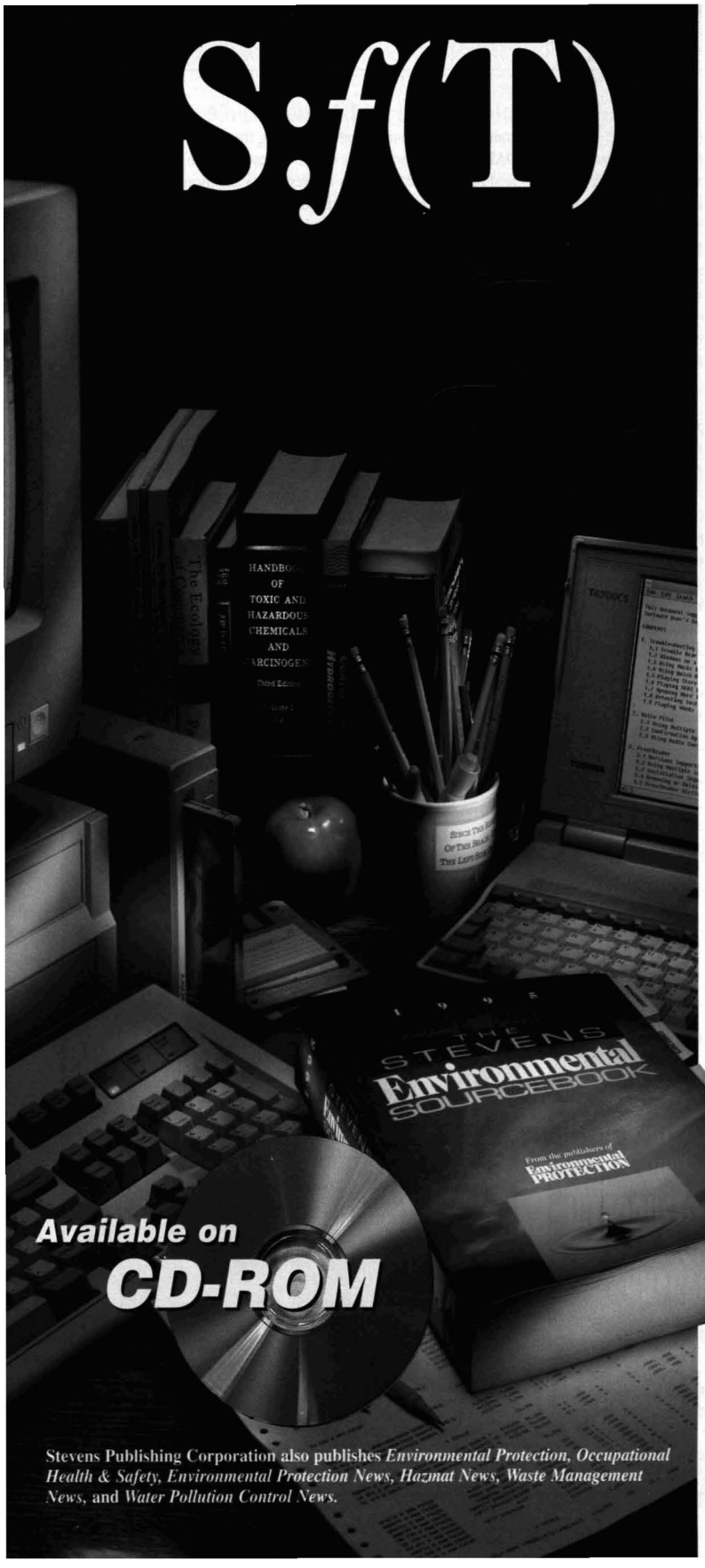
Regulators are not the only advocates of adopting increased monitoring technologies. As noted, industrial sources also have taken advantage of technological advances in monitoring to realize economic benefits. Two examples of these applications follow:

• **Municipal solid waste combustion**. With the costs of municipal solid waste incineration rising and the restrictions on emissions tightening, the need for sound process control has become more critical than ever. One major recurring operational cost for incineration is the lime needed for spray drying. Traditionally, operators have "over-limed" the flue gas in the spray dryer to assure adequate sulfur dioxide removal. New regulations shortly to be promulgated by EPA will tighten sulfur dioxide removal requirements and add, for the first time on a national basis, stringent restrictions on hydrogen chloride emissions. CEMS requirements also will be tightened – a potential burden that operators can convert into a management plus. Using the CEMS and its associated DAHS, spray dryer controls can be operated on both a feed-forward and feed-back control loop. This can result in a significant reduction in lime usage. A lime savings for as much as 50 percent has been noted at some plants, with typical reductions of 25-30 percent in sulfur dioxide emissions. With the cost of lime approximately $65 a ton and expected to rise, an advanced CEMS/DAHS can yield a payback in only a few years.

• **Black liquor boilers at pulp and paper mills**. These boilers commonly experience HCL breakthrough at the stack outlet, usually indicated by rusty streaks down the stack exit ring. By the time such streaking appears, the HCL content in the flue gas is typically high (20 ppm or greater) indicating both existing and ongoing damage to the boiler. As ash builds in the boiler tubes, boiler temperatures increase. This causes chlorides to leach and combine with moisture to form HCL and O_2, further damaging stack and boiler. Incorporating an HCL monitoring system in the CEMS would allow early detection of HCL; boiler shutdown and cleaning could immediately begin, reducing damage and replacement or repair costs.

As owners and operators find ways to turn the regulatory burden of monitoring into an economic benefit, manufacturers and suppliers of monitoring technologies will find themselves welcome in boardrooms as well as in regulatory agencies. And the migration of laboratory technologies into environmental compliance applications will continue. EP

Richard Hovan is vice president of product technology at KVB/Analect in Irvine, Calif. G. Vinson Hellwig is national director of Air Quality Service at Metcalf & Eddy in Wakefield, Mass.



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Choosing The Right Laboratory

By Craig Eastwood

Environmental laboratory pricing has dropped to new lows in the past two to three years. Laboratory analyses that cost $1,500 now are, most of the time, less than $750. This has led to hardships for environmental laboratories, with some closing permanently. Others have had to merge with competitors and trim staff to stay alive in the industry.

The problems in this industry can be traced back to simple mathematics. If a complete gas chromatography/mass spectrometry (GC/MS) setup costs about $150,000, a lab will make its return on investment much quicker charging $450 per sample than $225.

Smaller labs, thinking that the way to grow was to purchase "mass spec" technology, are finding that instead of being able to make the purchase price back in a year, it may take two or three. Upon realizing this, one of two things happens:

- If the lab has already made the instrument purchase, it leverages them for a longer period of time than expected (quite often this is the nail in the coffin for a small laboratory); or
- The lab makes the decision to purchase less expensive, and subsequently lower quality, technology.

Some laboratories offer unbelievably low prices to get samples through the door.

Why ? If, for example, sample volume is slow, getting work through the door at any price will keep employees busy and maintain morale at a temporarily inflated level. If the lab owner is interested in selling, pumping up sample volume is a good way to make the lab's top line look much more attractive to potential buyers. The price of an environmental laboratory, on average, has gone from at least 11/2 years' gross revenue a couple of years ago to 2/3 - 1 years' revenue today. Inflating the dollar volume through the lab pushes up the price long enough for the principals to accept an attractive offer, get their money and get out.

A few laboratories may choose to underbid environmental projects that come down the line. If, in a competitive bidding situation, five of six labs are within a couple of hundred dollars, and one laboratory comes in thousands of dollars lower for the identical set of analyses, it is time to find out exactly how the lab is able to charge incredibly low prices.

Experience shows that there are at least four main reasons why some laboratories offer prices that are significantly lower than average. Any one of them would be a good reason to take a closer look at whether using the lower-priced laboratory is really the best course of action for the project.

Low-Quality Technology

Instrumentation is the most important factor in an environmental laboratory. Thousands and sometimes millions of dollars are riding on the validity of the data coming from these machines. Advances are constantly being made in all areas of environmental laboratory instrumentation – for example, lower detection limits. For a laboratory to stay on the cutting edge of technology and keep state-of-the-art instrumentation in the lab, the manager and his team of decision makers must spend countless hours digesting information from vendors, attending instrument seminars and traveling to trade shows to see the latest technology to bring back to the lab.

The same instrument that may have been innovative a few years ago may be ready to be donated to the local university. Technology costs money, and with advances in areas such as ICP/MS, GC/MS/MS, solid phase extraction and supercritical fluid, more of a laboratory's income is going towards capital expenditures on equipment (already one of the largest slices of the pie) than ever before. Anyone who thinks that a $20,000 GC/MS can do just as good a job as an instrument costing $150,000 does not have a $150,000 instrument in the laboratory.

Now that automation is playing more of a role, it is necessary for the computer support personnel in the laboratory to be as knowledgeable about new computer products as the lab manager is with innovations in environmental instruments. An incorrect decision on a server, or which terminals to purchase, can mean the difference between the laboratory working through a slight inconvenience like an upgrade and shutting down temporarily because of total replacement of obso-

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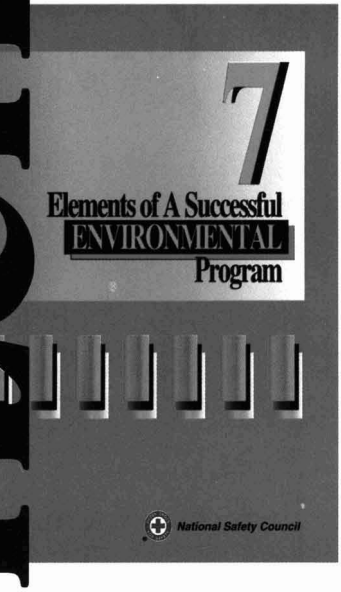

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lete computer technology. Computers and software must be constantly upgraded, changed and added to keep them running at their optimum efficiency and effectiveness.

The quality of a facility's Laboratory Information Management System (LIMS) will directly influence the data and report quality from that lab. To get a satisfactory LIMS operating in a medium-sized laboratory could take more than a year and cost more than $100,000. This investment will benefit the client many times over in the lab's ability to track samples, calculate data without transcription errors and produce reports quickly, correctly and efficiently.

Computer support is invading all areas of the laboratory. With most instruments tied to the LIMS, the importance of keeping these computers and instruments communicating reliably increases exponentially. Other computer tasks, such as diskette deliverables, on-line results and custom reporting formats also must be monitored and reassessed on a regular basis to ensure that everything is running smoothly and all avenues are being explored in the areas of speed, confidentiality, accessibility, compatibility and user friendliness.

"The same instrument that may have been innovative a few years ago may be ready to be donated to the local university."

Employee Support

Without quality personnel, an environmental lab could not run very dependably. This not only includes scientists, but account executives, customer service personnel, sample couriers and custodians, receptionists and office personnel. Salaries of employees is the single biggest item affecting a laboratory's bottom line and the prices it charges clients. It is one area most often sacrificed by cut-rate laboratories.

If a laboratory's wages are low, what caliber of employees will it attract? High salaries lure high quality people. Low salaries do not. A laboratory cutting salaries to keep prices low eventually will find itself without top-notch people to run the instrumentation, meet with clients, fill bottle orders and even answer the phone. After a while, price will be the only area in which it can compete.

