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Environmental PROTECTION

Management and Problem-Solving for Environmental Professionals

FEBRUARY 1997

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Front of the Pipe

Special Report on Pollution Prevention

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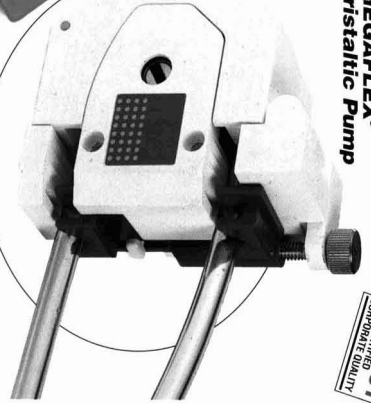
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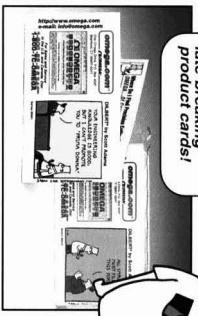
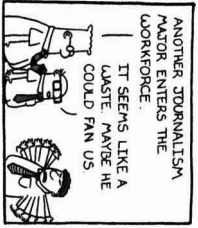
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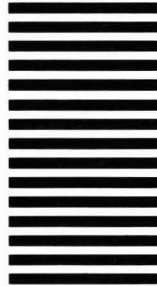
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FREE PRODUCT INFORMATION FOR ENVIRONMENTAL PROTECTION

February 1997

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101	118	135	152	169	186	203	220	237	254	271	288	305	322	339	356	373	390
102	119	136	153	170	187	204	221	238	255	272	289	306	323	340	357	374	391
103	120	137	154	171	188	205	222	239	256	273	290	307	324	341	358	375	392
104	121	138	155	172	189	206	223	240	257	274	291	308	325	342	359	376	393
105	122	139	156	173	190	207	224	241	258	275	292	309	326	343	360	377	394
106	123	140	157	174	191	208	225	242	259	276	293	310	327	344	361	378	395
107	124	141	158	175	192	209	226	243	260	277	294	311	328	345	362	379	396
108	125	142	159	176	193	210	227	244	261	278	295	312	329	346	363	380	397
109	126	143	160	177	194	211	228	245	262	279	296	313	330	347	364	381	398
110	127	144	161	178	195	212	229	246	263	280	297	314	331	348	365	382	399
111	128	145	162	179	196	213	230	247	264	281	298	315	332	349	366	383	400
112	129	146	163	180	197	214	231	248	265	282	299	316	333	350	367	384	401
113	130	147	164	181	198	215	232	249	266	283	300	317	334	351	368	385	402
114	131	148	165	182	199	216	233	250	267	284	301	318	335	352	369	386	403
115	132	149	166	183	200	217	234	251	268	285	302	319	336	353	370	387	404
116	133	150	167	184	201	218	235	252	269	286	303	320	337	354	371	388	405

Card Expires April 1997

Interested because of: **95** New Construction **96** Adding Capacity **97** Plant Upgrade **98** Maintenance **99** 1 for 1 Replacement

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Yes! Send/Continue to send *Environmental Protection* free of charge.

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**FOR FASTER SERVICE
USE PEEL OFF LABEL**

- G. Which of the following Water Quality Instrumentation and Package Wastewater Treatment Systems product(s)/services do you plan to purchase in the next 12 months?(Select all that apply)
- 800 pH meters
 - 801 Tests Kits
 - 802 Strip Chart Recorder
 - 803 Circular Chart Recorder
 - 804 Flow Controller/Monitor
 - 805 Level Controller/Monitor
 - 806 Groundwater Sampler
 - 807 Wastewater Sampler
 - 808 Dissolved Oxygen Analyzer
 - 809 Handheld Photometer
 - 810 Stream Velocity Meter
 - 811 VOCs Analyzer
 - 812 BOD Analyzer
 - 813 Mobile Laboratory
 - 814 Instrument Leasing
 - 815 Plating Waste

- A. 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 services on Pollution Control
 - E Provide staff environmental service on Pollution Control
 - Z Other _____
- B. Type of Business (check only one):
- A Manufacturing (if manufacturing, please check the appropriate SIC (check only one))
- J (06) Foot
 - J (01) Rubber/Plastic
 - J (21) Tobacco
 - J (31) Leather
 - J (22) Textile
 - J (32) Stone/Clay/Glass
 - J (23) Apparel
 - J (53) Primary Metal
 - J (24) Lumber & Wood
 - J (54) Food/Meat
 - J (25) Furniture
 - J (56) Mach., except Elect.
 - J (26) Paper
 - J (36) Elect. & Electron. Mach.
 - J (27) Print/Publish
 - J (37) Trans. Equip.
 - J (28) Chemicals
 - J (38) Instr./meas./analyzing/controlling
 - J (29) Petrol. & Coal
 - J (39) Miscellaneous Mfg.
 - B Mining
 - L Consulting
 - C Agriculture
 - M Insurance
 - D Engineering & Contracting
 - E Utilities, public, private & cooperative

- F Govt. including municipal or district sanitary water or wastewater treatment sys. or plants
- Type of Govt:
- G City
 - H County
 - I State
 - J Federal
- K Transportation

N Labor

O Training

P Real Estate

Z Misc. Services _____

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

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

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

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

- E. What types of Pollution Control are you responsible for? (check all that apply)
- A Air
 - F Toxic & hazardous material
 - B Water
 - G Energy control
 - C Noise
 - H Energy conservation
 - D Solid Waste
 - I None of the above _____
 - E Industrial hygiene
- F. Which of the following publications do you receive personally addressed to you? (check all that apply)
- A Pollution Engineering
 - B Environment Today
 - C Environmental Solutions
 - D Pollution Equipment News
 - E The National Environmental Journal
 - F Water Environment & Technology
 - G None of the above _____

**Environmental
PROTECTION**

- 816 Oil/Water Separator
- 817 Reverse Osmosis System
- 818 Ultrafiltration System
- 819 Ozonator
- 820 Chlorinator
- 821 Stormwater Treatment System
- 822 Stormwater Sampler
- 823 Water Quality Monitor
- 824 Aeration System
- 825 Activated Carbon System
- 826 Biotreatment System
- 827 Cooling Tower
- 828 Recorders
- 829 Complete Package Wastewater Treatment System

- H. What is your reason for purchasing the selected products/services? (Select one)
- 830 New Construction
 - 831 Plant Upgrade
 - 832 Replacement/Maintenance
- I. What is your projected budget for the selected products/services? (Select one)
- 833 Over \$200,000
 - 834 \$100,001-\$200,000
 - 835 \$50,001-\$100,000
 - 836 \$10,001-\$50,000
 - 837 \$5,000-\$10,000
 - 838 Under \$5,000

- J. How immediate is your need for the selected products/services? (Select one)
- 839 0-3 months
 - 840 4-6 months
 - 841 7-9 months
 - 842 10-12 months
 - 843 over 12 months

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Title _____

Company _____

Address _____

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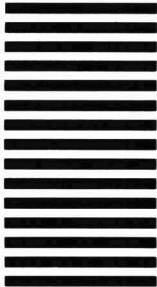
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About the cover:

In this issue, EP introduces the first in a continuing series of special reports on pollution prevention (P2). Turn to these articles for new strategies on cutting waste at the "front of the pipe": Are You Ready for MACT? (page 10), The Green Chemistry Challenge (page 14) and Trends in Fugitive Emissions (page 15).

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ENVIRONMENTAL PROTECTION (ISSN # 1057-4298, USPS #006-703) is published 12 times a year, Vol. 8, No. 2. © 1997 Stevens Publishing Corp., 3700 IH-35, Waco, TX 76706.
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P2: Still Job One at EPA

About nine years ago, a new mindset at the U.S. Environmental Protection Agency began to take hold—pollution prevention, nicknamed P2. In September 1988, the EPA Science Advisory Board announced, “The EPA should shift the focus of its environmental strategy from end-of-the-pipe control to preventing the generation of pollution.”

At that time, 99 percent of environmental funds was spent on controlling pollution after it was created and less than 1 percent was devoted to preventing the waste from being generated in the first place. During the past decade, regulators and industry began recognizing the inherent limits of treating and burying waste. It soon became evident that waste reduction is the most economical approach to handling the looming waste crisis.

The EPA defines P2 as being the use of materials, processes or practices that reduce or eliminate the creation of pollutants at the source. Choosing less toxic raw materials for production, altering production technology and equipment, improving production operations and processes, recycling waste within facilities and reformulating end products to be less hazardous are some examples.

In recent years, the EPA has increased its focus on P2. Carol M. Browner, the current EPA administrator, emphasized her commitment in an April 1993 statement, “I have four priorities for the agency. First, pollution prevention. ... Pollution prevention is our best hope for the future of environmental protection.”

The EPA has tried several approaches to promote P2. One of the most successful has been the 33/50 Program that began in 1991. Using 1988 as a base year, the program set national priorities for cutting the emissions of 17 chemicals that facilities are required to report in their Toxics Release Inventories (TRI). The program's name comes from its goals: a 33-percent decrease of the chemicals by 1992, followed by a 50-percent reduction by 1995. The target of 33/50 was hit in 1994, an entire year ahead of schedule.

Another example of the EPA's new P2 initiatives includes its announcement last fall of environmental management principles aimed at fostering waste reduction efforts by federal agencies and contractors. President Bill Clinton signed an executive order that mandated the EPA to establish the Federal Government Environmental Challenge Program. As a result, agencies like the Department of Defense and the Department of Energy are encouraged to draft provisions for P2 and environmental compliance into governmental agreements with contractors.

The EPA is also planning to launch a new initiative called Innovations in Building Sustainable Industries (IBSIN). The program will provide incentives for industry, government and communities to work together to promote sustainable development goals such as reducing TRI toxics and implementing product stewardship programs.

The EPA's P2 programs must contend with the daunting amounts of waste currently being churned out all over the country. No matter how far P2 is taken, it can't get rid of all waste. But it can go a long way in advancing more efficient use of resources and greater protection of the environment.

Angela Neville

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

Environmental PROTECTION

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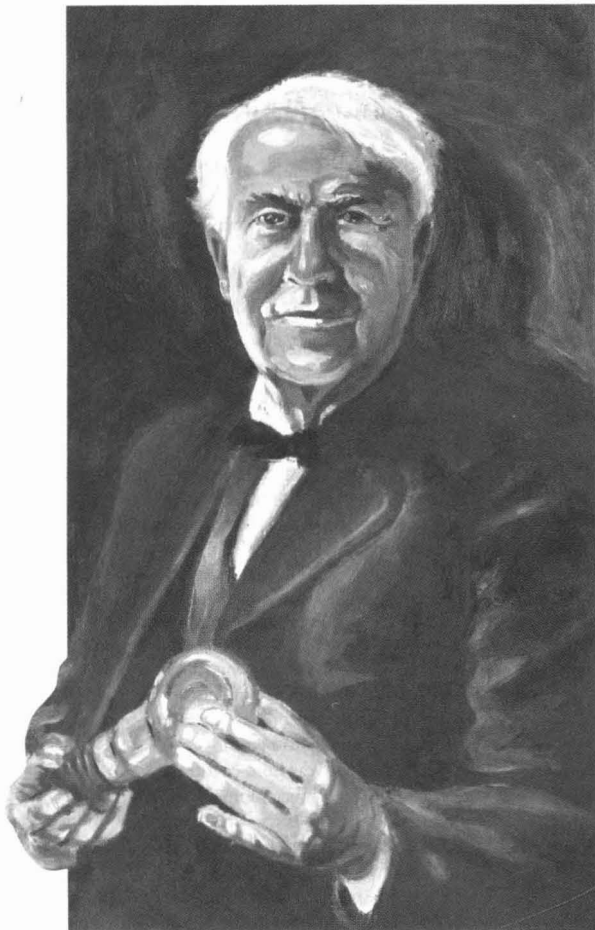
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Thomas Alva Edison, 1932

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ISO 14000 Published

BOSTON—The International Organization for Standardization has published the first two series of the ISO 14000 environmental management standards. The standards have been used by U.S. businesses in draft form until now. The core management system specifications consist of seven components. These are:

- a written environmental policy;
- identification of the significant environmental aspects of corporate operations;
- setting targets and objectives for self-improvement;
- establishing procedures and plans to meet the targets and objectives;
- adopting training programs and procedures for documentation;
- implementing a system of periodic management audits and reviews; and
- establishing methods for internal and external communication of environmental information.



Land Disposal Flexibility

WASHINGTON, D.C.—The Land Disposal Program Flexibility Act was signed into law by President Clinton in March 1996, giving small municipal solid waste (MSW) landfills more flexibility. Landfills in remote or dry areas that receive less than 20 tons of waste per day may qualify for exemption from groundwater monitoring requirements. Flexibility would include alternative frequencies of daily cover and methane monitoring, infiltration layers for final cover and means for demonstrating financial assurance. Exemption would be decided at the state and local level in EPA-approved states.

Local Emergency Planning Committee

HOUSTON—Government-mandated local emergency planning committees (LEPC) are raising awareness in preparation for the mid-1999 deadline set by the U.S. Environmental Protection Agency to receive risk-management programs (RMP) from business with hazardous or toxic materials on hand. RMPs must contain information about each facility's main EPA-regulated materials and how it works to prevent and mitigate such releases. LEPCs will pass along this information to their respective publics.



NO_x Emission Reduction

WASHINGTON, D.C.—The EPA announced a final regulation under the Clean Air Act that will reduce nitrogen oxide (NO_x) emissions by nearly 900,000 tons per year from coal-fired electric utility boilers beginning in 2000. This represents a 15-percent reduction from current utility levels and a 5-percent nationwide reduction from all sources. The rule was issued under authority of the Acid Rain provisions of the 1990 CAA Amendments and sets NO_x emission limitations for most of the 1,090 coal-fired electric utility plants in the United States with generation capacity above 25 megawatts. For further technical information, contact Peter Tsigotis of the EPA's Acid Rain Division at (202) 233-9133.

Right-to-Know More Bill Introduced

WASHINGTON, D.C.—Congressmen Pallone (D-N.J.) and Markey (D-Mass.) introduced the Public Right-To-Know and Children's Environmental Health Protection Act (H.R. 4234) near the end of the 104th Congress and will reintroduce the bill early in the 105th Congress. The bill proposes several changes in current law:

- add chemical-use reporting to the toxics release inventory (TRI);
- require non-manufacturing industries to report toxics release and use;
- ensure reporting on substances like mercury and dioxin; and
- put warning labels on children's

food and products that contain carcinogens, reproductive toxins or neurotoxins.

Biosludge Treatment Research

COLUMBUS, Ohio—The Chemical Industry Environmental Technology Projects (CIETP) is researching two methods for reducing the expense of treating biosludge, a byproduct of the biological treatment of chemical process wastewater. One project, Uncouplers, examines the potential to reduce sludge production, provide higher rates of treatment and allow facilities to be inexpensively retrofitted to increase treatment capacity. The objectives of the project are to make sure the uncouplers have minimal environmental impact, while reducing sludge mass by 50 percent.

The second project, Extremophiles, attempts to use extremophilic bacteria—organisms that can function in extreme acids or bases or in very high or low temperatures—to develop a process that reduces sludge volume over a wide range of variables while preserving high biochemical oxygen demand removal.

Ozone Laundry System

PALO ALTO, Calif.—The Electric Power Research Institute (EPRI), and Tri-O-Clean Systems Inc of Fort Pierce, Fla., created a new laundry system using ozone for the health care industry. Ozone, a highly reactive form of oxygen, is introduced in wash water to clean more quickly and thoroughly



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with less energy, water and washing chemicals. The technology has also been installed in commercial laundries, penal institutions and hotels. Using ozone increases laundry production and reduces labor because wash cycles are shorter. Chemical costs can be reduced up to 60 percent and hot water costs reduced by 80 percent. Closed-loop recycling ozone systems reduces water use by 70 percent.

Commercial Use for Ash

PROVIDENCE, R.I.—Two new studies at Brown University consider commercial options for the almost 50 million tons of the dark powdery material—high-carbon coal ash—that ends up trapped by power-plant filters and precipitators nationwide each year. Activated carbon in powdered or granular form is used in a range of filters and other materials to trap pollutants. Because large amounts of high-carbon ash are produced by utilities each year, the researchers think the material could one day be sold commercially at a fraction of the cost of activated carbon now in use.

Money for Recycling Jobs

WASHINGTON, D.C.—The EPA's Jobs Through Recycling program awarded \$1.675 million in grants to 18 states and two tribes to support several recycling initiatives. For example, Michigan scrap auto collectors, dismantlers and reclaimers received a grant to dismantle, sort, deliver and recycle post-consumer auto parts more efficiently. In Tennessee, the Wood and Waste Resource Center received money to provide wood wastes as raw materials for new businesses. More information about the Jobs Through Recycling program is available from the EPA.

Pollution Prediction

AIKEN, S.C.—Scientists with the Savannah River Ecology Laboratory have developed a theory to predict the effects of pollution and contamination on the environment. The theory examines three things: how individuals use their resources; how they respond to outside interference over their lifespans; and how scientists can use collected data from large numbers of the same

species to predict animals' physiological responses to stress.

\$1 Trillion Environmental Market

NORTHBROOK, Ill.—*The World Environmental Market* report says that the world environmental market will grow from \$888 billion in 1996 to over \$1 trillion by the year 2000. In that year, purchases of environmental products will be \$107 billion, purchases of services will be \$18 billion and management of environmental activities will cost \$894 billion.

Air Quality

WASHINGTON, D.C.—The EPA has proposed dramatic strengthening of air pollution regulations in effort to reduce death and illness from air pollution. The proposed rules cover two kinds of air pollution, ozone (smog) and particulate matter (solid and/or liquid matter). Because the cost of compliance is an estimated \$10 billion annually, several organizations have teamed up to fight the proposals. The Association of Container Reconditioners and the National Association of Manufacturers will act through their House Lobbying Committee.

Barataria-Terrebonne Estuary Cleanup

WASHINGTON, D.C.—EPA Administrator Carol M. Browner signed the final plan for long-term cleanup of Louisiana's Barataria-Terrebonne Estuary. The 4-million acre estuary, located between the Mississippi and Atchafalya Rivers in south Louisiana, contains more coastal wetlands than any other estuary in the United States. However, it is disappearing quickly—a half-acre of coastal land turns to open water every 15 minutes. It contains levees, forests, swamps, marshes, islands, bays, bayous and other coastal habitats.

The program contains 51 individual action plans designed to address technical issues such as hydrological modification and pathogen and toxic substance contamination. Its focus on economic growth preservation incorporates a consensus of representatives from government, industry, business and environmental interest groups. **EP**

the grapevine

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

Arkansas, New Jersey, New York and Vermont are now included in American Safety Casualty Insurance Co.'s surety bond program.

Excel Partnership Inc. is one of five ISO 14000 auditor training course providers chosen to participate in the U.S. National Accreditation Program EMS pilot course accreditation program.

Eastern Analytical Inc. promoted Emily Burr to receiving laboratory supervisor and hired Amanda Stanek as office assistant.

EET Inc. was awarded a contract under the Department of Energy's Program Research and Development Announcement program.

Andre C. Fiedler accepted a position as technical sales representative at Colorado Silica Sand Inc.

Dr. Dennis B. Fenn was appointed the first chief biologist for the U.S. Geological Survey.

Ronald C. Myers was elected president of the Air Movement and Control Association International Inc.

MG Industries has a new global identity, **Messer Group**.

Roux Associates Inc. hired Jeanette Schlichenmeyer as staff geologist, Mark Smith as project scientist/hydrogeologist, Richard Steinberg as marketing manager/staff scientist and Lance Richards as senior engineer.

Arnold Borish joined **Roy E. Weston Inc.** as general counsel and corporate secretary.

Bel-Art Products is the exclusive representative for Products for Science and Industry.

Spectrum Quality Products Inc. received ISO 9002 certification for its New Brunswick, N.J. facility.

Stan Geyer was promoted to president and chief executive officer of **Fluoroware Inc.** and Jim Dauwalter was promoted to executive vice president and chief operating officer.

Philip Shucet was named general manager and president of **Michael Baker Corp.**

Lexicon Environmental Associates Inc. appointed Peter T. Ingrassia vice president of northeastern operations.

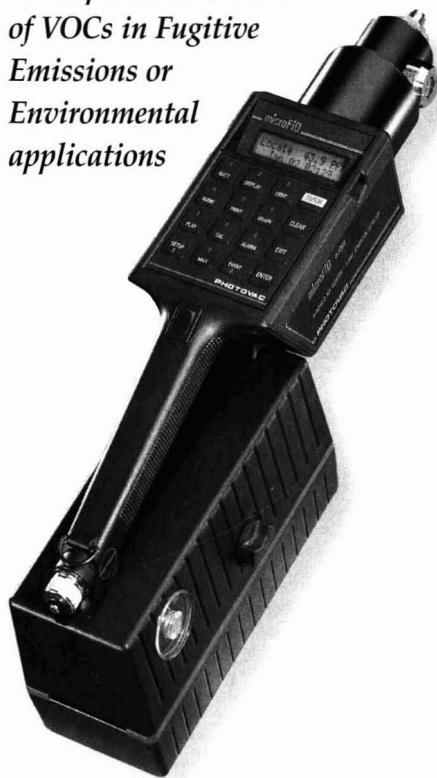
Gary Berman, Richard Fennema and Steven Tell have formed **Greyhawk North America**, a construction consulting firm.

Environamics Corp. appointed Stephen V. Ardia director. **EP**

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P2

Special Report

Are You Really Subject to MACT?

Three techniques are highlighted to minimize your regulatory burden and help you become a minor pollution source.

Section 112 of the 1990 Clean Air Act (CAA) mandates that the Environmental Protection Agency develop Maximum Achievable Control Technology (MACT) standards for major sources of hazardous air pollutants (HAPs). A major source, in most cases, is a facility that emits, or has the potential to emit (considering controls), 10 tons per year or more of any single HAP or 25 tons per year or more of a combination of HAPs. The EPA identified 188 substances as hazardous air pollutants and developed a list of 174 industrial categories that it considers major emitters of HAPs. An estimated 100,000 facilities will be subject to at least one MACT standard once the final rules for all industrial categories are promulgated.

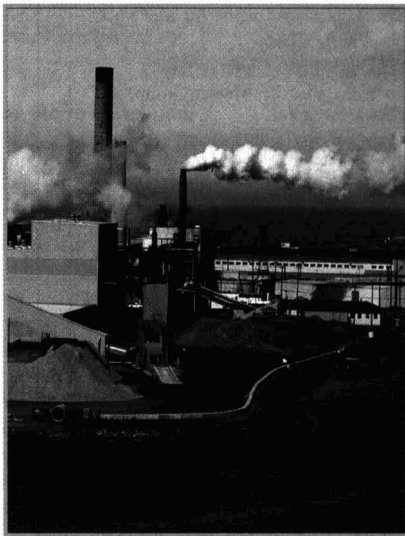
MACT standards represent a potentially large financial and regulatory burden for most subject industries. In most cases, the promulgated standard requires installation of some type of emission control equipment, increased monitoring, reporting and record-keeping, testing requirements and additional permitting ac-

tivity. However, there are ways to bypass these burdens and liabilities.

Am I MACT Material?

The answer to this question is itself a question. How "much" of a major source are you? Can you limit your emissions of HAPs to less than 10 tons per year for a single substance and 25 tons per year for a combination of substances? The magnitude of emissions may make this impossible for many facilities. Other facilities, however, may be able to reduce their emissions below the major source threshold quantities without installing MACT equipment. You must become a minor, or area source, before the first compliance date listed in the final MACT rule that applies to your specific industrial category. Once this date has passed, you fall prey to the "once in, always in" requirements of the MACT. There are three main ways to reduce emissions and become a minor source.

- **Pollution Prevention:** Pollution Prevention (P2) is a program where sources reduce or eliminate waste streams during the manufacturing



BY STEPHEN HAWKINS

Table 1: MACT Standard Proposal Schedule

2 Year MACTs (11/92)

Dry Cleaning
Hazardous Organic NESHAP (HON)

4 Year MACTs (11/94)

Acrylonitrile-Butadiene-Styrene Production
Aerospace Industries
Asbestos Processing
Butyl Rubber Production
Chromic Acid Anodizing
Coke Ovens
Commercial Sterilization
Decorative Chrome
Electroplating
Epichlorohydrin Elastomers Production
Epoxy Resins Productions
Ethylene-Propylene Rubber Production
Gasoline Distribution
Halogen Solvent Cleaners
Hard Chromium Electroplating
Hypalon Production
Industrial Process Cooling Towers
Magnetic Tape
Methyl Methacrylate-Acrylonitrile
Butadiene Styrene Production
Methyl Methacrylate-Butadiene-Styrene
Terpolymers
Neoprene Production
Nitrile Butadiene-Rubber Production
Non-Nylon Polyamides Production
Petroleum Refineries
Polyethylene Terephthalate Production
Polybutadiene Rubber Production
Polystyrene Production
Polysulfide Rubber Production
Printing/Publishing
Secondary Lead Smelting
Shipbuilding and Ship Repair
Solid Waste Treatment, Storage
and Disposal Facilities
Styrene-Acrylonitrile Production
Styrene-Butadiene Rubber
and Latex Production
Wood Furniture

7 Year MACTs (11/97)

4-Chloro-2-Methylphenoxyacetic Acid Production
2,4-D Salts & Esters Production
4,6-Dinitro-o-Cresol Production
Acetal Resins Production
Acrylic Fibers/Modacrylic Fibers Production
Amino Resins Production
Butadiene Dimers Production
Captal Production
Captan Production
Chloroneb Production
Chlorothalonil Production
Chlorine Production

Chromium Chemicals Manufacturing
Cyanuric Chloride Production
Dacthal (TM) Production
Ferrous Production
Flexible Polyurethane Foam Production
Hydrogen Cyanide Production
Mineral Wool Production
Non-Stainless Steel Manufacturing
Nylon 6 Production
Oil & Natural Gas Production
Petroleum Refineries Cat Cracking
Pharmaceuticals Production
Phenolic Resin Production
Polycarbonates Production
Polyether Polyols Production
Portland Cement Manufacturing
Primary Aluminum Production
Primary Copper Smelting
Primary Lead Smelting
Publicly Owned Treatment Works
Pulp and Paper Production
Reinforced Plastic Composites
Secondary Aluminum Production
Sodium Cyanide Production
Sodium Pentachlorophenate Production
Stainless Steel Manufacturing
Steel Pickling-HCl Process
Tordon™ Acid Production
Wood Treatment
Wool Fiberglass Manufacturing