No QA/QC Program

A laboratory has an obligation to its clients to keep instruments running at optimum levels for its clients' projects and there must be a set, repeatable program in place to ensure this occurs. This requires a written quality assurance/quality control program familiar to everyone in the lab. Constant interlaboratory check samples, blinds, duplicates, laboratory control samples and standards must be run on all instruments on a regular basis. Detailed service, use and repair logs for every instrument also must be kept close at hand, be up to date and reviewed regularly by the laboratory's QA/QC department.

If a QA/QC program is not implemented and adhered to, data quality is sacrificed. If a laboratory is lucky, its client receives invalid numbers and the lab team has to resample that particular project. A worst-case scenario may be lawsuits that would arise if, for example, incorrectly labeled waste was placed in a nonhazardous landfill and the whole site had to be remediated. Lawsuits originating from invalid data are a very real possibility, and the person who made the decision to use such a laboratory would have to answer to their clients, state and federal agencies and upper management.

A tangential area under QA/QC is certifications. Quite simply, the more certifications a laboratory holds, the better. It is quite an undertaking to become certified for anything in the environmental field; some certifications take years. For each certification a lab holds, it most likely had to run separate proficiency exam samples. It also had to be audited by each certifying agency or a third party, and receive a passing grade on its appearance, procedures and quality assurance practices. Certification fees come out of a lab's pocket, and the lab manager must keep up with certification changes, proficiency exam requirements, recertifications and new areas of certification in which to attempt participation.

Customer Service

It is very important that the lines of communication between client and laboratory remain as open as possible. A well-designed customer service framework is vital not only for clients with large projects but for everyone who has a sample stored in the labora-

Model Lab Houses Newest Equipment, Design Features

A new environmental lab set to open this month in Petaluma, Calif. combines the latest advances in analytical, automation and productivity tools, its developers say.

The 20,000 square-foot facility, dubbed Environmental Lab 2000, is the product of a nearly two-year-old venture by PACE Inc. and Hewlett-Packard to rethink the environmental laboratory from the ground up. The objective is to boost both productivity and accuracy in analyzing contamination samples, the two partners say.

"We've developed an entirely new way of operating and managing a lab," said Pace President Steven Vanderboom in announcing the new facility. "The lab's design is dramatically different than most labs today, and one which we believe will set the standard as we move into the next century."

The lab also represents a novel partnership that unites national laboratory services firm Pace, based in Minneapolis, with Palo Alto electronics giant Hewlett-Packard, which had sales of $16.4 billion in fiscal 1992. In its first foray into the lab services industry, HP, which makes analytical equipment for laboratories under its Analytical Products Group, will operate the facility jointly with Pace.

The lab's design results from an analysis of existing lab processes and workflows – from sample handling among entry-level technicians to top management organization, the groups said. Many small refinements, including use of barcoding and robotics, improving data transfer through the facility – and even such simple measures as putting certain equipment on wheels to improve mobility (see photo) – add up to significant productivity gains, they added.

"There will be an open flow of samples, extracts, and data throughput throughout the lab which will greatly reduce lab bottlenecks," Vanderboom said.

The facility, staffed by 50-70 employees, will be used by both Pace and HP as a model for future laboratories. HP intends to display technologies used by the lab to interested clients while Pace hopes to "clone" productivity-enhancing changes to its existing network of labs.

Environmental Lab 2000 will open for business shortly after a Feb. 16 ribbon-cutting ceremony.

–By Tom Barron

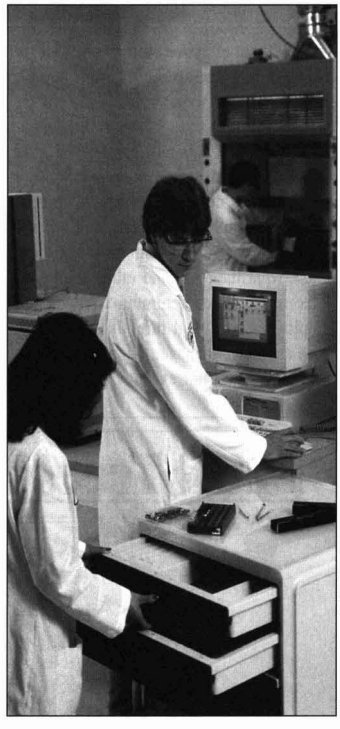


Photo courtesy of PACE Inc.

tory. Without effective customer service, the client loses control over the samples entrusted to the laboratory.

The ability to reach the right contact, whether it is the lab manager, account executive, technical writer, sample courier or whomever, is necessary to ensure that projects are completed correctly and on time. All employees dealing with the client should know what their job and other employees' jobs are. Good communication among employees who deal directly with clients, such as the lab manager, client services personnel and account executive, also is vital since a client may talk to each of these people regularly about the same project. If a client calls with a problem, the lab must have the personnel in place for immediate resolution. If the client wanted a problem taken care of a week after he or she called, the client would have called a week later.

As noted here, there are many ways laboratories can cut prices in the environmental market and they all could potentially harm the client in one way or another. By getting enough information about a laboratory before it is invited to make a bid, a buyer should guard against these risks.

The following items will help a potential laboratory client make an informed decision about services:

Talk to the account executive. See what suggestions he or she can give about the upcoming project. Ask how the lab will handle specifics with the project and about the lab in general. He is usually the first point of contact and is responsible for getting the relationship started and continuing smoothly.

Call the lab manager. Ask any questions you may have. Make sure the lab manager is easily accessible. He or she most likely will be the person to contact for answers to technical questions. Do not be afraid to ask tough questions about laboratory performance.

Read over information from the lab. Get all you can. Marketing information is nice, but seldom contains much relevant information. If a statement of qualifications or QA/QC manual is not available, carefully consider the risks of using such a facility.

Obtain a list of current certifications. Look for expired or incorrect certifications. Some states require specific certifications by analyte instead of by group, so it is a good idea to check with the laboratory for certification on each and every item when setting up a project.

Obtain a list of qualified personnel. This should include degrees held and years of experience for all personnel. A laboratory should not only have depth in terms of degree level, but breadth in the variety of study and even the places of education.

Obtain a list of satisfied clients. A list of satisfied clients with similar projects should be readily available. Do not hesitate to call each and every person listed and discuss the laboratory's performance in depth.

Take a tour of the lab. This is the single most effective way of deciding whether a laboratory satisfies your needs. If laboratory personnel do not feel comfortable giving a tour, then a potential client should not feel comfortable using it. Take time to speak with the scientists and technicians, ask questions and look at everything in the laboratory very closely. Don't be afraid to "kick the tires."

Clients must always remember that they get what they pay for and they don't get what they don't pay for. Making a decision on an environmental laboratory at first may seem as easy as comparing the bottom lines of project proposals, but may end up costing you many times what you try to save in the long run. These seven rules may save time and aggravation later. EP

Craig Eastwood is an account executive at Centre Analytical Laboratories in State College, Pa.

Biofiltration Holds VOCs, Odors At Bay

Maturing technology designs and an expanding list of proven applications make biofiltration an ever-more attractive air pollution control option.

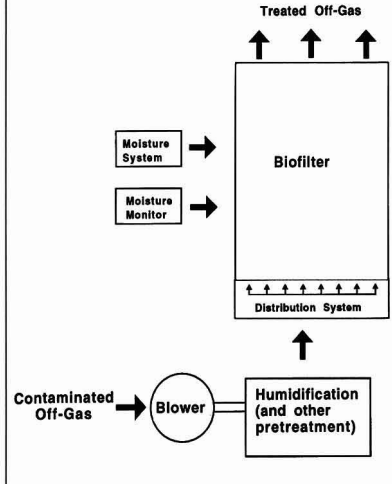
By Kannan Vembu and C. Stow Walker

Biofiltration, a well-established technology in Germany, the Netherlands and other European countries, is attracting interest in North America. In Europe, biofiltration has been applied to air pollution control problems for more than 30 years, and more than 500 biofiltration units currently are operating in a range of applications from controlling odors at wastewater treatment plants to reducing volatile organic compounds (VOCs) from emissions at coating facilities.

In North America, a few dozen biofiltration units have been installed in wastewater and industrial applications. Recent installations in the United States include a large system for treating ethanol at a foundry in southern California. Several major companies, including DuPont, Monsanto and American Cyanamid, are examining the technology's potential. Biofiltration is gaining recognition because of its low operating and capital costs. In addition, it is a clean pollution control technology. That is, it reduces organic emissions (and some inorganics) to water, carbon dioxide and salts, rather than transferring them to another medium. For odor control and for degradable organics in concentrations of less than 1,000 parts per million (ppm), biofiltration is an extremely attractive alternative.

Given continuing increases in the cost of hazardous waste disposal, companies have good reason to look closely at technologies that eliminate pollutants. Moreover, EPA prefers these clean technologies. At the same time, many facilities remain reluctant to consider biofiltration for odor and VOC control. Why? To some companies, more familiar and established technologies may seem like safer bets, despite disposal issues and potentially greater costs. And although biofiltration is in many ways a simple technology, specific applications need to be carefully piloted and designed to ensure that the biological process achieves its best effectiveness.

Figure 1: Components of a Biofiltration System



Source: Arthur D. Little, Inc.

How Biofiltration Works

Biofiltration is a naturally occurring process in which microorganisms, including bacteria, fungi and actinomycetes, break down organic compounds into carbon dioxide and water. In a biofilter, the microorganisms grow on materials such as soil, compost, peat or heather, supplemented sometimes with synthetic materials including activated carbon (to adsorb certain toxics) and polystyrene, which provides bulking and structural stability.

Recent U.S. biofiltration designs tend to favor

Kannan Vembu and C. Stow Walker are senior consultants at Arthur D. Little Inc.

mineral soils and synthetic mixtures designed for durability and good retention of moisture and structural characteristics. The microorganisms live in a thin layer of moisture, the biofilm, on the surface areas of the filter material. As contaminated off-gases enter the biofilter, they diffuse and are adsorbed onto the biofilm, where the microorganisms oxidize them to carbon dioxide, water and salts. The residence time of the off-gases – how long it takes for them to be biochemically degraded – depends on factors such as the composition of the waste stream and its flow rate. The process takes place entirely in the biofilm; no contaminants are permanently transferred to the filter material. The microorganisms at the heart of biofiltration are native to the compost, soil or other organic filter material. As the off-gas enters the filter, these microorganisms adapt to the specific organic compounds in the gas stream. If the off-gas is very toxic, it may initially kill off most of the organisms. But the system adapts and new microorganisms that are able to oxidize the organic compounds in the gas repopulate the filter material.

Occasionally, a biofiltration system will be seeded with specially developed microorganisms that already are adapted to the specific compounds in the off-gas. Most systems, however, do not use this approach, because if other conditions are right, any biofiltration system will become populated with microorganisms adapted to the gas stream within a couple weeks' time.