10 Year MACTs (11/00)

Aerosol Can Filling
Alkyd Resin Production
Alumina Processing
Ammonium Sulfate Production
Antimony Oxides Manufacturing
Asphalt Concrete Manufacturing
Asphalt Processing
Asphalt/Coal Tar Applications
Auto & Light Truck Coating
Bakers Yeast Manufacturing
Benzyltrimethylammonium
Chloride Production
Boat Manufacturing
Butadiene-Furfural Copolymer
Carbonyl Sulfide Production
Carboxymethylcellulose Production
Cellophane Production
Cellulose Esters Production
Cellulose Food Casing Manufacturing
Chelating Agents Production
Chlorinated Paraffins Production
Chromium Refractories Production
Clay Products Manufacturing
Coke By-Products
Coke Ovens
Dodecanonic Acid Production
Dry Cleaning (Petroleum Solvent)

Engine Test Facilities
Ethylidene Norbornene Production
Explosives Production
Flat Wood Paneling
Fume Silica Production
Hazardous Waste Incineration
Hydrazine Production
Hydrochloric Acid Production
Hydrogen Fluoride Production
Industrial Boilers
Institutional Boilers
Iron/Steel Manufacturing
Iron Foundries
Large Appliance Coatings
Lead Acid Battery Manufacturing
Lime Manufacturing
Maleic Anhydride Copolymers
Manufacture of Paint, Coatings, Adhesives
Metal Can Coating
Metal Coil Coating
Metal Furniture
Methylcellulose Production
Miscellaneous Metal Parts Coating
Municipal Landfills
OBPA/1,3 Diisocyanate Production
Organic Liquids Distribution
Paint Stripper Users
Paper & Other Webs Coatings
Phosphate Fertilizer Production
Phosphoric Acid Manufacturing
Photographic Chemicals Manufacturing
Phthalate Plasticizer Production
Plastic Parts Coating
Plywood/Particle Board Manufacturing
Polyester Resin Production
Polymerized Vinylidene Chloride Production
Polymethyl Methacrylate Resin Production
Polyvinyl Acetate Emulsion Production
Polyvinyl Alcohol Production
Polyvinyl Butyral Production
Polyvinyl Chloride and Copolymers
Primary Magnesium Refining
Printing, Coating, Dyeing Fabrics
Process Heaters
Quarternary Ammonium Compounds
Rayon Production
Rocket Engine Testing
Rubber Chemicals Manufacturing
Semiconductor Manufacturing
Sewage Sludge Incineration
Site Remediation
Spandex Production
Stationary IC Engines
Stationary Turbines
Steel Foundries
Symmetrical Tetrachloropyridine
Taconite Ore Processing
Tire Production
Uranium Hexafluoride Production
Vegetable Oil Production

process rather than with pollution-control equipment. P2 is the most attractive way to reduce emissions because it often provides economic, production and regulatory benefits. Every source that is potentially subject to MACT can, in some way, reduce HAP emissions through implementation of a P2 program. The following are some potential P2 options that can reduce your overall HAP emissions.

- **Alternative Raw Materials:** Often materials containing HAP constituents can be replaced with materials that are

HAP-free or contain lesser quantities of the pollutant. For example, perchloroethylene, a hazardous degreasing solvent, can be replaced in many degreasing operations with a citrus-based alternative.

- **Recycling and Reuse:** In many instances hazardous materials can be recycled or reused in the manufacturing process. Consequently, HAP emissions are minimized over a given process cycle time. For example, in the printing industry toluene and xylene vapors from coatings and inks can be collected and routed through activated carbon systems

where the vapors are adsorbed, recovered and reused.

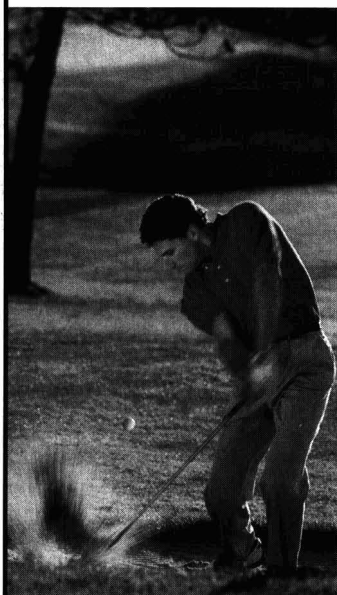
- **Waste Marketing:** How can you market waste? As the old cliché goes, "beauty is in the eye of the beholder." Waste to one person is a usable product for another. The field of waste minimization and pollution control is constantly changing and evolving. New and emerging innovative technologies are transforming waste into usable products.

Process Optimization

Process optimization, in many ways, is synonymous with P2. When most people think of process optimization they automatically picture ways of increasing production, profit or improving quality. All of these are integral components of total process optimization—however, process changes can also significantly reduce the amount of pollution emitted. For example, a plywood company had

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How can you market waste?

As the old cliché goes,

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problems with a process that spray-painted the company logo on individual plywood sheets. Because of the drying time needed for the paint, the company was having storage problems during heavy production periods. After reviewing the process, they decided the logo could be stamped or etched into the sheets to eliminate the spray painting process. Storage of the sheets could begin immediately without delay time. The result of eliminating the painting process not only solved the storage problem but also had significant pollution prevention impacts. Because the paint used in the logo contained 3 percent HAPs, the company eliminated approximately 7 tons per year of HAP emissions. This example illustrates that total process optimization often improves the overall manufacturing process, increases profits and improves product quality, while minimizing pollution.

Pollution Control Equipment

Installation of pollution-control equipment to avoid MACT seems like a paradox. However, it is a viable option. The use of "end of the stack" controls may not be as attractive as P2 or process optimization, but it keeps you under the MACT trigger thresholds. Installing control equipment prior to the first compliance deadline of the promulgated MACT standard offers several benefits.

- **Economic:** It may be more economical to install control equipment that achieves a lower level of control than required by MACT instead of complying with the MACT standard.

- **Regulatory:** State permitting requirements apply to sources adding on controls to avoid MACT. However, in general, these permitting requirements are less stringent than those required by the MACT standard. In addition, most sources subject to a MACT standard are

The use of "end of the stack" controls may not be as attractive as P2 or process optimization, but it keeps you under the MACT trigger thresholds.

required to obtain a Title V operating permit. By staying below the MACT thresholds, many sources will not be subject to the requirements of the Title V Operating Permit Program.

- **Emissions Flexibility:** By installing control equipment prior to becoming subject to a MACT standard, some industries may be able to obtain higher emission limitations, allowing greater flexibility manufacturing and production. For example, in the bulk gasoline terminal industry, vapor recovery units (VRU) are the typical means of control. New Source Performance Standards (NSPS) require bulk storage terminals to operate their VRU so no more than 35 milligrams of volatile organic compounds are emitted per liter of gasoline loaded. The MACT standard for bulk terminals also requires operation of a VRU, but the allowable limit is 20 milligrams of VOCs per liter of gasoline

loaded. For terminals that could operate as a minor source with a VRU installed and operated at the NSPS emission level, the benefit is an emission limitation 43 percent higher than would have been allowed by the same VRU operating under the MACT standard.

Conclusion

In today's changing environmental field, it is becoming increasingly important to "work smarter rather than harder." To receive long-term benefits, industry should not merely focus on compliance

with the applicable standards, but look at ways to reduce the overall liability and regulatory burden. For facilities emitting major quantities of HAPs, this means examining alternatives to reduce emissions prior to becoming regulated under a MACT standard. In the end, facilities will become more productive and profitable while avoiding regulatory requirements. **EP**

Steven C. Hawkins, EIT, is project manager with ECKENFELDER Inc. in Greenville, S.C.

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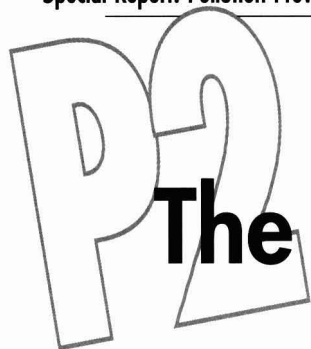
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* **hog happy adj. 1:** full of happiness; *esp.* : used in industry to describe New Pig customers who have a clean, safe work area
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Are you HOG HAPPY?



The Green Chemistry Challenge

The Green Chemistry Challenge was established by President Clinton to prevent industrial pollution using new chemical methods. The voluntary program offers awards, grants, presidential recognition and publicity for participants.

Green Chemistry Challenge Awards are given to companies, educational institutions and governmental organizations that create products, methods and technologies that meet certain criteria: beneficial to human health and the environment, have a general application, are innovative and have scientific merit.

Five winners were selected in 1996 for five different categories. The Alternative Synthetic Pathways Award went to Monsanto Co. for developing and implementing a less toxic, less volatile alternative to disodium ininodiacetate (DSIDA), called catalytic dehydrogenation of diethanolamine (DEA).

"DSIDA is used to manufacture glyphosate, the generic name of our herbicide [product] Round Up," said director of regulatory management for Monsanto, Ronald Condray.

"DSIDA is a long-term future trend to replace DEA. It has our own business application and a wider application. The chemistry is generic enough for other [industrial] uses." For example, the new technical breakthrough can be used in paint manufacturing.

The Dow Chemical Co. received the Alternative Solvents/Reaction Conditions Award for the development and commercial implementation a technology to reduce chlorofluorocarbon (CFC) blowing agents, the substances dissolved into plastic that allows it to foam. CFCs have been associated with ozone depletion, global warming and ground-level smog.

"It has been simpler to use conventional blowing agents in industrial processes. CO₂ is not easy to use," said Gary Welsh, development associate for Dow Chemical.

Dow's technology uses 100 percent carbon dioxide (CO₂) from existing commercial and natural sources to entirely replace CFCs. CO₂ is non-flammable, readily available and cost-effective.

Existing equipment can be retrofitted to accommodate the new CO₂ process.

Rohm and Haas Co., recipient of the Designing Safer Chemicals Award, designed Sea-Nine, an environmentally safe marine compound to remove fouling, the unwanted growth of plants and animals on ships' surfaces. The traditional organotin antifoulant, tributyltin oxide, is toxic and degrades very slowly with high bioaccumulation factors compared to Sea-Nine, which has a half life of less than one day, zero

bioaccumulation and no toxicity.

"The [Designing Safer Chemicals] award essentially substitutes a new product for an old product. There is a recognized need in industry for products that match the performance of the old products without the deleterious effects on the environment," said Gary Willingham of Rohm and Haas Corp.

The Small Business Award went to Donlar Corp. for production and use of thermal polyaspartic acid (TPA), a protein-based polymer that biodegrades and is beneficial to soil. TPA increases plants' intake of fertilizer and decreases fertilizer runoff that results in groundwater contamination.

The winning chemistry is marketable, profitable and environmentally beneficial. According to Larry Koskan, president of Donlar, the product is added to fertilizer and applied to the ground. The result is a higher number of germinating seeds, earlier maturation and higher yield.

"Our product is very affordable—for every dollar spent on it will offer \$3 in crop yield," said Koskan.

Texas A&M University was awarded the Academic Award for developing several technologies to convert waste biomass into animal feed, industrial chemicals and fuels. Mark T. Holtzapple, professor and leader of the team that developed the technologies, explained that the motivation to eliminate waste stemmed from the need to reduce waste, although this "family of technologies" offers multiple benefits.

"The United States spends about \$1 billion a week importing oil. Creating alcohol fuels out of waste [domestically] will improve the U.S. economy and provide clean-burning fuel."

Alcohol fuels comply with the Clean Air Act and add no new carbon dioxide to the environment.

Other benefits of these technologies include reduction of plowing-induced soil erosion, fertilizers, herbicides and pesticides on corn fields; reduction of biomasses being placed into landfills and conservation of non-renewable resources used to produce chemicals.

To participate in the Green Chemistry Challenge, contact the Toxic Substance Control Act Assistance Information Service at (202) 544-1404 or (202) 554-0551 (TDD). Information on the Green Chemistry Challenge program is also available from the EPA's Pollution Prevention Information Clearinghouse at (202) 260-1023 or the EPA's Industrial Chemistry Branch at (202) 260-2659. Additional information on the Green Chemistry Challenge program is available on the Internet at <http://www.epa.gov/docs/gcc>. **EP**

BY ASHLEY BLYTH

Fugitive Emissions Monitoring Trends

New Clean Air Act requirements are pushing facilities to reevaluate their monitoring programs.

The ongoing implementation of the 1990 Clean Air Act (CAA) has increased the overall awareness of fugitive emission monitoring programs. These emissions are volatile organic compound (VOC) leaks from process equipment such as connectors, flanges, pumps, compressors and valves. Within the structure of the CAA, the allowable leak rate and monitoring frequency is defined within each industry segment. As the National Emission Standards for Hazardous Air Pollutants (NESHAPs) are specified for each group of manufacturers, such as refining and synthetic organic chemicals, environmental specialists are starting to understand the full impact of the regulations.

Fugitive Emission Guidelines

Overall, these guidelines are:

- Increasing the number of points required to be monitored on a regular basis. One large refinery realized a three-fold increase in the number of points requiring monitoring from 100,000 to in excess of 300,000.
- Lowering the allowable leak rates. As an example, the previous standard of 10,000 parts per million (ppm) will be lowered in April 1997 to 500 ppm for some valves used in chemical processing.
- Providing a basis for tighter control by the national and regional regulatory groups. The U.S. Environmental Protection Agency regions and local air-quality authorities are purchasing state-of-the-art monitoring and recording instrumentation to ensure compliance in facilities. Examples of this new type of equipment include a gas detector, such as the toxic vapor analyzer (TVA) 1000 from the Foxboro Co., coupled with a LeakTracker 200 data collection and management system from Tracker Technologies.