Design And Operation

The basic components of a biofiltration system are a bed of filter material and a piping system that distributes the off-gas into the filter. A blower to propel the gas through the system and pretreatment devices for humidifying the gas and, in some cases, removing particulates, round out the system (see Figure 1, page 27). The size of the bed depends on the amount of off-gas to be treated. To save space and create a more completely controlled system, some facilities now use enclosed stacked or parallel biofilter units. As biofilters have become more widespread, their design has evolved to meet the needs of specific applications and to give operators more control over factors that affect the system's reliability and effectiveness. When a biofilter is being developed for a specific application, conducting pilot tests will help ensure that design parameters have been correctly determined. Pilot testing also will help give operators a sense of how the system will respond to upset conditions such as a sudden, heavy influx of toxics. The most important operational factors include:

Moisture – A consistent moisture level (the correct level depends upon the type of filter material) is essential for biofilter effectiveness. The microorganisms require a moist environment, and, clearly, blowing gas on damp filter material is going to have a drying effect. Biofiltration systems now control moisture with methods such as adding a pretreatment stage that moisturizes the off-gas before it reaches the filter material and moisturizing the filter material with spray nozzles, cloth hoses and other systems. Spraying must be done in a way that ensures an even distribution of moisture throughout the filter. Some designs also track moisture control with monitoring systems that measure the moisture content of the filter material. Maintaining a consistent moisture level also helps prolong the life of the filter material. Material that is repeatedly dried and wetted will develop lumps in which surface area and biochemical activity dwindle as well as cracks through which unfiltered gas escapes. Normally, biofiltration systems do not need to be specially tested to assure their viability. The system's

performance will indicate clearly that the microorganisms are alive and functioning as intended. Special care, however, should be taken if the system receives an extra-heavy slug of toxics all at once.

Temperature – Biofiltration systems operate best between 30 degrees C and 40 degrees C and will function adequately at temperatures as low as 10 degrees C. If incoming gases are very hot or the facility is in a place where winters are severe, the system needs to include methods for controlling temperature levels. In the United States, with its varied climates and temperature extremes, controlling system temperature can be especially important.

Oxygen levels — The microorganic processes in biofiltration are, of course, aerobic, so it is important to ensure that oxygen is included in the gas stream. The microorganisms actually take the oxygen not from the gas stream itself, but in dissolved form in the biofilm. In most cases, the off-gas already contains sufficient oxygen. In cases where it does not, as with hydrogen sulfide, air or oxygen can be added to the gas stream. It is important not to raise the pressure of the air stream too much, because an excessive pressure drop in the biofilter will help cause the material to dry out, develop lumps and crack.

Stop and Go Operations — In the past, biofiltration has been looked upon as a system that needed a continuous waste stream flow to keep the microorganisms alive. It is now known that a biofiltration system can remain inactive for two to three weeks without a significant loss of effectiveness. After longer shutdowns, the system may need time to rebuild microorganism populations before becoming fully effective.

Fluctuations and System Overloads — Biofiltration systems are able to tolerate fluctuations in incoming contaminant levels. A very heavy load of a contaminant such as hydrogen sulfide may kill off microorganisms and interrupt the system's operation, but the population will regenerate and the system recover without the need to replace the filter material.

Applications

Biofiltration first gained a reputation as an odor-control technology that gets good results with hydrogen sulfide and other odorous substances at wastewater treatment plants and food-processing facilities such as rendering plants. Now, as updated air pollution and indoor air quality regulations increase the need to control VOCs and other problems, plant operators and engineers are seeing biofiltration as a very effective treatment technology for moderate volumes of gas discharges with low concentrations of volatile organic compounds and other organic pollutants.

The technology is finding applications in a wide range of industries – and especially where processes involve painting, coating or solvents. At wastewater treatment facilities, where biofiltration already has shown its effectiveness with odors, the technology can be considered for not only large sources such as headworks and sludge management, but also for smaller sources in collection systems, primary treatment and secondary treatment. Biofiltration has been shown to provide the 99 percent removal levels necessary for odor control and the 90 percent-plus levels for VOC control. It can be particularly useful with low-level emissions of substances such as alcohols, petroleum distillates, methanol, ethanol and simple aromatics. Biofiltration has not emerged as a prime choice for large contaminant flows (more than 100,000 cubic feet per minute) because the typical open bed and single-layer bed design would require more space than most facilities can spare. But new designs using

continued on page 58

Air Treatment Technology Comparison

	Contaminant types	Strengths	Drawbacks
Carbon Adsorption	Broad range of organics and inorganics	• Competitive capital costs • Effective with many contaminants • Low maintenance • Efficient odor removal	• Carbon requires frequent regeneration • Failure/breakthrough time is hard to predict • Worker safety issues in confined space and with handling and storage • Eventual replacement raises disposal issues • Moisture reduces absorption capacity
Scrubbers	Water-soluble contaminants	• Lower material costs than carbon • Effective with large flowrates	• High capital, operating, and maintenance costs • Not as effective with odors as carbon or biofiltration • Continual handling and disposal of hazardous chemicals • Not effective for low flowrates
Incineration	Broad range of organic compounds	• Highly effective for a wide range of contaminants in high co	• High capital and operating costs • Negative public image
Biofiltration	Odors, VOCs, H_2S, other reactive inorganics	• Very effective with medium flow rates and low contamination levels • Low capital, maintenance, and operating costs • Completely destroys contaminants	• System may require large space • Not suitable for very large flows or high concentrations

Source: Arthur D. Little Inc.

Stronger Economy Aids Instrumentation

INDUSTRY PROFILE:
ANALYTICAL INSTRUMENTATION

Last year proved to be a reasonably good year in the analytical instrumentation industry. Sales and profitability were higher than 1993 primarily as a result of a strengthened national economy. The regulatory climate, however, has been weaker than expected, in part because the Clinton Administration has been slow to throw its full support behind environmental issues. Critical national issues (such as health care reform, NAFTA) have prevented the Clinton Administration from focusing on the environment, even though Clinton and Gore campaigned on a "pro-environment" platform. As a result, much of the enforcement has been done at the state and local levels.

We expect 1995 to be a stronger year overall for this industry. The economy is continuing to grow without significant inflation and EPA is showing signs of renewed vigor as Administrator Carol Browner has had enough time under her belt to get things moving again.

COMPANY PROFILE: ISCO Inc., Lincoln, NE (NASDAQ Symbol - ISKO) A manufacturer of water pollution monitoring equipment and chemical separation instruments, ISCO also is the leading producer of wastewater samplers and open channel flow measuring devices.

Stock Data Recent Price (9/30/94) $9
52 WK High $12 3/4
52 WK Low $8
Price Earnings Ratio 13. 89

Earnings for its fiscal fourth quarter 1994 were up 13 percent over the prior year aided by the strong performance of its Environmental Division, which had a record quarter in orders received. Overall, ISCO was able to keep its expense growth flat as expense reductions in the Separation Instruments Division offset any additional expenses the company incurred by increasing product development programs in the environmental division. New offerings in flow measurement products, parameter measurement instruments and supercritical fluid extraction systems all contributed to revenue increases.

ISCO's international sales increased approximately 9 percent over the last year. Its cash flow from operations for fiscal 1994 were up 15 percent over 1993, and are buoyed by the fact that the company does not carry any debt. Company President Robert Allington projects a 10 percent increase in profitability in 1995 as a result of the continued market penetration of its new products, a more robust economy, a stronger regulatory environment and continued sales growth internationally. EP

Second and Third Quarter Stock Watch

Analytical Lab	Yr High	Yr Low	3rd Qtr 9/30/94	Qtly chg	Current earnings	Current P/E (10/31/94)
ISKO	12.75	8	9	-14.2%	0.63	13.89
Landauer	17	13.125	16.25	18.18	1.02	16.30
National Tech	4.625	2	2.25	-10	0.13	27.88
Nytest	1.375	0.25	1.3	108	-0.06	
Engineering Consulting						
ATC Environmental	12.625	6.5	10.625	6.25	0.5	27.25
Dames & Moore	21.25	12.875	13.125	-10.26	0.93	15.86
EA Engineering	12.5	4.75	9.5	-5	0.3	
Earth Tech	16.5	7.375	10.19	-14.19	-0.52	
EMCON Associates	9.5	4.625	5.325	-29.59	0.23	23.37
Harding	10.5	5.25	6	-22.58	0.24	30.21
ICF Intl	5	2	2.75	10	-0.81	
Jacobs	26.875	18	34.5	133	1.16	
Tetratech	20.25	12	19.125	29.22	0.62	30.65
Versar	4.375	2.875	3.875	21.57	-0.74	
Weston	10.25	5.125	6.078125	1.30	-0.25	
Pollution Control						
Air & Water Tech	16.125	6.5	7.375	-19.18	-8.51	
Air Products	50.375	38.75	46.75	10.32	2.06	23.18

–From KADO Resources, Huntington, N.Y.

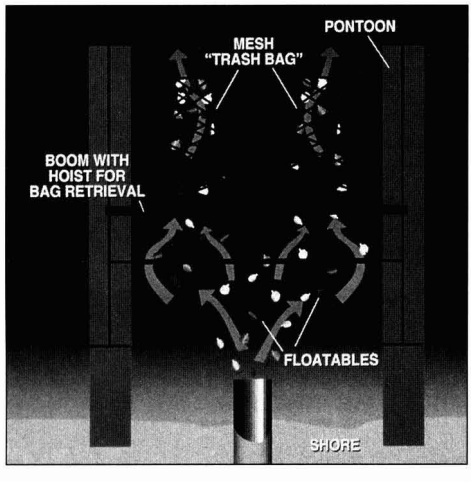
The information in this report is taken from trade and statistical services and other sources we deem reliable. We do not represent it as accurate or complete and it should not be relied upon as such.

	Yr High	Yr Low	3rd Qtr 9/30/94	Qtly chg	Current earnings	Current P/E (10/31/94)
Betz Laboratories	53.625	40	43.375	2.36	2.14	23.31
BHA Group	4	8.25	13	40.54	0.67	19.03
Calgon Carbon	15.375	9.875	13.75	18.28	0.38	29.61
Wellstead	7.5	3.25	5	-9.09	-3.38	
Davis Wastewater	9.25	5.625	8.25	-5.71	-1.5	
Durion	20	14.25	15.75	-1.56	0.98	18.37
Ionics	54.25	42.75	48.75	13.04	2.06	26.09
Met Pro	17.875	12.125	16.625	0	1.05	15.95
Natec	1.21875	0.125	0.625	-16.67	-0.12	
Thermo Instruments	34.875	27.125	31.125	10.18	1.12	28.35
TRC Companies	13.25	7.75	9.25	-7.50	0.39	25.64
Walcho	6.125	1.75	2.625	10.53	-4.24	
Zurn	29.75	16.875	19.625	3.90	0.03	654.17
Remediation Companies						
American Ecology	12.5	7.25	7.75	-6.77	0.55	15.45
Canonie	7.625	2.75	5.4375	31.82	-0.16	
Clean Harbors	9.25	5.75	6.5	-16.13	0.32	21.09
Ecology & Environ	12.5	7.25	10.5	3.70	0.55	15.45
GNI Group	8.5	2.6875	47.75	17.54	-0.29	-16.81
Groundwater Tech	15.75	11	12.625	-6.48	0.7	18.21
Handex	9.5	6	8.75	18.64	0.23	33.15
Heidejemi	12.75	8.5	10.25	5.31		
International Tech	4.5	2	3.625	31.82	-0.36	
Kimmens Environ	2.75	1.5	1.75	-17.65	0.09	18.06
OH Material	19.5	9.875	11.5	8.24	0.4	
Rollins	6.375	4	6.125	25.64	-0.17	
Severson	19.5	14	17.875	-2.50	1.33	13.72
Industry Bellweather						
Browning Ferris	32.875	22	29.7	-2.22	1.52	20.89
Chem Waste Mgmt	11.375	7	7.75	-11.43	0.29	32.76
WMX Technologies	30.75	22.625	28.875	8.96	1.53	19.20
Dow Indust Av	3978	3631	3843	6.01		
S&P 500	482.85	435.86	462.7	4.16		

Sewer Overflows And Waste Debris

By Frank J. Sudol

One of the most objectionable discharges from combined sewer overflows (CSO) is waterborne waste material or floatables. A major source of this is the trash and debris discharged during rain events. Floatables represent a significant water pollution problem that must be controlled under the Clean Water Act and state regulations. These materials endanger marine biota through entanglement and ingestion and form waterborne slicks that cause navigational hazards and wash up on shorelines. They also adversely impact coastal cities that rely on tourism.