- Assisting the management of the facilities in preventing pollution. Fugitive emissions can comprise up to one-third of the total VOC releases from a processing facility. Hence, efficient control and monitoring of these emissions can reduce the overall level of pollution.

These regulations are driving the chemical manufacturers, refiners and the independent contractors that provide fugitive emission monitoring services to reevaluate their system and equipment needs. The desired end results for all the organizations involved are data reliability, monitoring productivity, worker safety and long-term flexibility.

To meet these needs, a complete monitoring system comprised of tagging solutions, gas detection and data collection is provided by The Foxboro Co. through its partnership with Tracker Technologies.

Tagging Solutions

Each component involved in the fugitive emissions program is identified in one of three ways: route definitions, stamped tags and/or bar code tags. Generally, the productivity of the individuals monitoring for leaks increases as the equipment used switches from the route definition to the bar code tags. However, due to the perceived high maintenance cost of the bar code tag solution, many facilities and contractors use a combination of route definition and stamped tags. An estimated 10 percent of the current facilities are using bar tags as a core element of their program. Bar code tags require high-quality materials compatible to the process environment.

Gas Detection

Formerly, the Foxboro organic vapor analyzer (OVA) 108, which incorporates a flame ionization detector,

BY KENNETH H. BROWN

P2

Special Report

Special Report: Pollution Prevention

represented the primary type of gas-detection equipment used in fugitive emissions monitoring. This analyzer has been replaced by the TVA 1000.

Due to the overall growth in fugitive emissions monitoring, many other gas detection equipment manufacturers are targeting for this application. The detection technologies offered include catalytic bead, photoionization and the other versions of flame ionization analyzers. The best choice remains the flame ionization detectors, due to the fast response time that is usually a maximum of 3.5 seconds to 90 percent of the test values; a broad dynamic range up to 50,000 ppm; and repeatability, which is required to be at the most plus-or-minus 5 percent for each calibration gas.

Catalytic bead and photoionization offer some improvements in the ease of use. However, each of the detectors has at least one significant drawback. Catalytic bead-based detectors generally have a very slow response time—they can take more than 60 seconds to reach a stable and accurate reading. Photo-

ionization detectors offer the same fast response as the flame ionization systems. However, the maintenance of the lamp surface, concerns about moisture interference and quenching of the reading due to excessive readings of methane limit the technology's acceptance.

Data Collection

Prior to the availability of interconnected gas detection and data collection systems, most recording of the leak rates was done manually—a method prone to errors. Data was easily transcribed incorrectly, additional staff was required in the field to write the values and labor was needed to transfer the data to computer.

With the development of the Tracker Technologies Leak Tracker 200® system, these problems were eliminated. Because the data collection system is connected directly to the TVA 1000 or OVA 108 analyzers, no manual records are necessary. The connections are Factory Mutual-certified as intrinsically safe, and the integral bar code reader, menu-driven

screens, ergonomic vest and single-button transmission of the data to the PC-based software makes it an extremely efficient and safe system.

Complete System Approach

The trend in fugitive emissions monitoring is toward a complete system approach. The system must encompass compatible tagging solutions, gas detection and data collection elements. With these systems, the end user is able to efficiently record increased numbers of points over a wide dynamic range of leak rates and meet the expectations of national and local regulatory bodies. **EP**

Kenneth H. Brown is the sales director for the environmental monitoring operations of *The Foxboro Co. in East Bridgewater, Mass.*

For more information on Foxboro OVA 108 and TVA 1000 analyzers, circle 147 on card.

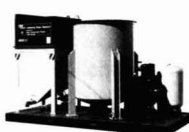
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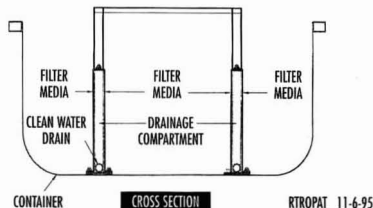
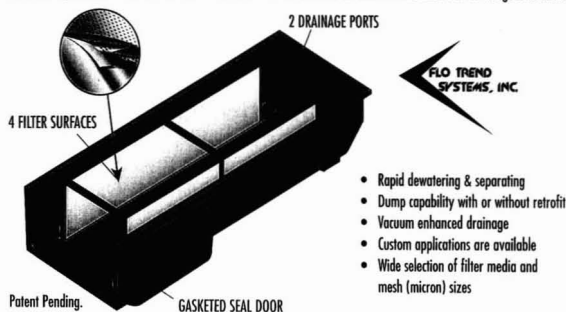
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Pulp and Paper Industry

The University of Maine is participating in a joint project with Argonne National Laboratory to apply artificial intelligence to improve the efficiency, productivity and quality of production processes in the pulp and paper industry. The work is also expected to help other industries, such as chemicals, glass making, steel, metal casting and petroleum. The project will focus on processes expected to produce the biggest benefits in energy consumption, waste reduction, productivity and product quality.

Alternative Fuel for Landfills

Blymyer Engineers Inc. designed a new liquefied natural gas (LNG) trailer unloading and vaporizing station in Irvine, Calif. The facility will provide fuel to supplement landfill gas. It is the first of two public LNG and compressed natural gas (CNG) vehicle fueling stations. The project demonstrates the long-term cost-effectiveness of using

CNG/LNG to fuel heavy-duty trucks and assess the potential for further market development of alternative fueling infrastructure along Interstate 5, the main route between southern and northern California.

Glass Micromodels

Flow and transport processes in soils, groundwater and petroleum reservoirs can now be more realistically studied through glass micromodels of pore networks and fractures. Berkeley Lab, a U.S. Department of Energy laboratory managed by the University of California, improved glass micromodels and fracture casts to be fabricated with a much wider and much finer range of pore sizes. Micromodel patterns and fracture casts can be custom-designed to suit particular experimental needs. Glass surfaces are more water-wettable than epoxy surfaces and can be altered for specific purposes.

Aluminum Research

Argonne National Laboratory will in-

vestigate the basic mechanisms that lead boric acid to form a thin film that bonds tightly to aluminum surfaces. Better understanding of the bond boric acid makes with aluminum surfaces could help aluminum casting mills reduce the friction between metal rollers and the aluminum plates they squeeze out. Boric acid can be washed off the finished metal with water and recycled. Its use could reduce or eliminate the need for harsher solvents to clean lubricants off the metal.

Corn Into Chemicals

Researchers from four U.S. Department of Energy laboratories have developed a new process to convert corn into a cost-effective source of commercial chemicals. The chemicals produced will be incorporated into polymers and solvents for use in clothing, fibers, paints, inks, food additives and other industrial and consumer products. Existing domestic markets for such chemicals total almost one billion pounds of materials per year at a value of more than \$1.3 billion. **EP**

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ENHANCING BIOREMEDIATION

New magnesium peroxygen compound accelerates natural attenuation.

By Stephen Koenigsberg, Ph.D.

Oxygen is often the limiting factor in aerobic bioremediation, the process by which microorganisms are used to degrade hazardous substances. Without adequate oxygen, contaminant degradation will either cease or proceed by highly inefficient anaerobic processes.

Researchers at Regenesi Bioremediation Products recently developed an innovative patented technology to combat this problem, Oxygen Release Compound (ORC[®]), a unique formulation of magnesium peroxide that releases oxygen slowly when hydrated. In one of its applications, ORC is ideal for supporting bioremediation in the oxygen-limited contaminated subsurface associated with underground storage tank (UST) releases. ORC has proven effective in the treatment of residual contamination in UST removal excavations and for dissolved phase hydrocarbon plumes emanating from the source.

ORC treatment represents a "low intensity" approach to remediation—providing a simple, passive, low-cost and long-term enhancement of natural attenuation. In many cases, the less acceptable alternatives such as air sparging and pump and treat, are more capital- and management-intensive while failing to deliver any significant advantages.

ORC technology fits well into strategies that seek to enhance natural attenuation in connection with Risk Based Corrective Action (RBCA) compliance standards. The proper application of the compound will reduce the dissolved phase mass and reduce risk at designated downgradient monitoring points. This

property has been demonstrated at several sites nationwide.

The combined ORC application strategy for site closure is illustrated in Figure 1; some or all of the methods being appropriate at a given site. ORC powder, packaged in exchangeable filter socks, is contacted with contaminated groundwater via an array of wells or

**ORC treatment
represents a "low
intensity" approach to
remediation—providing
a simple, passive,
low-cost and long-term
enhancement of natural
attenuation.**

trenches to form an "oxygen barrier" at the downgradient edge of a developing plume. In more static plumes, a broader array of treatment points applied directly in the source may be recommended. This array can be composed of socks and wells or, preferentially, by direct injections of an ORC slurry.

Slurry injection involves the mixing of the compound with water to form a free-flowing injectable paste. Using low-cost, small-bore push point methods exemplified by the Geoprobe system, the ORC slurry is either backfilled or pressure

grouted into the contaminated subsurface. Finally, at the location of the leaking UST itself, the compound is dispersed as a free powder for the treatment of soil at the excavation floor.

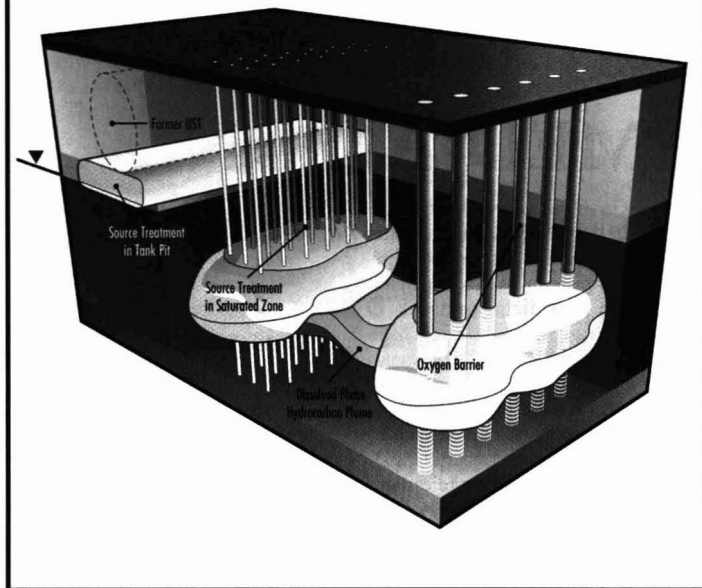
One variation on the theme of direct source treatment is "hot spot" control, which uses ORC socks in existing monitoring wells. Sometimes a site becomes overdrilled during the initial characterization phase ("chasing the plume"). The excess monitoring wells are often included in required monitoring programs, but they can be retired as remediation wells with sock or slurry applications.

ORC is insoluble and releases oxygen in a rate-controlled manner while being converted to a concretion of ordinary magnesium hydroxide, which is also insoluble. Applications of the compound last from four months to a year as a function of contaminant loading. Filter socks are removed from wells or trenches as required (usually when dissolved oxygen levels return to background levels). The slurry injections are permanent. After the placement of the compound, the hole can be finished with bentonite and cement according to the standard methods following a Geoprobe sampling event. Soil mixing applications involve dispersions of as little as .10 percent up to 1 percent ORC by weight of soil—the particles then simply harden and behave like sand grains in the subsurface.

Oxygen Barriers

Historically, Regenesi applied ORC to the remediation of above ground soil

Figure 1



piles and then evolved into subsurface applications. Initially, ORC socks were tested in single wells for localized remediation. In a comprehensive study involving the installation of ORC filter socks in 41 wells on 16 diverse sites, benzene, toluene, ethylbenzene and xylene (BTEX) were reduced by 80 percent to 100 percent in 75 percent of the wells on or before the first quarterly monitoring event. The development of an array of wells to form a "oxygen barrier" followed as a natural extension of the localized treatment protocol.

The objective of an oxygen barrier is plume cut-off, while recognizing that any significant reduction of contaminant mass will pull the compliance point back toward the source and reduce risk. Several intensive field trials established the value of this application. The first oxygen barrier was installed in Belen, N.M., by GRAM Inc., in cooperation with the UST Division of the New Mexico Environmental Department. It consisted of 20 wells on 5-foot centers and in the first three months reduced the

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BTEX mass 80 percent immediately downgradient of the barrier and 50 percent across the target area. The resultant plume shrinkage allowed the downgradient sentinel well to register non-detect levels within the first year.

The most intensively studied oxygen barrier project was conducted by the University of Waterloo at a former gas station site in Strathroy, Ontario. The barrier was configured to achieve full cut-off of a plume moving 3 inches to 6 inches per day. Within the plume there were two distinct zones of BTEX contamination—a low concentration zone at 2 ppm to 4 ppm and a high concentration zone at 10 ppm to 94 ppm. At a point 12 feet downgradient from the barrier, 99.7 percent of the BTEX in the low concentration zone and 50 percent of the BTEX in the high concentration zone was removed.

Other less intensively monitored examples of the compound's use include

the reduction of BTEX by 89 percent at a point 16 feet downgradient of a barrier after five months, and the treatment of a tank farm area impacted by leaking pipelines where hydrocarbons were brought under control to the point that closure is scheduled in early 1997. The

ORC is insoluble and releases oxygen in a rate-controlled manner while being converted to a concretion of ordinary magnesium hydroxide, which is also insoluble.

client projected savings to be in excess of \$100,000.

Slurry Injection Treatment in Dexter, Mich.