Graphic Courtesy of Frank J. Sudol

In densely populated areas such as New York City and New Jersey, floatables can affect many local water bodies. There are approximately 300 combined sewer overflows in New York City, and about 600 in New Jersey that require proper management.

On April 11, 1994, EPA finalized a CSO policy. The action ended the debate among federal policy makers and local officials representing communities confronting record compliance costs on how to control overflows and improve water quality. The final policy establishes a comprehensive approach for directing compliance efforts for CSOs that were developed when engineering practices combined sanitary and stormwater flows into one collection system in nearly 1,100 communities. Concentrated in the Northeast and the Midwest, these systems overflow an average of 50 to 80 times per year, according to EPA.

Under EPA policy, municipalities with combined sewers would have to improve street and catch basin maintenance programs, make maximum use of collection systems for storage of waste, improve pretreatment requirements, eliminate overflows during dry weather and keep the public informed of overflow occurrences and impacts. Long-term plans have to give highest priority to environmentally sensitive waterways and to include input from the public. In addition, financial capability of municipalities can be taken into account in devising long-term plans.

EPA has estimated that compliance with the current law would require CSO communities to spend approximately $160 billion over the next 10 years over the substantial investments already made. Under the final policy, assuming it will be enacted, the estimated costs will fall to $41 billion.

CSO Policy Requirements

The policy requires municipalities, such as Newark, N.J., and New York City, to develop short- and long-term plans for remediating combined sewer overflows at a level that will meet water quality standards. In addition, municipalities are required to take a number of immediate steps, including limiting floatables, maximizing the flow of sewage to treatment facilities and monitoring to determine the impact of controls.

Combined sewer overflows can occur during any summer thunderstorm or rain of less than a half inch. As the water inundates the system and pipeline network, flow that would normally go to treatment plants is diverted either through a weir overflow or electromechanically operated regulator chamber of the treatment plant into a waterway. This prevents inundating and flooding at the treatment plant. In the case of New York City, which has 6,000 miles of combined sewer, the result can be a massive deluge of untreated sewage and debris.

Newark city officials experience similar difficulties, but they have devised a management plan that reduces the debris at the source and removes it from the system and waterways.

Long-term plans have to give highest priority to environmentally sensitive waterways and to include input from the public.

A Clean Sweep

For source reduction, Newark employs modern vacuum and mechanical sweepers that clean every street in the city at least weekly and cleans the city's stormwater catch basins regularly. Whenever a street is resurfaced in Newark, the city replaces the old catch basin curb inlets, which have a large arched opening along the curb with gratings that have smaller openings and no curb inlets. This conversion virtually eliminates plastic, styrofoam cups, bottles, cans and other litter from entering the system. The city also maintains a recycling depot that accepts used motor oil.

To remove floatables from the combined sewer overflow system, Newark is preparing an engineering study to combine underutilized combined sewer outfalls. This will allow the city to divert overflows to one outfall control device and will result in the need for fewer CSO remediation structures. As a major partner in the Passaic Valley Sewage Commission, the city will reap the benefits of the commission's recently upgraded process from primary to secondary sewage treatment. With a program to re-line water mains, the city will prevent corrosion and caking in metal pipes that create high particulate levels in the water supply and reduce flow.

Finally, Newark is using an EPA-demonstrated technology to remove floatables from waterways and shores. The modular floatables capture system has been installed in front of the outfalls (discharge pipes) for CSO control.

Installation takes from two to four weeks. Located in the waterway, the capture system features nets supported by a floating pontoon structure, which is held in place by steel cable or struts connected to the face of the outfall. This structure uses funnels to capture debris in large, mesh nylon "trash" bags. The structure floats to compensate for tidal variation and may rest on the bottom during low tide. Bags typically hold 25 cubic feet of floatables with a drained weight of up to 500 pounds. The system also can be installed with two- and four-bag configurations. During an overflow event, the floatables empty into the water from the outfall. The passive energy of the discharged water and the system's containment boom guide the litter into the trash bags. Following the overflow event, the bags are replaced and the filled bags are drained and transported to an approved waste site. The bags can be lifted by a boom truck crane and loaded into a carting container or a track-mounted hoist and dumpster may be built into the system.

The system described above could be designed and engineered for a "flat land" environment, such as on the high plains in the Midwest of the United States. However, site-specific design is needed for each location. As such, the TrashTrap system can be adapted for most locations, including "flat land" applications.

More than 10 tons (drained) of floatables were captured in three months from two Newark sites. About 2 pounds of floatables are captured for every inch of rain for every acre of drainage. Capture efficiency rates varied from 95 percent to 98 percent. EP

Frank Sudol is chief of research and program development at Newark Department of Engineering, Newark, N.J.

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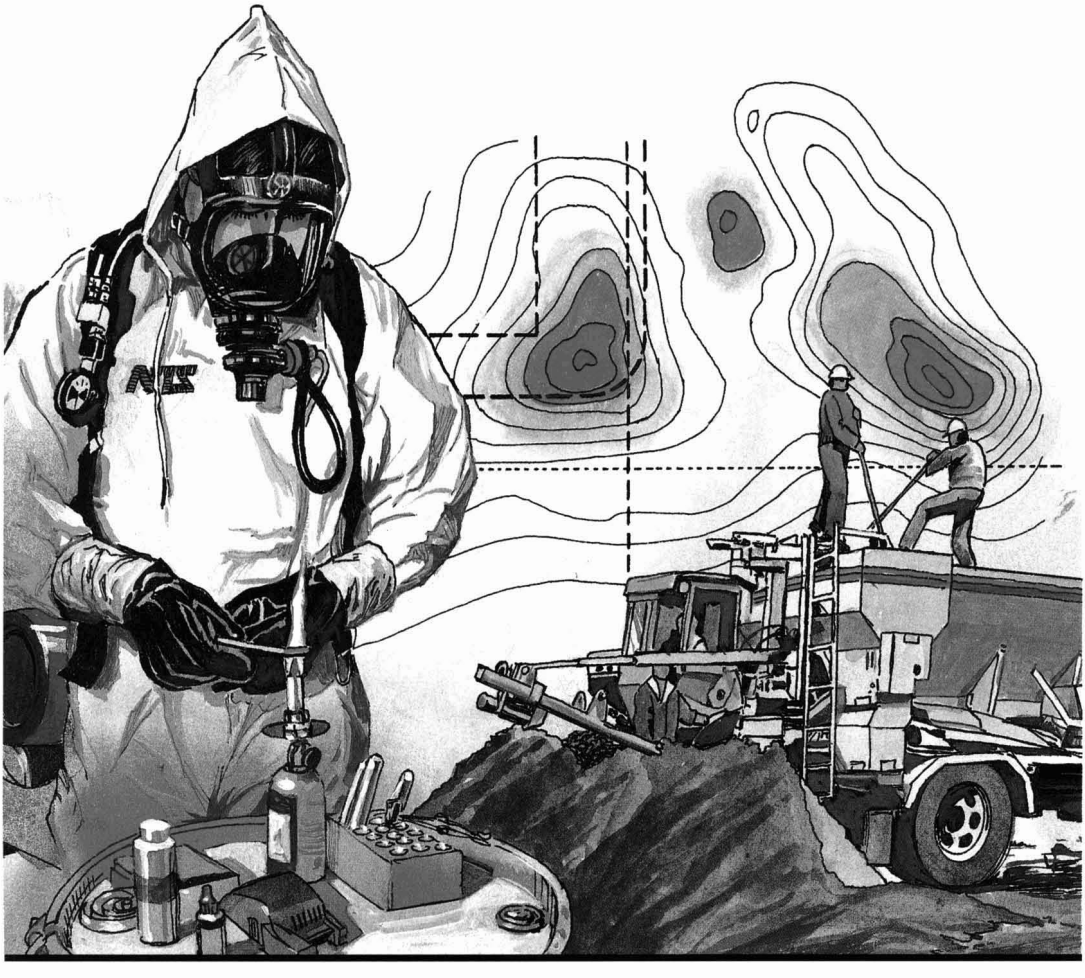

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Thermal Treatment of Polluted Soil

Sometimes the owner or manager of an operating gas station discovers that an underground storage tank is leaking. Or perhaps, a landowner wants to sell a piece of property and finds there was once a service station on site, and the soil is contaminated.

Other causes of soil contamination with gasoline or diesel fuel might include episodic or one-time spills, such as pipeline rupture or barge collision; smaller, operational spills over a relatively long period of time; imprudent disposal practices; or leaking underground or aboveground tanks and related equipment.

Whatever the cause, the resultant contamination usually must be cleaned up. Under certain circumstances, particularly when a cleanup is not economically feasible, risk assessment and monitoring of the situation may be acceptable alternatives. Depending on local requirements and circumstances, contamination may have to be cleaned up to what is considered an acceptable level, in view of overall health risks. Or the site may have to be cleaned up to "background" or naturally occurring levels of contamination.

A thorough assessment usually is the first priority. These assessments generally begin with an examination of pertinent property records, including potential sources of contamination, site and area characteristics, and any tanks that have been on site; followed by borings and analysis of soil samples on the site. A quick analysis can be done through the direct-push method: soil is pushed to the side and then a small sample of soil and water is analyzed on the spot by an expert.

The next step is the monitoring of wells and testing for groundwater contamination. This is the more traditional drilling and monitoring that produces samples for laboratory analysis. A minimum of three monitoring wells are needed for adequate information on aquifer characteristics.

The assessment firm then produces a delineation of the plume of contamination and develops site maps that indicate surface features, underground utilities, sample locations, contours of soil and groundwater contamination, the hydraulic gradient showing flow direction and a cross section of geologic layers.

By Helen Hodges and Steven K. Wells

The Nature Of Water

Finally, the assessment should identify the characteristics of the aquifer or shallow water table: how the water is flowing and how fast it can be pumped out. The aquifer's capability to store and transmit flow, its hydraulic gradient are among the parameters of interest. Slug tests, in which a given volume of water is withdrawn from or added to a well, are commonly used to determine aquifer characteristics.

If gasoline or diesel fuel is discovered during an assessment, the first step is to remove the danger immediately. This is an emergency action for which prior approval from regulators usually is not needed (though prompt reporting is still required). Fuel can be extremely dangerous if it enters a storm sewer or underground utility line.

Once the extent of contamination and pertinent site characteristics are known, a variety of alternatives for soil and groundwater treatment can be evaluated. Some of the more common soil remediation techniques include off-site landfill disposal; off-site or on-site use of native microbes to convert contaminants to carbon dioxide and water; off-site asphalt recycling, in which contaminated soil becomes the raw material for the manufacture of paving materials; soil venting, in which fuel is pulled out of pore spaces by vacuum extraction; and on-site thermal treatment.

Thermal treatment generally involves excavating contaminated soils and treating it in batches. Most thermal techniques involve driving diesel or gasoline fractions out of the soil and into an air stream, after which the volatilized hydrocarbons are either burned and destroyed or condensed and recovered.

Choice as to remedial technology usually is made partly on the basis of local conditions – soil venting, for example, is effective for the treatment of sandy soils in such locales as southern California. It does not work as well with clay soils, such as those found in southeast Texas. In clay soil conditions, thermal treatment is more effective.

Other overriding factors are the requirements of the relevant regulatory agency and the client's decision as to the best way to minimize liability, which is not necessarily the same as minimizing cost. Some decisionmakers feel better protected if all waste is removed from the site; some feel better protected if no outside disposal facilities are used. The more contaminated soil there is to be treated, the more cost-effective it might be to treat on-site.

Once a technology choice is made and regulatory approval obtained, there are still decisions to be made. For example, there are several types of on-site thermal treatment (even after assuming that destruction of hydrocarbons is preferred to condensation). The two major types are catalytic oxidation and thermal oxidation. Other variations include the use of carbon absorption as an alternative for air treatment, the use of pressurized steam for desorption of contaminants and processes for heating the soil in situ.

There are several advantages to catalytic oxidation. When catalytic oxidation is used, combustion occurs at a lower temperature, thereby saving fuel and costs. However, the catalytic system requires a higher capital cost and is often more temperamental and more subject to upset. In some cases it might be necessary to blend highly contaminated soil with less contaminated soil to avoid the problem of "hot spots." Some compounds (sulfur, halogens) might react badly with the catalyst used, which may limit the types of contamination that can be treated.

Technology Trade-offs

Thermal oxidation, which uses combustion alone to break down contaminants, is a simpler,

less temperamental process. However, it requires higher temperatures and more fuel. In some circumstances, higher temperatures are considered a drawback because of some of the immediate compounds that can be formed.

The carbon method involves heating soil to drive organic compounds into the air stream and then channeling the vapors through carbon canisters. The organic vapors absorb onto the carbon. Upon completion of processing, the carbon must be sent to a regeneration facility and prepared for re-use. Either directly or indirectly, the client will be charged for the regeneration.

In many cases, consultants accept bids for two or more processes and then examine the pros and cons. Whatever type of thermal remediation is selected, several of the process steps remain the same. Usually, the contaminated soil is first excavated. Bulldozers, backhoes and trackhoes can all be used, depending on the depth of contamination and the rate at which excavation must be accomplished. For relatively small sites where contamination is within 10 feet of the surface, a backhoe can be especially useful if it is equipped with a digging bucket on one end and a loader on the other.

Once excavated, the contaminated soil must be loaded into the thermal treatment equipment. Systems vary, and consequently the method of loading varies. Contaminated soil can be loaded directly as it is excavated with some systems, but, with most, it is necessary to move the soil to the treatment system and load it as a separate step. Backhoes or front-end loaders are commonly used for this purpose.

The heating mechanism is the heart of the thermal treatment system. Most thermal desorption systems heat contaminated soil either directly or indirectly, volatilizing the hydrocarbon contaminants. There are many important considerations at this critical stage in the process. For example, all of the contaminated soil must be heated and exposed to allow volatilization; otherwise the remediation is incomplete.

After volatilization (desorption of the hydrocarbon contaminants from the soil), the hydrocarbons are destroyed by either a straight thermal or catalyst-enhanced process. As a variation on the thermal process, some units condense the volatilized hydrocarbons and water to recover, rather than destroy, the hydrocarbons, which are then available for recycling. Recovery is generally more expensive than destruction, but there are significant regulatory benefits, particularly where hazardous wastes are concerned.

Once treatment of the soil is completed, the final step is to document thoroughly what has been done so that all concerned parties – regulatory authorities, sellers, buyers, lenders, attorneys, the public, and so on – will have readily available all the material necessary to demonstrate convincingly that the problem has been resolved once and for all. A final report should be prepared based on documentation produced continuously throughout the active life of the project.

Thermal treatment, in summary, is a highly effective means of ridding soil of petroleum contaminants. But whether to use thermal treatment or not, and which type of thermal treatment to use, can be determined accurately only after thorough, informed analysis of all the circumstances of a particular project. Before beginning to perform treatment, the contractor must also be sure to obtain all the necessary regulatory approvals or exemptions. After treatment, thorough documentation of what was done is equally important so no party involved will have any doubt about the remediation of the contamination. EP

Helen Hodges is the president of Separation Systems Consultants, Inc., an environmental services company headquartered in Houston. Steven K. Wells is SSCI's senior environmental consultant and division manager for special projects, state courts, adjudicatory hearings in government agencies and public hearings before municipal boards.

Environmental PROTECTION

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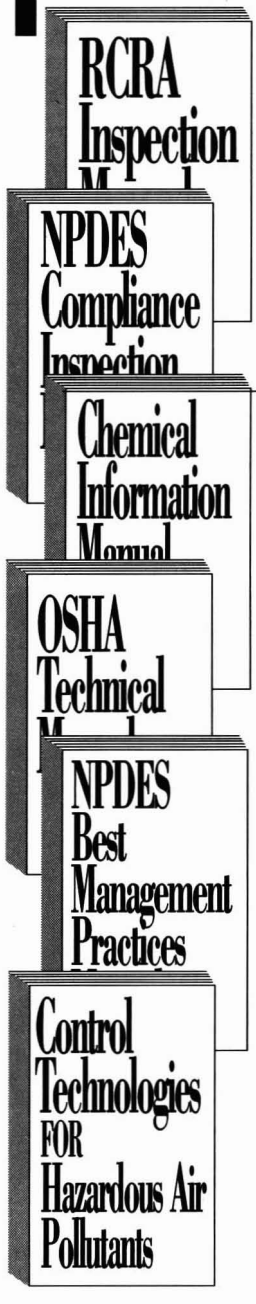

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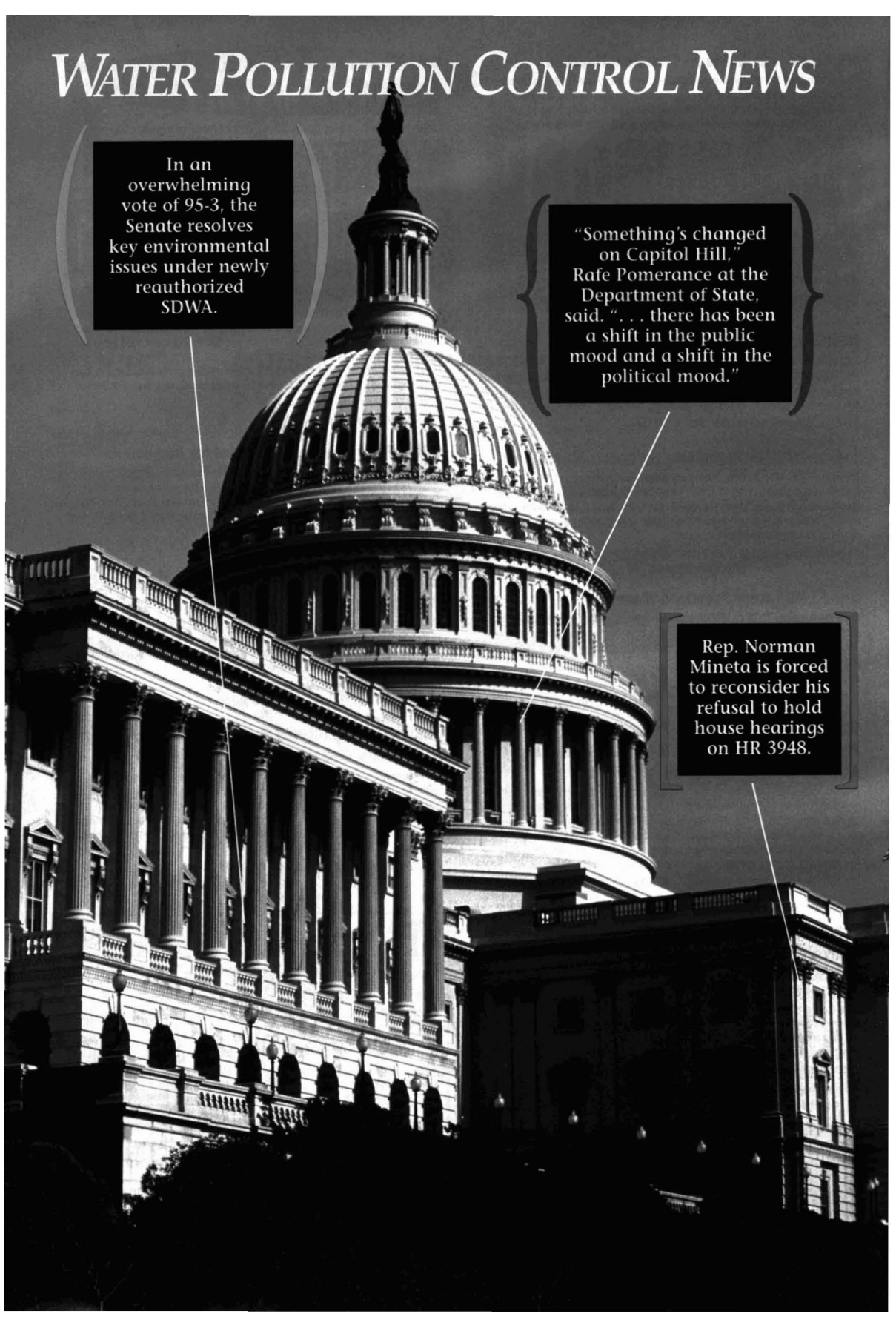

WATER POLLUTION CONTROL NEWS
In an overwhelming vote of 95-3, the Senate resolves key environmental issues under newly reauthorized SDWA.
"Something's changed on Capitol Hill," Rafe Pomerance at the Department of State, said. ". . . there has been a shift in the public mood and a shift in the political mood."
Rep. Norman Mineta is forced to reconsider his refusal to hold house hearings on HR 3948.