Oxygen barriers are an effective remediation tool—however, source treatments

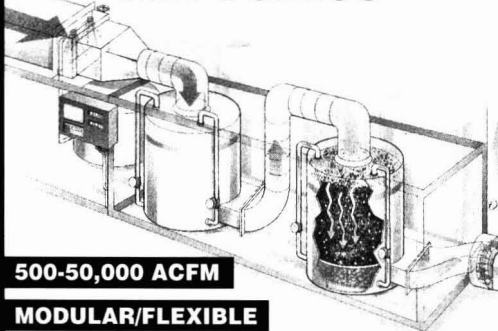
with slurry injections are rapidly gaining in popularity since they are less expensive and easier to implement. Although ORC is being used at more than 1,500 sites, the source treatment option has only recently been implemented.

One leaking UST-impacted convenience store site in Dexter, Mich., demolished for reconstruction presented the first opportunity to make a series of direct placements of ORC. This method was chosen because of the relatively static nature of the contaminant plume and the fact that the site was scheduled for repaving immediately following remediation efforts. The objective was to make a one-time passive application of oxygen by using ORC to achieve some level of mass reduction.

The compound was applied by drilling 47 holes with a 5 1/4-inch hollow-stem auger. The 4 1/4-inch cores were filled with 3,050 pounds of ORC at a cost of about \$27,000. The area of the plume was

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approximately 120 feet by 68 feet with a 10-foot thick contaminated saturated zone containing about 40 pounds of BTEX. Results were monitored at various times over 315 days at which point there was a 39 percent reduction in total BTEX and a 65 percent reduction in benzene, the most actionable component. Xylene, which tends to be recalcitrant, accounted for more than half the BTEX mass and only began to degrade significantly between the last two sampling dates (194 and 315 days). Without xylene, a 55-percent reduction for B, T


and E was noted. These rates of remediation were significantly faster than expected by natural attenuation.

Source Treatment in Great Bend, Kan.

On behalf of the Kansas Department of Health and Environment (KDHE), Terranext was charged with the remediation of a site in which UST releases from two adjacent corner gas stations had formed a commingled dissolved phase hydrocarbon plume over an area 500 feet by 350 feet. Although initial investi-

gations and testing revealed an air sparging and soil vapor extraction system could be installed, there were several drawbacks. In addition to a capital cost of \$300,000, the small size of the service stations limited the placement of equipment. There were also aesthetic and nuisance considerations in the residential area. In light of these difficulties, ORC was chosen to enhance aerobic remediation in the anoxic core of the dissolved phase plume.

The ORC was placed by Geoprobe injection techniques into the saturated zone that consisted of approximately 8 feet of medium-to-coarse grained sand. Based on calculations of BTEX mass in the core of the plume, 2,325 pounds of ORC were injected at 118 points throughout the site. After three months an 81-percent reduction of BTEX was achieved. The cost of ORC for this project was \$23,600. In combination with about \$24,000 of implementation costs, a substantial savings relative to air sparging capital and operating expenses was realized.

New uses for ORC are in development. The provision of supplementary oxygen by ORC can impact a wide range of aerobically degradable compounds such as gasoline and diesel range organics, a variety of polycyclic aromatic hydrocarbons, vinyl chloride, pentachlorophenols and methyl tertiary butyl ether. 

Stephen S. Koenigsberg, Ph.D., is vice president for research and development at Regensis Bioremediation Products and an adjunct professor at National University in Irvine, Calif. He is the co-inventor of ORC®.

For more information on ORC®, circle 145 on card.

This article can also be seen on *Environmental Protection's* home page at <http://www.eponline.com>.

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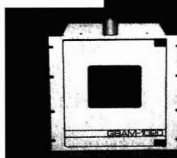
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STAYING STRONG IN THE WORST OF TIMES

*Addressing crisis situations before they happen
helps maintain business strength even
in the aftermath of a disaster.*

By Michael Kutner

Companies prepare for emergencies in a variety of ways, such as training emergency response teams and installing fire suppression systems. But environmental accidents pose difficult challenges for three reasons: they attract media attention, which can thrust unsuspecting companies into the spotlight; subsequent investigations and potential fines by government authorities put managers on the defensive; and accidents heighten fear among employees and the public over exposure to toxic substances.

While companies' crisis management plans may be comprehensive, they rarely address training managers and employees to deal with the stressful aftermath of industrial accidents.

Studies confirm that 90 percent of individuals involved in a critical incident will have a post-traumatic stress reaction. For most people, the symptoms will resolve themselves in a short time—but not always.

Critical incidents shine a bright light on other problems that were either hid-

Staying Strong in the Worst of Times

den or management had been avoiding. Like a pressure cooker, these problems simmer below the surface. Then an accident, such as a blinding eye injury or severe burn, occurs and other problems surface. Before they know it, company managers are dealing with low productivity, absenteeism, low morale and potential legal problems. Safety managers can enhance their ability to manage a crisis and its aftermath by learning about a rarely seen side of critical inci-

dents that have broad implications for the company.

Assessing Potential Trouble

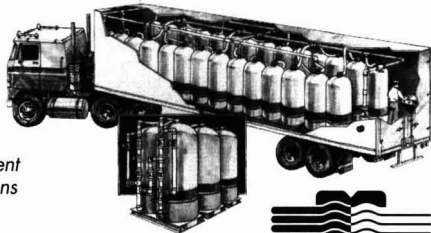
Nobody likes to think about bad things that could happen. But anticipating potential accidents and instituting preventative measures is a part of a safety manager's job—and it pays from a business perspective. Whether a company is a multi-billion dollar organization or a local start-up, analyzing potential crises is beneficial.

It is also a tangible sign to employees that management is addressing safety issues, a common concern in industrial settings. It is not new that management's attitude toward worker safety affects morale. In an accident's aftermath, the recovery process requires teamwork. Low morale among workers who feel the company doesn't adequately protect them will make catching up for lost time difficult.

In one instance, a worker at an oil tank storage farm was killed in an explosion while welding a seam on a tank he thought had been properly drained and cleaned. For months before the event, workers had complained of poor coordination among the maintenance and safety departments responsible for ensuring the procedure was safe. Following the incident, employees' anger and resentment toward the company became an issue that directly affected employees' work ethic and willingness to work.

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Setting Response Strategies

It is impossible to anticipate every crisis, but that is not what crisis management is about—it's about understanding the "tools" a company has in its "toolbox."

The fact is, many aspects of crisis management can be anticipated, such as dealing with the media, addressing productivity concerns, working with insurance professionals and handling security issues.

Though large companies should have comprehensive crisis management plans, all companies face potential crises. In fact, small and mid-sized companies face the greatest harm from a serious incident because they may lack the financial and managerial resources needed to fully address the post-crisis environment. Planning for the worst is the best thing management can do for the company it represents.

Assessing the Post-Critical Incident Environment

If a labor union is involved, a critical incident can be an opportunity for management and labor to work together in a positive way. General Motors and the United Auto Workers, for example, have coordinated a joint labor/management critical incident response plan and team. The team helps GM employees through the emotional aftermath of fires, violence, toxic incidents, machinery-related accidents and other emergencies.

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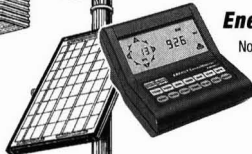
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GM has not released cost estimates, but company officials believe critical incidents significantly hurt productivity and workers' compensation, and that having a critical incident response plan and team in place helps them get back on track. From 1991 through 1995, the GM/UAW team was deployed 30 times to work with more than 1,200 employees.

Addressing Employee Issues After a Crisis

Good crisis management programs outline how management should address the needs of staff following a critical incident. Actions should occur in the immediate hours following the crisis and continue from two weeks to several months afterwards, depending on the intensity of the incident. Dealing with a crisis on an employee level requires managers to exhibit a level of leadership they may not have experience applying. It requires strength, compassion and acknowledgement that the crisis touched everyone.

Though many managers don't feel comfortable with this "touchy-feely" aspect of management, avoiding and discouraging workers from talking about the event and ignoring workplace trauma can lead to long-term productivity problems, high accident rates, repetitive injuries and higher turnover following a crisis.

One significant goal of any crisis management program is to empower employees to regain control over an environment that has been taken over by a traumatic event. Employees look to management for an indication that actions are being taken to resolve the situation. Addressing the issues of greatest concern is the best way to reinforce your employees' safety and help speed their return to "normal."

The costly employee injuries caused by a crisis may not be all physical. Those who witness the event or try to rescue injured employees may suffer emotional injuries, which are covered by workers' compensation. If not addressed, these injuries could take a financial toll on a company. In fact, stress-related disabilities cost twice as much as physical injury claims. By the year 2000, more than \$140 billion will be paid to injured workers—many of whom suffer from emotional trauma. Some claims could be avoided if management takes a well-planned approach to meeting employee needs after a crisis.

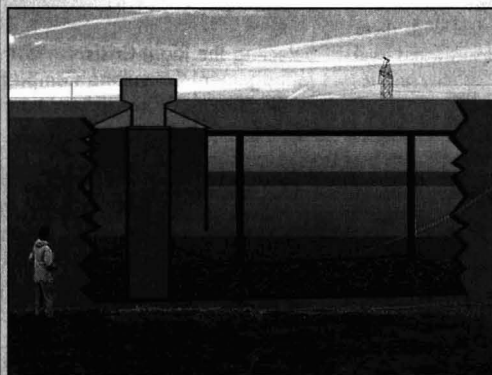
The Need For Outside Crisis Support

Management has a responsibility to its employees to respond quickly to their needs following a crisis.

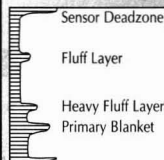
Unfortunately, no amount of corporate training can prepare managers to handle the impact of a crisis single-handedly. Following a traumatic event, the services of a crisis management consultant will likely be necessary to devel-

op a critical incident response plan (CIRP), an action plan that ultimately becomes a company's lifeline as it evaluates the aftermath of a traumatic event. The plan not only enables companies to diffuse stress, but identifies and addresses the effects the event could have on personnel and specific employee relations, helping to decide which procedures should be followed. The plan also covers the coordination of a critical inci-

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dent team of safety personnel, psychologists, human resource managers, crisis consultants and others—all of whom will work together to minimize the disruption and impact of the crisis.

Many times crisis situations present an opportunity for fraudulent claims from employees seeking to profit from a corporation's misfortune. CIRPs pinpoint exaggerated or false claims and ensure that the needs of seriously injured employees are being met.

In addition, a skilled crisis consultant will work with management to help those impacted by the event. Conflicts and disputes are a normal part of work, but tempers easily flare and simple misunderstandings become violent episodes in the aftermath of accidents. Teaching a manager how to recognize signs of distressed employees and deal with them positively helps the company avoid legal problems, a long-term disability and retraining and retraining issues.

Some crisis management consulting companies bring to their clients another valuable resource—a staff of clinical psychologists who have training in disaster psychology. If the crisis causes a disrupt-

consultants may be based in your area, it is best to look for a company whose services are restricted to crisis management support. Companies that diversify into too many aspects of training rarely possess the catastrophic management experience needed during a crisis. Since crisis management consulting is a specialty, don't be surprised if your search for a consultant extends into another geographic area. Crisis consultants are prepared to travel to you.

It is also helpful to find out exactly how the consulting company would respond in the event of an emergency. You should establish what you expect from the consultant you select early on in the process. **EP**


Michael Kutner is the president of Corporate Response Management, Bensalem, Pa.

For information on Corporate Response Management, circle 144 on card.

Nobody likes to think about bad things that could happen. But anticipating potential accidents and instituting preventative measures is one part of a safety manager's job—it pays from a business perspective, too.

tion that is too great to be handled effectively by management, crisis intervention and stress debriefings can be offered to personnel.

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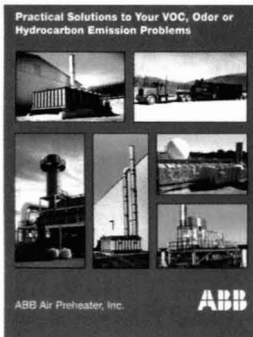
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Check out some of EP's favorite catalogs, brochures, books and reports available this month.

"PRACTICAL SOLUTIONS TO Your VOC, Odor or



Hydrocarbon Emission Problems," a brochure from ABB Air Preheater Inc., features oxidizers that offer practical answers for installation costs, efficiency, operation economy,

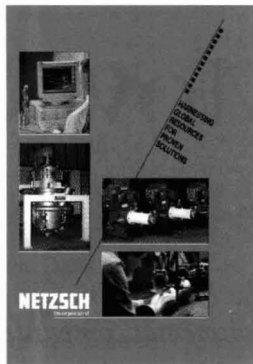
maintenance, space requirements and expandibility. **ABB Air Preheater Inc.**
Circle 150 on card.

HEWLETT-PACKARD CO. published a primer that



describes the basic principles and applications of UV-visible spectroscopy, with a particular focus on the advantages of diode-array technology. **Hewlett-Packard Co.**
Circle 151 on card.

THE FULL RANGE OF specialized industrial equipment manufactured by **Netzsch Inc.** is featured in a



new 12-page full-color brochure. Included are progressing-cavity pumps, wet- and dry-grinding and dispersion equipment, filter press systems and thermo-analytical instrumentation. **Netzsch Inc.**
Circle 152 on card.

WATERS CORP. announces the new **Symmetry® Columns**



Brochure, which describes four different product offerings.