FROM THE INSIDE OUT

'HOSTILE' MOOD PERVADES CONGRESS, PUBLIC WHEN IT COMES TO ENVIRONMENTAL REGULATION

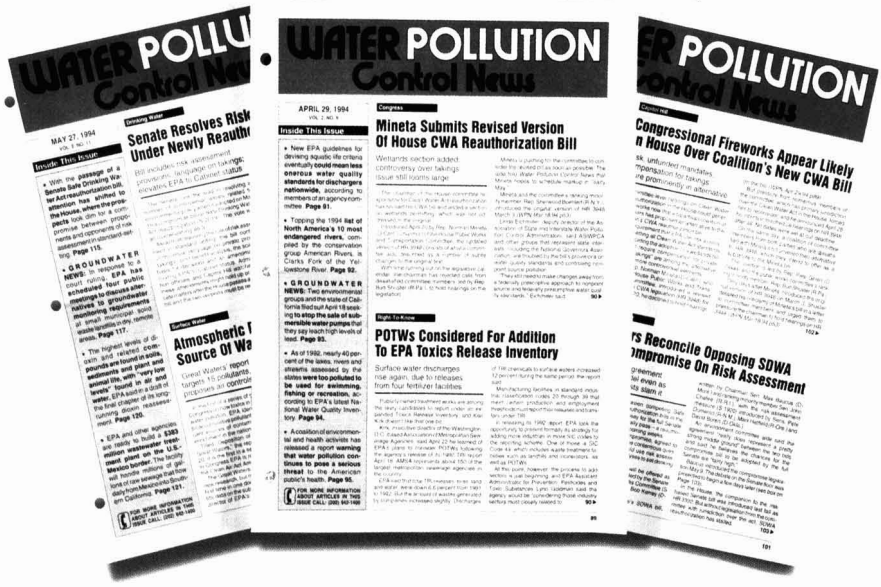
Opposition to environmental legislation is not limited to big industry anymore. Mike Evans, Senate Staffer said, "the regulated communities today are farmers, state and local government and people generally. Your enemy today, in many ways, is not the National Association of Manufacturers, it's the National Governors Association."

SENATE RESOLVES RISK ASSESSMENT UNDER NEWLY REAUTHORIZED SDWA

Capitol Hill watchers fear amendments might hold up or complicate matters after the House passes an SDWA bill and the two versions must be reconciled.

CONGRESSIONAL FIREWORKS APPEAR LIKELY IN HOUSE OVER COALITION'S NEW CWA BILL

On the same day, dissatisfied with Mineta's bill, a coalition of committee members from both parties, unveiled their alternative to HR 3948. Congressional fireworks appear likely.



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Guest Commentary

Warren R. Muir

Subduing Toxicity with TSCA Reform

The Toxic Substances Control Act (15 U.S.C. Sections 2601-2629), enacted by Congress in 1976, was to control potential toxic hazards to human health and the environment posed by commercially produced chemicals. It required EPA to gather information on the toxicity of chemicals, the extent of human and environmental exposure, the potential risks of such exposure and to regulate the problems away.

Overall, the law has proven a sad failure. In nearly two decades, not one already commercial chemical has been restricted or removed from the market under TSCA. An expensive 14-year battle to regulate asbestos ultimately failed in the courts. As Congress begins debate over TSCA's reauthorization, it should do so with major reform in mind: the lessons of the past 15 years show that no minor changes will enable TSCA to solve the problems this law has intended to address – the environmental and health risks of toxic chemicals in commerce.

Toxics in commerce – in contrast to toxic chemicals in the waste streams of industrial plants – refers to the toxic chemicals intentionally used as products at every stage in commerce from material extraction (mining), refining to manufacture, through distribution, use and re-use, to ultimate disposal. Toxic chemicals in commerce are the cause of much non-point source pollution (such as agricultural fertilizers), indoor air pollution (cleaning products), food contamination (pesticides), workplace health risks (industrial solvents) and stratospheric ozone-depletion.

More than 70,000 synthetic chemicals are in commerce in the United States. While industrial facilities report a few billion pounds of environmental releases of some 300-plus toxic chemicals to the Toxic Release Inventory each year, trillions of pounds of chemicals are manufactured and introduced into commerce. If the environment and public health could be safeguarded by identifying and then phasing out "bad" chemicals, TSCA might have worked. But barely 20 percent of the more than 70,000 chemicals in commerce have even been adequately characterized for their potential to pose health or environmental effects, and government's centralized approach, using extensive data to try to identify safe thresholds of exposure for decision-making was doomed to fail.

Situations posing unreasonable risks from chemicals in commerce are not few, but many; not national, but local; not static, but dynamic. A decentralized regulatory approach is essential – one that takes into account local circumstances and stimulates many shifts from less appropriate to more appropriate uses in specific settings.

Five basic changes in TSCA would go a long way to enable this legislation to address problems related to the uses of toxics in the real world:

- EPA should provide guidelines for industries on the safe uses of chemicals. The primary responsibility for avoiding unsafe uses would then rest with industrial producers and users.
- EPA should create a Chemical Use

Inventory, containing data from industry on the flow of chemicals in commerce as a vehicle for evaluating safe uses.

• Confidential business information (CBI) should be strictly limited. CBI policy and practices today exclude the scientific community, state and local government agencies, workers, the press, and the public from gaining TSCA's perspectives on chemicals in commerce and have prevented accountability of industrial firms for their actions.

Congress could consider a CBI approach based on use so that when any chemical is sold in commerce or used dispersively, the public's right to know about such uses overrules trade secret requests.

• The new chemical review (PMN) process has been one successful TSCA provision. (Few, if any, major environmental issues of today are associated with a chemical that has gone through this review process.) But the process could be improved in three ways: 1) close a serious loophole, by basing approvals of a chemical's use only on those uses explicitly requested by the applicant and deemed safe by the EPA. 2) Require companies to submit their own risk assessment for their intended uses of chemicals as a prerequisite for approval. 3) Have the chemical review program scientifically reviewed every five years or so.

• Make producers and users responsible for ensuring that the chemicals they produce and use do not create unreasonable risk, with government-sponsored testing conducted only when this approach would be impractical, such as when a chemical is used primarily by very small companies.

By making government-established principles for chemical production and use the general duties of chemical producers and consumers (and by holding industry responsible for assessing the risks of different uses to verify that the ones chosen are reasonable), EPA can devote its energies to analyzing the chemical use inventory data that will drive this system and to enforcing general duties on those firms that are ignoring their responsibilities of product stewardship. EP

Warren R. Muir, PhD, is a senior fellow with INFORM, a New York City-based non-profit environmental research firm.

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groups operate: individuals rallying their friends and neighbors to urge bureaucracies to take action on environment issues. For example, Marie Tuccito, a teacher and mother of a 19-year-old boy, distributed a barely legible, handwritten map of her neighborhoood in Southington, Conn., (population 39,000). Like black bugs, ink blots were scattered across the map. Each blot marked a cancer case – 65 in all – identified in the vicinity of the Solvents Recovery Co. For years, the company had been discharging substances into a lagoon 600 feet from the town. Tuccito, who lived nearby, and other mothers correctly assumed that the discharges were toxic and bore a direct relationship to the geographic distribution of the diseased population.

The alarmed mothers, organized as the Southington Association for the Environment, began phoning and writing the DEP, requesting an official investigation of the site, but a response was slow.

"We were caught between the air/water and waste bureaucracy and buck passing in the DEP," Tuccito said.

But she and her friends finally prevailed. On the very day that they briefly picketed outside the company gate, the Attorney General of Connecticut closed the plant by blocking renewal of its operating permit.

In microcosm, the Southington incident shows how grass-roots, neighborhood-based groups can focus public attention on health-related environment issues. They can trigger action by authorities. In addition, the collection of survey material, even if less than scientific, also can catalyze an official response. Multiplied literally by thousands, such groups that concentrate on neighborhood issues underscore the potential power of the environmental justice movement.

The growth of grass-roots groups, which by definition are locally based, sometimes town and neighborhood-based, contrasts with the decline in membership of the mainstream, national environmental organizations. Greenpeace and the Sierra Club are going through hard economic times as revenues fall and with that, power and influence.

Can it be that the grass-roots organizations will supplant the big national organizations as the warriors in defense of the environment?

A crystal ball would help answer that question. But one doesn't need a crystal ball to predict that American industry will be affected by the environmental justice movement. While the President's executive order applies only to federal agencies, it is hard to believe that there will not be any fallout on industry.

Deeohn Ferris, an attorney who drafted the paper on environmental justice for Clinton's transition team and subsequently served in EPA's Office of Enforcement, is convinced that the executive order will have a "tremendous impact on industry."

"Industry is a regulated community, regulated by federal agencies," she said. "In federal responses to the concept of environmental justice, federal agencies will have to change to make sure that everybody is protected. But achieving compliance will still leave many people exposed to high levels of contamination and pollution. So the push will be for changing the paradigm. To do that, we have to evaluate how the existing system affects people. That means we have to change. What may be legal today may be illegal tomorrow."

With the official recognition bestowed by the President's executive order, with the numbers and militancy of grass-roots organizations growing, environmental justice could well become the rallying cry of the next generation of environmental activists. And if they succeed in changing the paradigm, industry's operations also may have to change. After all, in the American scheme of things, any movement that bears the word "justice" on its banner is as unassailable as apple pie. EP

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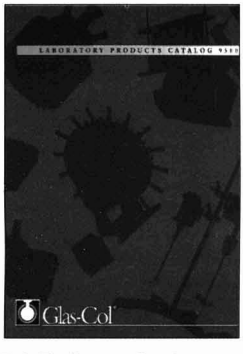

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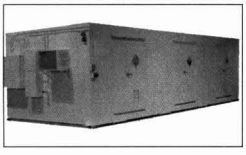

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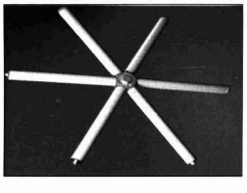

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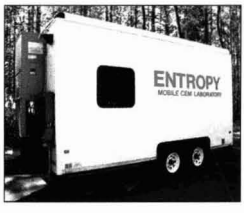
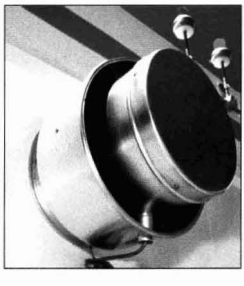


Mobile Laboratories

Entropy mobile laboratories are fully equipped to conduct stack testing. The E1620 laboratory is a turn-key package designed for performing EPA instrumental test methods in 40 CFR Parts 60 and 75. The lab also performs relative accuracy test audits, compliance testing and cylinder gas audits of installed CEMs. The package includes stack sampling training.

Entropy

Circle 73 on card.

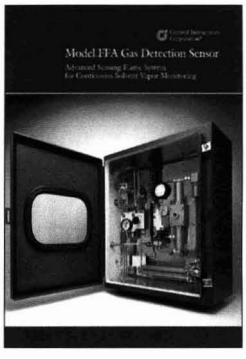


Ventilation Fan

Haz-Safe has produced the first ventilation fan on a hazmat building with a motor-encapsulated from contaminated exhaust air, but cooled through an outside fresh-air tube. The fan includes an explosion-proof motor, centrifugal wheel and electrical connections accessible through a removable end cover. An air pressure switch turns on a blue "trouble" light, while a fire alarm lights a red light and turns off the fan and HVAC systems.

Haz-Safe

Circle 74 on card.