These offerings include chromatograms for each product, illustrating their impact on sensitivity, accurate quantitation, speed and methods transfer for complex pharmaceutical and biological samples. **Waters Corp.**
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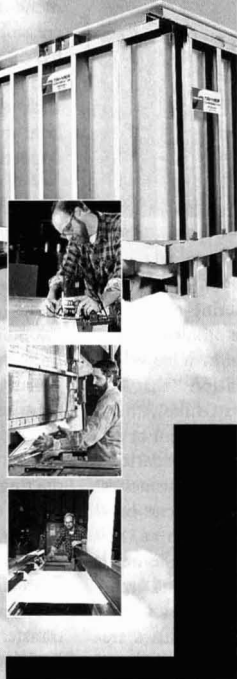
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MOVING INTO ASIAN MARKETS

*The Pacific Rim offers great opportunities for
U.S. environmental companies willing to do their homework.*

By Dayton Carpenter, JD



Photo courtesy of Dayton Carpenter

A land reclamation project at Victoria Harbor in Hong Kong.

Asian countries across the Pacific Ocean share a similar background regarding environmental issues. Within the past five to 10 years there has been a substantial increase in environmental concerns, helping to promulgate environmental rules and regulations for industries and municipalities. Asian industrial countries have quickly learned that economic development issues cannot be separated from environmental issues. Economic pressures to produce more food and increase the gross national product eventually lead to the overuse of natural resources. Once these resources

have reached their buffering capacities they become major toxic problems.

Asia's rapid industrial growth has led to environmental degradation that is among the world's worst. Like Americans, most Asians want to prevent or remediate environmental degradation, while Asian governments and businesses are concerned about green policies hindering economic growth. Even so, regional leaders are recognizing the need for environmental regulations and technologies in order to achieve sustainable development. Most Asian countries are seeking environmental services, products and technologies from outside countries.

Asian Environmental Economics

Numerous opportunities exist in the Asian market for U.S. companies to promote environmental services and technologies. Not only are the needs large, but continually growing. The market for environmental technologies in Asia is estimated at \$80 billion and is expected to reach \$120 billion by the year 2000. Economic growth in the last 10 to 15 years has averaged about 8 percent, higher than any other area of the world. The overall environmental pollution abatement market in Asia is expected to increase by 12 percent to 14 percent. Asia has 50 percent of the world's population and 15 of the world's 30 largest cities with populations greater than 10 million, making Asia an enormous market opportunity.

Basic Marketing Strategies

Even though Asia presents a large market opportunity, few U.S. firms do business in Asia. While the United States is a leader in environmental technologies development and offers a more diversified product range than any other nation, it is still not aggressive in the export of these technologies. U.S. companies interested in exporting are often dissuaded by not knowing the methods of conducting business in Asia. For U.S. companies to be successful in Asian markets they need to perform expensive and time-consuming research, as well as form and foster Asian contacts.

Three basic considerations apply to transferring environmental technologies to Asian countries. The markets are diverse and numerous, so one must be pre-

pared to build control technology to the specifications applicable to the particular country. Secondly, Asian markets are not driven by harsh regulations like the United States. You must demonstrate a return on investment within three to five years. Thirdly, and most important, Asian markets are "relationship" markets that require much work before the actual deal happens.

U.S. companies must develop marketing plans and cannot rely on existing environmental regulations to make the sale. They must look at the countries' long-term goals and incorporate those goals into the marketing plan. In selling environmental services and technologies, the long- and short-term advantages of being environmentally responsible must be stressed.

Best Asian Prospects

The most promising markets for U.S. environmental technologies are in Asian countries with strict environmental regulations, enforcement and compliance laws, and available funds for environmental protection. Presently, Hong Kong, South Korea and Taiwan meet these criteria. These countries currently have governments that are committed to strong environmental programs and willing to spend more for environmental protection and improvement than other Asian countries. Such governmental policies aimed at achieving sustainable development and reversing existing environmental problems have created opportunities for U.S. environmental companies in numerous areas, such as solid waste management and disposal, hazardous waste management and treatment, wastewater treatment, air pollution abatement, energy development and water resource management. Although slower in developing, Malaysia and Thailand may soon be joining the environmental policy of the other countries and may be better markets since the Hong Kong and Taiwan markets are somewhat developed and more competitive.

Some U.S. businesses have tried to form partnerships with Asian countries but have found the risks too great. Conducting business in Asian markets should be viewed as a long-term commitment. The quick business deal is not an acceptable procedure in Asian countries. Return on investment is not quick but likely worth the wait. Before obtaining a contract for services, companies

should be prepared to invest one to two years in education on Asian markets and relationship building with potential clients. Asians prefer to buy from someone they know and trust.

Assisting Agencies

Several U.S. agencies and funds play a role in the transfer of environmental technologies to Asian countries. One agency is the United States Asian Environmental Partnership (USAEP), whose objectives are to foster solutions to Asian countries with environmental problems by utilizing American pollution-control technologies and services. USAEP provides information to Asian governments about the U.S. technologies and services and promotes relationships with Asian governments, agencies, public, private and non-governmental sectors with U.S. firms.

Before obtaining a contract for services, companies should be prepared to invest one to two years in education on Asian markets and relationship building with potential clients.

The USAEP works with 34 nations and territories in Asia and the Pacific Rim and has offices in most Asian countries. The lead agency for USAEP is the United States Agency for International Development (USAID), which funds \$25 million a year to USAEP in addition to the \$400 million in contributions from public, private, and non-governmental partners.

USAEP also provides matching grants to small and mid-size U.S. firms to demonstrate their environmental technologies in Asia. USAEP provides updates on market figures, projections on the best environmental opportunities within a specific Asian country and business leads. It also provides connections to trade financing and can increase the access to financial resources for large-scale environmental and energy projects.

The World Environment Center (WEC) works in developing countries through its three exchange programs: The Technology Assessment Program, the Factory Assessment Program and the Corporate Environmental Program. The WEC brings expert volunteers with technical skills and hands-on experience from various industries to work with their Asian counterparts. This helps make Asian countries aware of available environmental control technologies and shares experiences of the U.S. companies using the technology. Ultimately, this introduces Asian companies with specific environmental problems to the appropriate U.S. environmental technology companies that can produce an efficient and effective solution.

The Environmental Technology Network (ETNA) disseminates environmental opportunity notices electronically and free of charge from Asian-based Technology Cooperation offices. ETNA matches the notices with appropriate U.S. firms registered in the database. To register, companies must fill out the ETNA registration mailer. Opportunity notices are also sent out to 48 state development agencies, 14 trade associations and other organizations.

Financing Information/Assistance

The Access to Export Capital Program (AXCAP) was launched by the joint efforts of USAEP, the Bankers' Association for Foreign Trade, the U.S. Department of Trade and the U.S. Department of Commerce. The program was started to help U.S. companies wanting to export to Asian countries, but were unfamiliar with international trade finance, methods of payment and which banks offered export finance services. AXCAP matches banks that conduct international trade financing with the specific needs of the company. It also provides information on other export financing methods, such as documentary letters of credit, letters of credit confirmations, back-to-back letters of credit, standby letters of credit and acceptance financing.

The Infrastructure Finance Advisory Service (IFAS) provides information to U.S. firms interested in pursuing environmental and energy infrastructure projects in Asia. The IFAS is a cooperative effort of the U.S. Agency for International Development, the U.S. Export-Import Bank, the Overseas Private Investment Corp., the Trade and Development

Moving into Asian Markets

Agency and the Small Business Administration.

IFAS focuses on three areas of service: disseminating information on energy and environmental markets/projects; identifying U.S. technologies that give a competitive edge when bidding on Asian projects; and locating U.S. government and commercial financing sources.

IFAS serves U.S. equipment manufacturers, contractors and project developers interested in bidding for public utilities and treatment stations of Build-to-Operate or Build-Operate-Transfer. It also serves those wanting to enter joint ventures with Asian governments or companies.

IFAS also gives country-specific data on environmental laws and regulations, government contacts and potential joint-venture or business partners.

The Environmental Enterprises Development Initiative (EEDI) promotes environmental improvement in Asia by creating opportunities for environmental enterprises through technology transfer and capital modelization. EEDI provides grant funds to help pay for pre-investment activities of U.S. firms seeking to conduct business in Asia. Funding helps cover the evaluation expenses of market-entry assessments, business plans, technology checks, investor reviews, prototype or pilot projects and other pre-investment analyses.

Maximum funding per project is \$100,000, with the U.S. sponsor contributing at least 50 percent (25 percent for small businesses). Fifty percent of the sponsor's contribution must be in cash, and if the project goes forward, the sponsor is required

to pay a Success Fee in an amount equal to the assistance provided. Under EEDI, U.S. environmental firm projects must have a majority private-sector ownership, a positive developmental impact on the host country, and not result in diversion of jobs from the United States.

The sponsors must be U.S. citizens or a majority-owned U.S. company, have the necessary business and technical background, intend to make a tangible equity investment in the project (no brokering) and be able to partially share the financial obligation of the initial study.

The Environmental/Energy Technology Fund provides grants to help promote the transfers of energy-efficient technologies from the United States to Asia. The overall goal is to reduce energy consumption while increasing the standard of living by employing U.S. technologies. Small- and medium-size businesses in the energy-efficient technology area are eligible for Technology Fund grants. Grants match from 20 percent to 50 percent of total project costs up to \$20,000.

Businesses must first discuss their proposal with the National Association of State Development Agencies (NASDA). Formal applications must be submitted through qualified U.S. non-profit organizations such as World Trade Centers, Chambers of Commerce and Trade Associates. The Technology Fund covers numerous expenses like shipment of equipment, airfare, copying, translations, meeting rooms, equipment rental and interpreter services.

Opportunities exist in Asian markets for U.S. companies that provide environmental technologies, products and services. Industrialization should continue to grow at an enormous rate in Asia. As in the United States, with industrialization comes the by-products of technology: hazardous wastes, solid wastes, toxic air emissions and waste discharges to water bodies. These by-products are treated by environmental control technologies in which the United States is the world leader.

Even with agencies to provide support and funding for environmental technology transfers to Asia, many U.S. firms are uneasy about doing business in a foreign system whose laws, customs, business relations and government structures are different from their own.

Some U.S. companies do not see the existence of federal assistance and funding to be helpful or an incentive to get into the Asian markets. Those that have tried using agencies such as USAEP might have tried when the agency was just beginning and should try again.

Firms taking time to know how federal agencies associated with environmental technology transfer operate will be the winners in the long haul. Companies entering Asia's environmental technology transfer market willing to do their research, establish business relationships and take risks will be successful. The China market is starting to develop in the infrastructure area, and not far behind will be the need for environmental abatement, prevention and cleanup technologies. Companies willing to take this adventure will be prepared and well-seasoned for the next round of environmental technology transfers to Third World countries. **EP**

Dayton J. Carpenter, JD, is an environmental/international attorney with the law firm of Hancock & Estabrook, LLP, in Syracuse, N.Y.

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Abanaki Corp.

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DC Ammeter

The HHM51-DC digital clamp-on dc connectionless

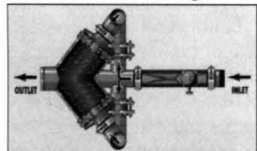


ammeter measures dc current up to 1200 Adc, dc voltage up to 200Vdc and resistance up to 2000 Ohms. It is ideal for checking equipment such as dc motors, starters, alternators, generators and voltage regulators. **OMEGA Engineering.**

Circle 161 on card.

Continuous Mixing

Polymer products and polymer muds are being more



broadly used. The continual increase in drilling fluid cost and the use of these more sophisticated mud systems has brought the JET SHEAR™ to the forefront as a product that stabilizes mud properties and eliminates over-treatment. **Flo Trend Systems.**

Circle 162 on card.

Remediation Pumps

AutoPump allows fluid extraction in wells with I.D.s as

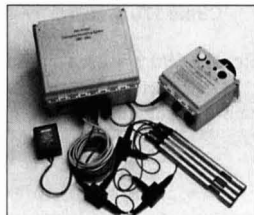


small as two inches. This family of 2-inch remediation pumps accommodates flow rates over 2.5 GPM and depths of 500 feet. They operate on oily, watery compressed air, and the air valves can pass 90-weight oil without fouling. **Clean Environment Equipment.**

Circle 163 on card.

Continuous Monitoring

The CMS-5000 Continuous Monitoring System is ideal for



real time, *in situ* detection of leaks in aboveground storage tanks. This system uses fiber optic chemical sensor (FOCS®) which continuously monitors the environment under ASTs and detects hydrocarbons. **Whesoe Varec Inc.**

Circle 164 on card.

HazMat CD-ROM



HazProfile Marketing System contains more than 150,000 detailed company profiles on one CD-ROM. It has more than 50 state and federal environmental databases. Also included is seamless link to ACT® and download capabilities to other popular sales- and marketing-support applications such as Lotus Notes™, Maximizer™, Sharkware™, Access™ and TeleMagic™. Generate personalized form letters, mailing labels, profiles for hazardous waste producers or reports on air releases in a certain area. With GIS packages, HazProfile creates maps showing locations of target companies. **Environmental Data Services.**

Circle 165 on card.

MSDS Software

MSDSFILE, the popular Windows™ software for man-

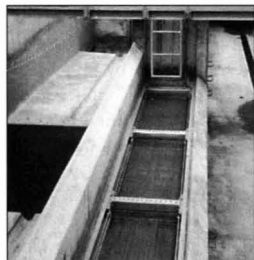


aging Material Safety Data Sheets (MSDS) has been updated. The new 3.1 version combines a quick and easy-to-use scanning interface. MSDSs are scanned and automatically added to the master database in one step. **HazMat Control Systems Inc.**

Circle 166 on card.

Stormwater Screen

The ROMAG Screen is a Swiss-designed, weir-mounted automatic stormwater screen for CSS and CSO applications. It handles flows up to 100 MGD. Fits stormwater channels or retention basins to prevent solids from becoming

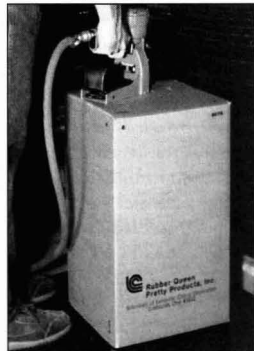


part of the outfall during major storms. **Hycor Corp.**

Circle 167 on card.

Safety Runner

Vina Grid Safety Runner has a super-grip surface for



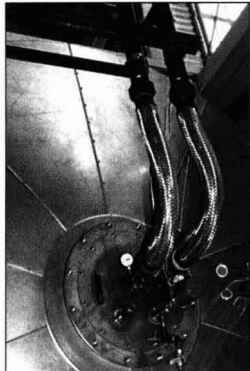
new products

safe footing with easy drainage and cleaning. Ideal for either wet or dry areas, it is 1/2-inch thick and rolls up for easy maintenance and cleaning. **Lancaster Colony Commercial Products.**

Circle 168 on card.

Low-NO_x Burner

The new Ultra Low NO_x burner destroys hazardous hy-



drocarbon emissions while reducing smog-forming nitric oxide and nitrogen dioxide during operation. Reduces NO_x formation by 90 percent in industrial applications. **Durr Environmental Inc.**

Circle 169 on card.

Centrifugal Pump

Series H heavy-duty centrifugal pump is made of solid



CPVC and is an economical alternative to ANSI-style process pumps. Available in two sizes with high flow rates and total chemical resistance. Ideal for waste treatment, chemical processing, transfer and filter pumping. **Serfilco Ltd.**

Circle 170 on card.

Tightness-Tested ASTs

Aboveground storage tanks Fireguard® and F921® meet

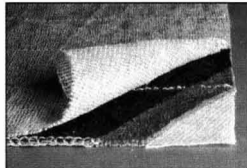


the new NFPA-30 revision that requires the enclosed secondary containment areas of ASTs to be tightness-tested on-site prior to installation. **Steel Tank Institute.**

Circle 171 on card.

Clay Liner

Claymax® 600SP is a new geosynthetic clay liner manu-

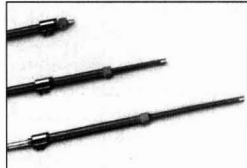


factured with a geomembrane laminated to the inside of one carrier geotextile for improved hydraulic performance. Ideal for landfill caps, ponds, surface impoundments and secondary containment projects. **CETCO.**

Circle 172 on card.

Telescoping Ball Screw

Telescoping multi-extended ball screws double their lengths



to save space and offer higher speeds. Solve difficult tight-space linear actuation problems with inch-size combinations and higher strength-to-weight ratios than standard ball screws. **Thomson Saginaw.**

Circle 173 on card.

Multi-Directional Scrubber

Bulletin MD is available from Duall that describes its line of multi-directional scrubbers. They reduce head space requirements and are manufac-

tured from Type II Grade I corrosion-resistant pvc. Standard sizes up to 5000 CFM with larger units available upon request. **Duall Division.**

Circle 174 on card.

Gas Detector

The Quadrants portable gas detector is the smallest, light-



est, least expensive four-gas instrument on the market today. Surface-mount electronics and flexibility in sensor combinations allows customization to meet specific requirements. **ENMET Corp.**

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Grinder

Model 1042 Tumble Grinder is ideal for private and mu-

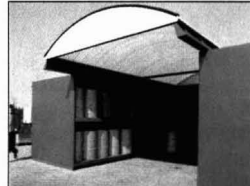


nicipal yard waste processing sites and land-clearing contractors. The pre-screening area reduces fines before getting to the hammer to reduce wear. **Portec Environmental Products.**

Circle 176 on card.

Storage Warehouses

Pre-engineered storage warehouses are for environmentally



safe storage of unlimited container capacities. The polycarbonate roof allows 75 percent to 80 percent natural light in while keeping rain, ice and

snow out. All units have secondary containment sumps. **P&D Solutions Corp.**

Circle 177 on card.

Flow Transmitter

SIGNET® Compak transmitter family offers a variety of



installation requirements where transmitters need to be mounted on a remote panel, secured to piping or installed with a universal mounting adapter. Additional models available for temperature, pressure and conductivity measurement. **George Fischer Inc.**

Circle 178 on card.

Groundwater Purging

Pump groundwater from monitoring wells by vacuum



with air assist using flexible tubing and purge from depths as much as 125 feet below ground surface. This new technique is quick and allows easy monitoring with minimal risk of cross contamination. **TRAK Environmental Group.**

Circle 179 on card.

Recycle Aerosol Cans

Eliminate the expense of aerosol can disposal and recycle the cans as scrap metal. The 3D MACHINE safely depressurizes and drains aerosol cans and the activated carbon filter

new products



absorbs vapors. It mounts on a 55-, 30- or 16-gallon drum. **PND Corp.**

Circle 180 on card.

Liquid Level Switches

The OL Series is a new line of liquid level switches for op-



eration in small tanks and containers. They are available in plastic float or metal float versions, and can be used in corrosive chemicals and solvents, food, water and lubricating and hydraulic oil. **Scientific Technology Inc.**

Circle 181 on card.

Filter Press

Automatic filter presses are available from 50 cubic feet to



500 cubic feet. Designs include a single motor and endless chain on a single track which drives and integrates both the plate shifter and cloth washer operations. Automatic pump controls provide the industry's driest filter cake. **Pacific Press Co.**

Circle 182 on card.

Gas Monitoring Transmitters

The explosion-proof TOX-ARRAY transmitters use chem-



ically selective toxic, LEL and O₂ sensors that do not react with air, are not sensitive to changes in temperature, humidity or pressure and stay awake when gas is absent. Recovery is less than 15 seconds. **Mil-Ram Technology Inc.**

Circle 183 on card.

Toxicity Test System

DeltaTox™ PS1 is a simple, rapid and portable test system



for monitoring diverse environmental samples such as water, wastewater, industrial discharges, soils and sediments. The system uses a specialized strain of freeze-dried luminescent bacteria as a biosensor to detect biological effects of contaminants. **Azur Environmental.**

Circle 184 on card.

Automated Testers

Setafash Series 7 instruments are fully automated and



feature small sample size, flash/no flash tests or ramp mode, wide temperature range, auto-

mated barometric corrections, fast cool down between tests and integral printer and computer interface. **Petroleum Systems Services Corp.**

Circle 185 on card.

Odor Containment

For wastewater treatment facilities with odor emission



problems, Vapor Guard™ structural-fabric covers provide the solution. The flat profile minimizes emission equipment costs and integrates directly with catwalks—eliminating confined space entry requirements. **ILC Dover Inc.**

Circle 186 on card.

Gas Flowmeter

The DigitalFlow™ Series is a new line of ultrasonic flowme-



ters. New additions are flowmeters for flare, natural and general-purpose gas. They are accurate, reliable and drift-free in a wide variety of conditions. **Panametrics.**

Circle 187 on card.

Flue Gas Analyzer

The new Testo 346 portable combustion efficiency analyzer is a low-cost alternative for furnace and boiler analysis equipment. It accurately measures O₂, CO, CO₂, temperature, efficiency and excess air.



It also allows on-site documentation of collected data. **Testo Inc.**

Circle 188 on card.

Groundwater Pump

Solinst Portable Grundfos Redi-Flo2 is mounted on a



convenient cart with pneumatic tires. Compact unit is easily transported over rough terrain and fits into pick-up truck or van. Tubing is mounted on sturdy reel; adjustable height tubing guide protects cables from well casing. **Solinst Canada Ltd.**

Circle 189 on card.

Oil Analyzer

The Infracal Oil/Grease analyzer screens petroleum hy-



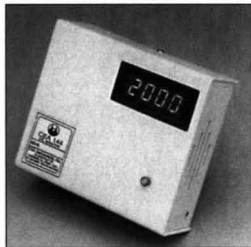
drocarbons in soil. It is microprocessor controlled and push-button operated. Ideal for field screening because it is small, rugged, lightweight and runs on AC power. **The Foxboro Co.**

Circle 190 on card.

new products

CO₂ Monitor

The CEA 144 is a low-cost, wall-mounted continuous in-



frared CO₂ gas monitor contained in a rugged steel enclosure with digital display. Adaptable for use in food-related industries, breweries, greenhouse horticulture, welding, office ventilation systems, cooling systems, hazardous environments and more. **CEA Instruments Inc.**

Circle 191 on card.

Emergency Response

The Emergency Response Program offers a line of vapor



and liquid phase-activated carbon adsorption systems and related services for response to spills or emergency releases. Units are available for purchase or for short- or long-term leasing. **Carbtrol Corp.**

Circle 192 on card.

Remote Monitoring

The Messenger 300 Series Remote Monitors are one-



tenth the size of other telemetry units and priced dramatically lower than their counterparts. Three products are available and track and report on conditions of equipment, processes and facilities at re-

mote, unattended or inaccessible locations. **Dancer Communications Inc.**

Circle 193 on card.

IDSR Technology

Intelligent Doppler Signal Recognition (IDSR) technol-



ogy expands the application range or EIT's Model 2450 portable flowmeter to include cleaner flow, pipes with surges and other fluid anomalies, diaphragm and piston pumps. **EIT.**

Circle 194 on card.

Gas Dilution

The Cal-MAT Series 2020 Computerized Dilution Cali-



bration System dilutes high-concentration Protocol-1 or certified gases to an infinitely variable range of concentrations from high percentages to low parts per million. It allows calibration of most analyzer ranges from a single cylinder of each gas type. **Matheson Gas Products.**

Circle 195 on card.

Ice-Free Valves

Freeze-protection valves automatically get rid of cold

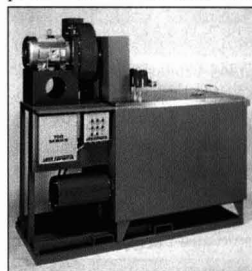


water as it approaches freezing, allowing a system in danger of freezing to drain entirely or replenish itself with warmer water from underground supply lines. Prevent ice that can clog lines, shut off flow and crack pipes, valves and fittings. **Therm-Omega-Tech Inc.**

Circle 196 on card.

Water Evaporator

Evaporation is the only disposal method available that

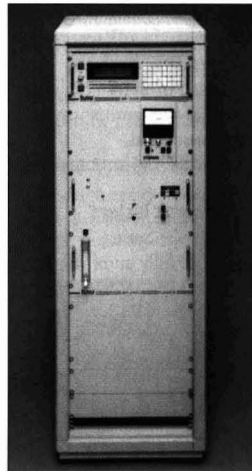


disposes of the water component of water-based wastestreams and separates oil for recycling. Designed for fully automatic, 24-hour unattended use with a wide range of evaporative rates and fuel sources. **Samsco Inc.**

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Multipoint Analyzer

The HNU Model MP-2000A Multipoint Analyzer



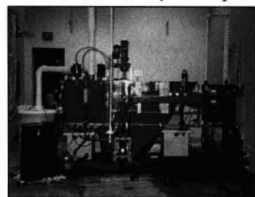
has the capability to expand a single monitor up to 24 sample points, reducing the cost

per point to just over \$1,000. By switching from one source to the next, it allows the analysis and data-logging of samples from numerous remote sources. **HNU Systems Inc.**

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Compact Treatment

Alert 2000 Compact Wastewater Treatment Systems pro-



cess metals for water purification and disposal or recover pure electroplating metals for direct reuse and resale. Engineered to compliment tight spaces, fully skid-mounted system processes up to 20 gallons per minute in 35 square feet. **Hoffland Environmental Inc.**

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strument that brings a new dimension to the monitoring and control of chlorination systems treating potable water, wastewater and cooling water. It is a powerful, field-proven tool that helps you comply with EPA monitoring requirements. **Wallace & Tiernan Inc.**

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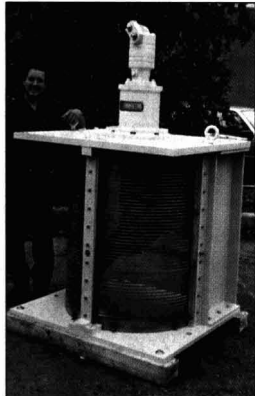
Anaerobic Treatment

The Biothane anaerobic wastewater treatment process includes a special interior design for separation of the gas, liquid and solid phases. Sludge particles settle and are retained within the digester while rapid

hydraulic develops granular sludge characteristic of the Biothane process. **Biothane Corp.**
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Screening and Shredding

The DIMMINUTOR™ screens and shreds oversized wastewater particles in open



channels without needing secondary devices for solids re-

moval or transfer. It provides convenient, dependable and cost-effective particle size reduction with high capacity and low-power consumption. **Franklin Miller Inc.**
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Surety Bond Program

American Safety Casualty Insurance Co. responds to the specialized needs of contractors and consultants for general construction and environmental remediation projects on a licensed and admitted basis in 40 states/jurisdictions. The program offers bond limits up to \$5 million. **American Safety Casualty Insurance Co.**
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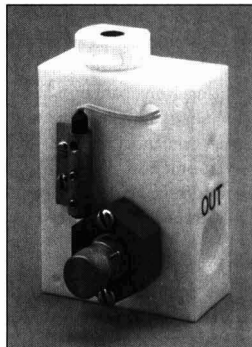
management systems and now has qualified experts in QS-9000 as well. Available services include gap analysis, pre-assessment audits and in-house training including registered Lead and Internal Auditor courses. **The Victoria Group Inc.**
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Flow Monitor

The 500-T-BP Teflon series flow monitor works in the



CVD systems, pollution control, metering pumps, compressors, oxygen, hydrogen and nitrogen lines. Its latest application is in gas sampling lines monitoring critical flow of highly corrosive stack gases to vacuum sampling pumps. **CTE CHEMTEC.**
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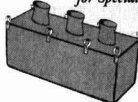
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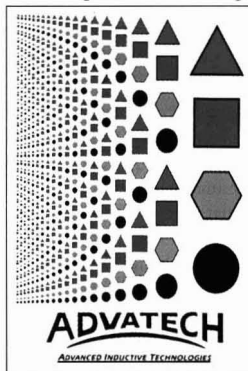
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that accumulates on micro-surfaces of suspended particulates. Eliminating naturally negative repulsive surface forces improves particulate aggregation during flocculation, filtration and sedimentation. **Advatech Corp.**
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Electric Gas Flowmeter

The Model 310 Gas Flowmeter features both an LED



bar graph display and an LCD digital readout. It measures gas flow rates from 10 ml per minute to 200 liters per minute over several ranges, and has accuracy of ± 3 percent full scale. **McMillan Co.**
Circle 211 on card.