Flammable Gas Detection

The FFA gas detection system is used for monitoring solvent vapors in printing processes. Adding continuous monitors allows the printer to reduce the safety ventilation rate in the dryer from inefficient settings. Although the instrument has been calibrated for only one solvent, it measures concentrations for a variety of solvents, eliminating the need for recalibration.

Control Instruments

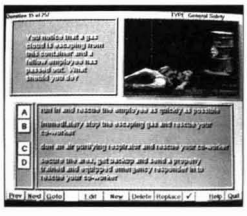
Circle 75 on card.

Drum Storage Pallet

Modular Pallet Systems for Horizontal Drum Storage are designed for dispensing drums in the workplace safely and effectively. The drums are cradled on carbon steel structural members that stand over a carbon steel containment sump. Options include a manual push rail and drum rollers that allow for easy rotation to align spigots for dispensing capabilities.

P&D Systemtechnic

Circle 76 on card.



Assessment Program

The Worksafe Assessment Program is a computer-based testing tool that measures employee knowledge of necessary safety and compliance information. The program uses high-resolution graphics to place employees in actual work situations. The program documents each employees's proficiencies and weaknesses and prescribes specific training to meet deficiencies.

Williams Knowledge Systems

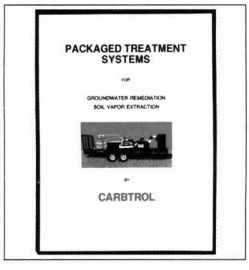
Circle 77 on card.

Meter Selection Guide

The Trace Automated Meter Reading System offers fast, efficient and accurate meter reading. Trace meters use radio telemetry for automated meter reading. The Pit Transponder features a field replaceable battery to simplify servicing. A free Meter Selection Guide on meters and meter reading

products is available. For information, call (800) 633-0986.
Badger Meter

Circle 78 on card.



Packaged Treatment Systems

This four-page, color brochure covers packaged treatment systems for groundwater remediation and soil vapor extraction. Details on four functioning installations and drawings of a typical equipment arrangement and a typical flow sheet are included.
CARBTROL

Circle 79 on card.

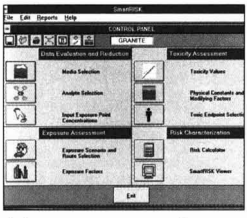
Liquid Level Measurement

The MSP110 is a liquid level measurement and control system that combines a 60-foot range ultrasonic transducer with a programmable control unit. By measuring the time delay between transmitted and reflected impulses, the liquid level in the vessel can be accurately measured. A hand-held remote programmer communicates with the control unit.
Magne-Sonics

Circle 80 on card.

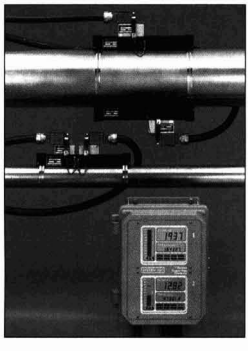
Risk Assessment Software

SmartRISK is a multi-chemical, multi-pathway human health risk assessment modeling and information management system for Windows. Complex



risk assessments can be performed in less than an hour. Version 2.0 includes new one-step printing Wizards, a Cleanup Level Calculator and Monte Carlo compatibility.
Pioneer

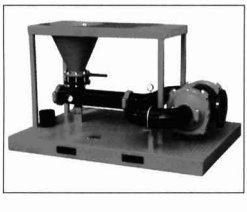
Circle 81 on card.



Flowmeter

The Clamp-On Flowmeter System 990N is used for upgrade and retrofit applications and requires no process or flow shutdown for installation. The flowmeter is non-intrusive, and there are no moving parts to wear or to be damaged by the flow stream. The MultiPulse measurement technique is digital, and the system uses ultrasonic transit-time technology.
Controlotron

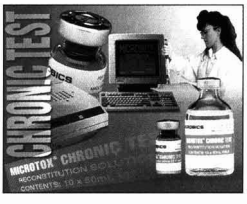
Circle 82 on card.



Jet Shear

This is a one-pass method of rapidly mixing and delivering a bentonite slurry for trench and slurry wall applications. The Jet Shear provides a hydraulic shearing action without moving parts for instant hydration of bentonite for a fast impervious cake formation. Other applications include dam repairs, cutoffs, dock and waterfront installations, tunnels, and underground facilities.
Flo Trend Systems

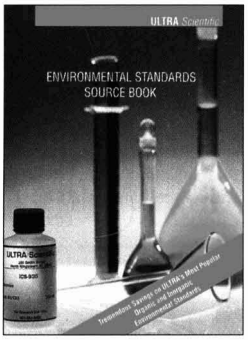
Circle 83 on card.



Chronic Toxicity Test

This "overnight" toxicity test has sensitivity comparable to that of a seven-day ceriodaphnia test. The tests are used to measure the quality of treated wastewater released from treatment plants. The test organisms are incubated overnight in a growth medium in the presence of the test sample. The organisms reproduce at least three times before their light output is measured.
Microbics

Circle 84 on card.



Chemical Standards

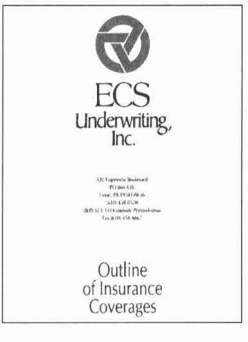
The 22-page catalog features an extensive listing of analytical chemical standards. Organic solution standards for all EPA water quality methods as well as inorganic standards for ICP, AA and Ion Chromatography are included. The catalog features a collection of organic and inorganic quality control check standards.
ULTRA Scientific

Circle 85 on card.

Miniature Fluorometer

The design of RF-Mini provides accurate fluorometric quantitation of DNA, RNA or fluorescent tags. High sensitivity measurements from microgram to picogram levels are attained through routine analyses of DNA using Hoescht Dye and RNA/DNA with ethium bromide.
Shimadzu

Circle 86 on card.

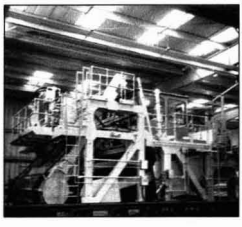


Scientific Instruments Insurance Services

Environmental Compliance Services provides environmental insurance, consulting and claims management. Physical damage, pollution legal liability, first-party pollution cleanup, pollution and remediation legal liability, consultants environmental liability, contractors pollution liability and environmental risk management services

are some of the types of insurance offered.
Environmental Compliance Services

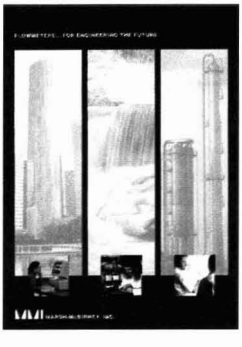
Circle 87 on card.



Moving Compost

The Compost Excavator has a rotary breaker device for cutting/turning the compost and a discharge conveyor table that is capable of transferring compost from one cell to another or discharging onto a conveyor belt. The machine mounts on existing rails on top of an "in-vessel" reactor and was designed to transfer at least 4,600 cubic feet of compost per hour.
Ellicott Engineering

Circle 88 on card.



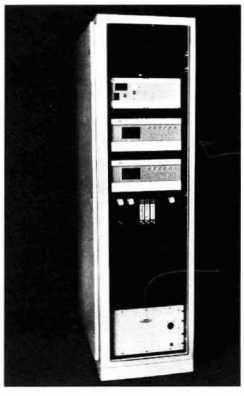
Flowmeters

This new catalog includes instruments for portable and permanent applications and features products for the measurement of waste/wastewater, industrial processes, slurries/sludges and chemical and pulp stock applications.
Marsh-McBirney

Circle 89 on card.

Emission Measures

The ML660 Standard Extractive System is designed for use in process control for



EPA 40 CFR 60 and EPA 40 CFR 75 applications and can be configured to measure SO_2, NO_X, CO, CO_2 and O_2 on a dry basis.
Monitor Labs

Circle 90 on card.

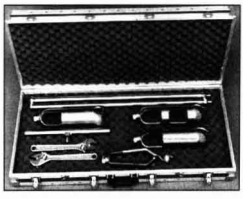
Chemical Badge

Direct-reading colorimetric badges are designed to indicate the presence of gases and vapors in the air. The badge provides enhanced sensibility and facilitates reading since the color formed is homogeneous. The SafeAir Optical Comparator, when used in conjunction with the badge, allows personnel to monitor exposure doses from 0.9 ppm/min to 100 ppm/min.
Gilian

Circle 91 on card.

Auger Kits

General purpose, sand, clay and mud augers included in the JMS Professional Auger Kits can collect soil samples almost anywhere. With several versions available, a user can tailor kits



to his needs. For an additional cost, three-inch stainless steel augers may be substituted for the standard, nickel-plated, carbon steel augers.
JMC Soil

Circle 92 on card.

Investigation Equipment for Lagoon Pumping

The remote control lagoon waste pumping platforms remove sludge without onboard operators. Electronic solenoids control hydraulic systems for traveling winch, pump speed, depth, slurry agitation gate and eight-foot auger/cutter heads. Controls can be hand-held or mounted, and optional automated lateral movement systems control unattended operation.
Liquid Waste Technology

Circle 93 on card.

Skin Protectant

Skintect is a water-proof skin protectant that forms an impervious and hydrophobic barrier on the skin once applied. The barrier protects industrial professionals from occupational irritant exposure. It also provides personal protection from many hazardous and corrosive substances known to cause contact dermatitis.
Goodway USA

Circle 94 on card.

Carrying Cases

ZERO Enclosures is expanding its Quick Ship program to include two lines of carrying cases. Almost 100 sizes of carrying cases will be available for next-day shipping. The Quick Ship service is available on orders placed before 3 p.m. (MDT) and for as much as 10 cases. Additional cases are shipped within five working days.
ZERO

Circle 95 on card.

Vapor Monitoring System

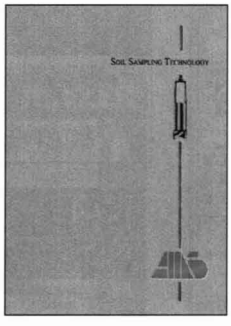
Printing operations can rely on a new flammable vapor monitoring system that provides continuous, high-speed vapor concentrations, allowing printers to adjust the safety ventilation rate from inefficient fixed settings. The Model FFA gas detection system measures concentrations of a wide variety of solvents, eliminating the need to recalibrate for different solvent usage. It also signals any change in the system's status, such as sample flow rates, electrical signal fluctuations, and fuel supply changes.
Control Instruments

Circle 96 on card.

PRODUCT LITERATURE

Reader Service

To receive information or find out more on any of the product literature featured on this page, circle the appropriate number on the enclosed reader service card or call the company directly.



AMT Equipment Catalog
The complete line of AMS soil and groundwater sampling equipment is showcased in the company's new 28-page catalog. The catalog includes AMS's latest innovative entries into the sampling technology field and includes some recently patented items for both soil and groundwater sampling.
Arts Manufacturing & Supply Inc.
105 Harrison
American Falls, ID 83211-1230
(208) 226-2017, (800) 635-7330

Circle 53 on card.

Trenchless Pipe Renovation
TT Technologies' trenchless, pipe-bursting GRUNDOCRACK® is an economical tool to renovate water, sewer, gas, electrical telephone conduit or duct systems 2-30 inches in diameter. GRUNDOCRACK® eliminates time-consuming excavation of existing pipe and minimizes surface and environmental disruption. Launched into the old pipe, GRUNDOCRACK® cracks and splits the existing pipe apart as it simultaneously pulls in the new liner or pipe. Burst and install the same size pipe or upsize.
TT Technologies, 800-533-2078

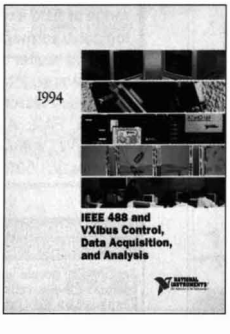
Circle 50 on card.

Instruments Catalog
The free 1995-96 instruments catalog contains over 1,700 full-color pages and feature more than 40,000 products covering scientific instruments, equipment and supplies. It includes a detailed 40-page product index, informative introductory pages for several sections, "Hot Tips" and an eight-page section of late-breaking products.
Cole-Parmer Instrument Co.
7425 N. Oak Park Ave.
Niles, IL 60714
(800) 323-4340

Circle 54 on card.

Earthprobe 200
This self-contained all hydraulic rig meets the growing demand for direct push/probing technology for taking soil, water or vapor samples. The Earthprobe 200 is ruggedly built and can be mounted in any suitably sized pickup truck. Advanced hydraulics allow precise control over the feed and hammering functions. The mast tilts for angle probing. The optional rotary head provides limited auger drilling capability.
SIMCO
(800) 338-9925

Circle 51 on card.



DAQ Software Tool
DAQ Designer is a free software tool that helps determine which hardware-software combinations are best for your PC-based data acquisition system.
National Instruments
6504 Bridge Point Parkway
Austin, TX 78730
(512) 794-0100
(800) 433-3488
Fax: (512) 794-8411

Circle 55 on card.

KATOX Catalytic Oxidizers
KATOX VES Catalytic Oxidizers utilize flameless combustion and precious metal catalyst to provide 99+ percent VOC destruction for soil vapor extraction and industrial processes. Standard KATOX units with 55 to 70 percent Heat Exchangers are available from 100 to 5,000 scfm flow rates. Trailer mounted, turnkey and halogenated systems are available as options.
ADWEST Technologies Inc.
Orange, CA
(714) 997-8722
Fax (714) 997-8744

Circle 52 on card.

Soil Sampling Equipment
Clements Associates manufactures a complete line of hand-operated soil sampling equipment. Their free, full color, 24-page catalog describes several probe handles, bucket augers and sampling tubes with removable liners. It spotlights a probe that uses a sliding drop-hammer to drive a 36-inch long sampling tube into the ground and a foot-operated jack to retrieve it.
Clements Associates Inc.
(515) 792-8285 or (800) 247-6630

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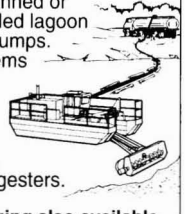

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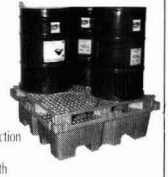

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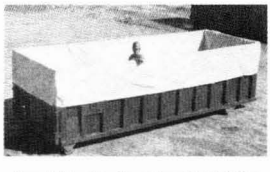

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Competing Technologies

Going into the air pollution control market, biofiltration competes with established technologies such as incineration, scrubbers and carbon adsorption. None of these approaches – including biofiltration – is right in every situation.While assessing an air pollution control technology, engineers typically look at existing applications where it has proven effective, determine the capital cost for building the system and assess its potential operating cost and maintenance requirements. Competing technologies will rate differently in each of these categories. More technologically intensive systems bring with them much higher capital costs and potentially high operating and maintenance bills.

Biofiltration's strengths are its low capital, operating and maintenance costs as well as its effectiveness in situations where off-gas flow is moderate, the contaminants degrade relatively quickly, and they occur in concentrations of less than 1,000 ppm. The core of the system –the filter material and microorganisms – are economical, and the associated control mechanisms are not technologically complex. As better controls have been developed for moisture and temperature, the maintenance picture for biofiltration has improved further, prolonging the life of the filter material and increasing the stability of the microbial population. Incineration, by contrast, offers very high levels of effectiveness, but comes with high capital costs and negative public perceptions. Carbon adsorption offers competitive capital costs and works well across a wide range of contaminant types and concentrations. But it can be difficult to anticipate the breakthrough point when the carbon is no longer effective. Moreover, activated carbon needs to be regenerated, and eventually replaced and disposed of. Scrubbers are very effective with large flows, but only work with water-soluble contaminants and come with high capital and operating costs. The liquids involved also raise chemical handling and disposal issues. The growing number of large, established industrial companies, consulting engineering firms and pollution control vendors that have committed themselves to biofiltration is a strong indicator of the progress this technology has made in securing a position in the marketplace. The key to success with biofiltration is ensuring that the system's design is adapted to the specific contaminants it will receive.

The growing number of companies that have committed themselves to biofiltration is a strong indicator of the progress this technology has made.

Kannan Vembu is a senior consultant at Arthur D. Little Inc., and works with a wide range of industries on environmental technology and management issues. C. Stow Walker, also a senior consultant at the firm, specializes in environmental business and strategy, helping companies define opportunities and issues in the environmental arena.

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1. Function which best describes your activity in Pollution Control (check only one):

A ☐ Corporate responsibility for Pollution Control
B ☐ Manage all Pollution Control Operations at this location
C ☐ Supervise sub-group in Pollution Control Operations
D ☐ Provide professional consulting service on Pollution Control
E ☐ Provide staff environmental service on Pollution Control
Z ☐ Other (please specify) _____

2. Type of Business (check only one):

A ☐ Manufacturing. If manufacturing, please check the appropriate SIC (check only one):

☐ (20) Food
☐ (21) Tobacco
☐ (22) Textile
☐ (23) Apparel
☐ (24) Lumber & Wood
☐ (25) Furniture
☐ (26) Paper
☐ (27) Print/Publish
☐ (28) Chemicals
☐ (29) Petrol. & Coal
☐ (30) Rubber/Plastic
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☐ (33) Primary Metal
☐ (34) Fab. Metal
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☐ (36) Elect. & Electron. Mach.
☐ (37) Trans. Equip.
☐ (38) Instru/meas/analyz/controlling
☐ (39) Miscellaneous Mfg.

B ☐ Mining
C ☐ Agriculture
D ☐ Engineering & Contracting
L ☐ Consulting
M ☐ Insurance
E ☐ Utilities, public, private & cooperative
F ☐ Govt. including municipal or district sanitary water or wastewater trmnt. sys. or plants

Type of Govt:

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K ☐ Transportation
N ☐ Labs O ☐ Training P ☐ Real Estate
Z ☐ Misc. Services _____ (please specify)

3. Approximate number of employees at this address (check only one):

A ☐ 1-19 E ☐ 250-499 H ☐ 1500-2499
B ☐ 20-49 F ☐ 500-999 I ☐ 2500 and up
C ☐ 50-99 G ☐ 1000-1499
D ☐ 100-249

4. In your job function do you recommend, specify or purchase? (check all that apply):

A ☐ Pollution Control Equipment
B ☐ Instrumentation
C ☐ Chemicals
D ☐ Parts & equipment for maintenance operation and control
E ☐ Services/Consulting
F ☐ None of the above _____ (please specify)

5. What types of Pollution Control are you responsible for? (check all that apply):

A ☐ Air
B ☐ Water
C ☐ Noise
D ☐ Solid waste disposal
E ☐ Industrial hygiene
F ☐ Toxic & hazardous material
G ☐ Energy control/energy conservation
H ☐ None of the above _____ (please specify)

6. Which of the following publications do you receive personally addressed to you? (check all that apply):

A ☐ Pollution Engineering
B ☐ Environment Today
C ☐ Hazmat World
D ☐ Pollution Equipment News
E ☐ The National Environmental Journal
F ☐ Water Environment & Technology
G ☐ None of the above _____ (please specify)

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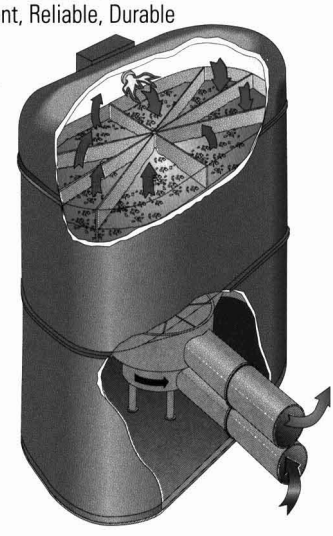

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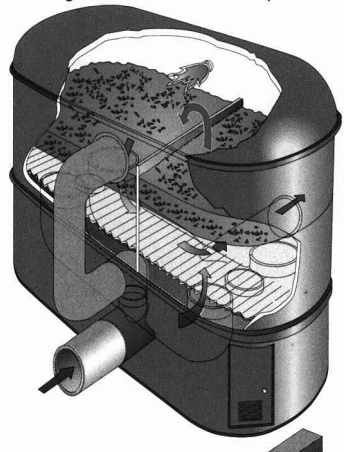

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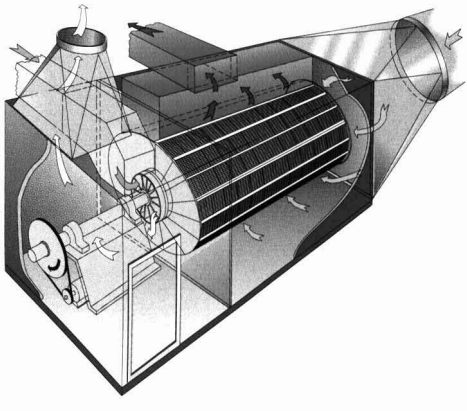

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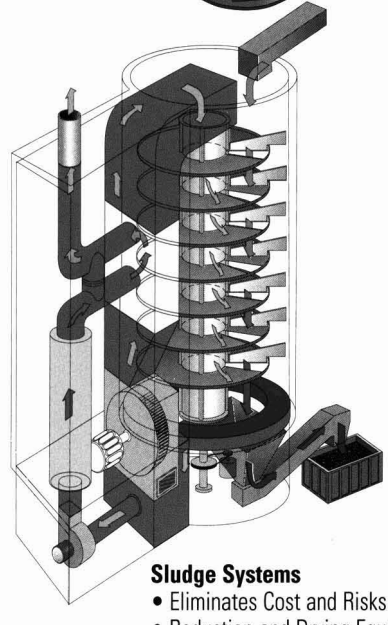

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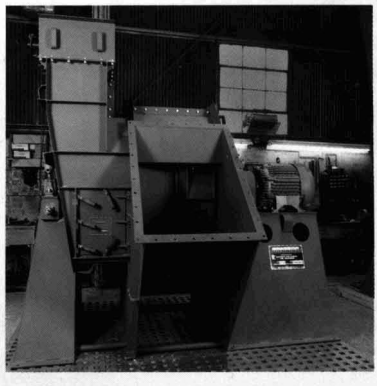

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