Storage Buildings

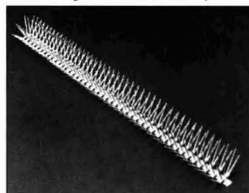
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of forklifts in the handling of drums meet OSHA requirements to reduce injuries by eliminating the need to lift heavy items by hand. Doors are double-wide for insertion of two pallets and to read drum labels from the outside. **Environmental Compliance Products.**
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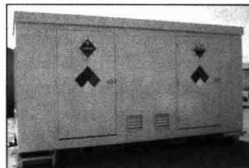
made from an unbreakable polycarbonate blend of plastic with UV inhibitors. It is sun proof, weather proof, affordable and effective. It prevents birds from landing without harming them. **Bird-B-Gone.**
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Wastewater Treatment

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Chemical Storage

The Model 3200 is designed for storing hazardous chemicals and materials in order to meet local, state and federal



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- Examples of Case Studies used in Regulations
- Class Exercise: How Do You Conduct a RA Anyway?

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- Regulatory Drivers/Industrial Redevelopment (Brownfields)/Negotiations of Clean Up goals
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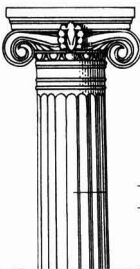
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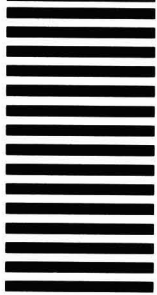
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February 1997

100	117	134	151	168	185	202	219	236	253	270	287	304	321	338	355	372	389
101	118	135	152	169	186	203	220	237	254	271	288	305	322	339	356	373	390
102	119	136	153	170	187	204	221	238	255	272	289	306	323	340	357	374	391
103	120	137	154	171	188	205	222	239	256	273	290	307	324	341	358	375	392
104	121	138	155	172	189	206	223	240	257	274	291	308	325	342	359	376	393
105	122	139	156	173	190	207	224	241	258	275	292	309	326	343	360	377	394
106	123	140	157	174	191	208	225	242	259	276	293	310	327	344	361	378	395
107	124	141	158	175	192	209	226	243	260	277	294	311	328	345	362	379	396
108	125	142	159	176	193	210	227	244	261	278	295	312	329	346	363	380	397
109	126	143	160	177	194	211	228	245	262	279	296	313	330	347	364	381	398
110	127	144	161	178	195	212	229	246	263	280	297	314	331	348	365	382	399
111	128	145	162	179	196	213	230	247	264	281	298	315	332	349	366	383	400
112	129	146	163	180	197	214	231	248	265	282	299	316	333	350	367	384	401
113	130	147	164	181	198	215	232	249	266	283	300	317	334	351	368	385	402
114	131	148	165	182	199	216	233	250	267	284	301	318	335	352	369	386	403
115	132	149	166	183	200	217	234	251	268	285	302	319	336	353	370	387	404
116	133	150	167	184	201	218	235	252	269	286	303	320	337	354	371	388	405

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Interested because of: 95 ■ New Construction 96 ■ Adding Capacity 97 ■ Plant Upgrade 98 ■ Maintenance 99 ■ 1 for 1 Replacement

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02/97

- Yes! Send/Continue to send *Environmental Protection* free of charge.
 No, I'm not interested at this time.

Signature (Required) _____ Date _____

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Zip+4 _____ Phone _____

Fax _____ E-Mail _____

- G. Which of the following Water Quality Instrumentation and Package Wastewater Treatment Systems products/services do you plan to purchase in the next 12 months? (Select all that apply)
- 800 pH meters
 - 801 Tests Kits
 - 802 Strip Chart Recorder
 - 803 Circular Chart Recorder
 - 804 Flow Controller/Monitor
 - 805 Level Controller/Monitor
 - 806 Groundwater Sampler
 - 807 Wastewater Sampler
 - 808 Dissolved Oxygen Analyzer
 - 809 Handheld Photometer
 - 810 Stream Velocity Meter
 - 811 VOCs Analyzer
 - 812 BOD Analyzer
 - 813 Mobile Laboratory
 - 814 Instrument Leasing
 - 815 Plating Waste

- A. 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 the 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 _____
- B. Type of Business (check only one):
- A Manufacturing, if manufacturing, please check the appropriate SIC (check only one):
- J (20) Food
 - J (21) Tobacco
 - J (22) Textile
 - J (23) Apparel
 - J (24) Lumber & Wood
 - J (25) Furniture
 - J (26) Paper
 - J (27) Print/Publish
 - J (28) Chemicals
 - J (29) Petrol & Coal
 - E Mining
 - C Agriculture
 - D Engineering & Contracting
 - J (30) Rubber/Plastic
 - J (31) Leather
 - J (32) Stone/Clay/Glass
 - J (33) Primary Metal
 - J (34) Fab. Metal
 - J (35) Mach. except Elect.
 - J (36) Elect. & Electron Mach.
 - J (37) Trans. Equip.
 - J (38) Instr. mass. analyzing/controlling and control
 - M Consulting
 - M Insurance
 - E Utilities, public, private & cooperative
- C. 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
- D. 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 _____
- F Govt. including municipal or district sanitary water or wastewater treatment sys. or plants
- Type of Govt:
- G City
 - H County
 - I State
 - J Federal
- K Transportation

N Labs

O Training

P Real Estate

Z Misc. Services

Environmental PROTECTION

- H. What is your reason for purchasing the selected products/services? (Select one)
- 830 New Construction
 - 831 Plant Upgrade
 - 832 Replacement/Maintenance
- I. What is your projected budget for the selected products/services? (Select one)
- 833 Over \$200,000
 - 834 \$100,001-\$200,000
 - 835 \$50,001-\$100,000
 - 836 \$10,001-\$50,000
 - 837 \$5,000-\$10,000
 - 838 Under \$5,000
- J. How immediate is your need for the selected products/services? (Select one)
- 839 0-3 months
 - 840 4-6 months
 - 841 7-9 months
 - 842 10-12 months
 - 843 over 12 months

FREE PRODUCT INFORMATION FOR ENVIRONMENTAL PROTECTION

February 1997

100	117	134	151	168	185	202	219	236	253	270	287	304	321	338	355	372	389
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116	133	150	167	184	201	218	235	252	269	286	303	320	337	354	371	388	405

Card Expires April 1997

Interested because of: 95 New Construction 96 Adding Capacity 97 Plant Upgrade 98 Maintenance 99 1 for 1 Replacement

FREE SUBSCRIPTION INFORMATION 02/97

Yes! Send/Continue to send *Environmental Protection* free of charge.

No, I'm not interested at this time.

Signature (Required) _____ Date _____

Name _____

Title _____

Company _____

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Zip+4 _____ Phone _____

Fax _____ E-Mail _____

FOR FASTER SERVICE
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A. 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 the 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 _____

B. Type of Business (check only one):
 check the appropriate SIC (check only one)

J (20) Food	J (30) Rubber/Plastic
J (21) Tobacco	J (31) Leather
J (22) Textile	J (32) Stone/Clay/Glass
J (23) Apparel	J (33) Primary Metal
J (24) Lumber & Wood	J (34) Iron Metal
J (25) Furniture	J (35) Mech. except Elect.
J (26) Paper	J (36) Elect. & Electron Mach.
J (27) Print/Publish	J (37) Trans. Equip.
J (28) Chemicals	J (38) Instr. Pres. Inscr. Controlling
J (29) Petrol. & Coal	J (39) Miscellaneous Mfg.
B <input type="checkbox"/> Mining	L <input type="checkbox"/> Consulting
C <input type="checkbox"/> Agriculture	M <input type="checkbox"/> Insurance
D <input type="checkbox"/> Engineering & Contracting	N <input type="checkbox"/> Utilities, public, private & cooperative

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

A <input type="checkbox"/> 1-19	D <input type="checkbox"/> 100-249	G <input type="checkbox"/> 1000-1499
B <input type="checkbox"/> 20-49	E <input type="checkbox"/> 250-499	H <input type="checkbox"/> 1500-2499
C <input type="checkbox"/> 50-99	F <input type="checkbox"/> 500-999	I <input type="checkbox"/> 2500 and up

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

A <input type="checkbox"/> Pollution Control Equipment
B <input type="checkbox"/> Instrumentation
C <input type="checkbox"/> Chemicals
D <input type="checkbox"/> Parts & equipment for maintenance operation and control
E <input type="checkbox"/> Services/Consulting
F <input type="checkbox"/> None of the above

E. What type of Pollution Control are you responsible for? (check all that apply)

A <input type="checkbox"/> Air	F <input type="checkbox"/> Toxic & hazardous material
B <input type="checkbox"/> Water	G <input type="checkbox"/> Energy control
C <input type="checkbox"/> Noise	H <input type="checkbox"/> Solid Waste energy conservation
D <input type="checkbox"/> Solid Waste	I <input type="checkbox"/> None of the above
E <input type="checkbox"/> Industrial hygiene	

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

A <input type="checkbox"/> Pollution Engineering
B <input type="checkbox"/> Environment Today
C <input type="checkbox"/> Environmental Solutions
D <input type="checkbox"/> Pollution Equipment News
E <input type="checkbox"/> The National Environmental Journal
F <input type="checkbox"/> Water Environment & Technology
G <input type="checkbox"/> None of the above

Environmental PROTECTION

G. Which of the following Water Quality Instrumentation and Package Wastewater Treatment Systems product(s)/services do you plan to purchase in the next 12 months?(Select all that apply)

800 <input type="checkbox"/> pH meters	808 <input type="checkbox"/> Dissolved Oxygen Analyzer
801 <input type="checkbox"/> Tests Kits	809 <input type="checkbox"/> Handheld Photometer
802 <input type="checkbox"/> Strip Chart Recorder	810 <input type="checkbox"/> Stream Velocity Meter
803 <input type="checkbox"/> Circular Chart Recorder	811 <input type="checkbox"/> VOCs Analyzer
804 <input type="checkbox"/> Flow Controller/Monitor	812 <input type="checkbox"/> BOD Analyzer
805 <input type="checkbox"/> Level Controller/Monitor	813 <input type="checkbox"/> Mobile Laboratory
806 <input type="checkbox"/> Groundwater Sampler	814 <input type="checkbox"/> Instrument Leasing
807 <input type="checkbox"/> Wastewater Sampler	815 <input type="checkbox"/> Plating Waste

rs162a

H. What is your reason for purchasing the selected product(s)/services? (Select one)

816 <input type="checkbox"/> Oil/Water Separator
817 <input type="checkbox"/> Reverse Osmosis System
818 <input type="checkbox"/> Ultrafiltration System
819 <input type="checkbox"/> Ozonator
820 <input type="checkbox"/> Chlorinator
821 <input type="checkbox"/> Stormwater Treatment System
822 <input type="checkbox"/> Stormwater Sampler
823 <input type="checkbox"/> Water Quality Monitor
824 <input type="checkbox"/> Aeration System
825 <input type="checkbox"/> Activated Carbon System
826 <input type="checkbox"/> Biotreatment System
827 <input type="checkbox"/> Cooling Tower
828 <input type="checkbox"/> Recorders
829 <input type="checkbox"/> Complete Package Wastewater Treatment System

I. What is your projected budget for the selected product(s)/services? (Select one)

830 <input type="checkbox"/> New Construction
831 <input type="checkbox"/> Plant Upgrade
832 <input type="checkbox"/> Replacement/Maintenance
833 <input type="checkbox"/> Over \$200,000
834 <input type="checkbox"/> \$100,001-\$200,000
835 <input type="checkbox"/> \$50,001-\$100,000
836 <input type="checkbox"/> \$10,001-\$50,000
837 <input type="checkbox"/> \$5,000-\$10,000
838 <input type="checkbox"/> Under \$5,000

J. How immediate is your need for the selected product(s)/services? (Select one)

839 <input type="checkbox"/> 0-3 months
840 <input type="checkbox"/> 4-6 months
841 <input type="checkbox"/> 7-9 months
842 <input type="checkbox"/> 10-12 months
843 <input type="checkbox"/> Over 12 months

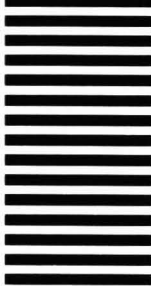
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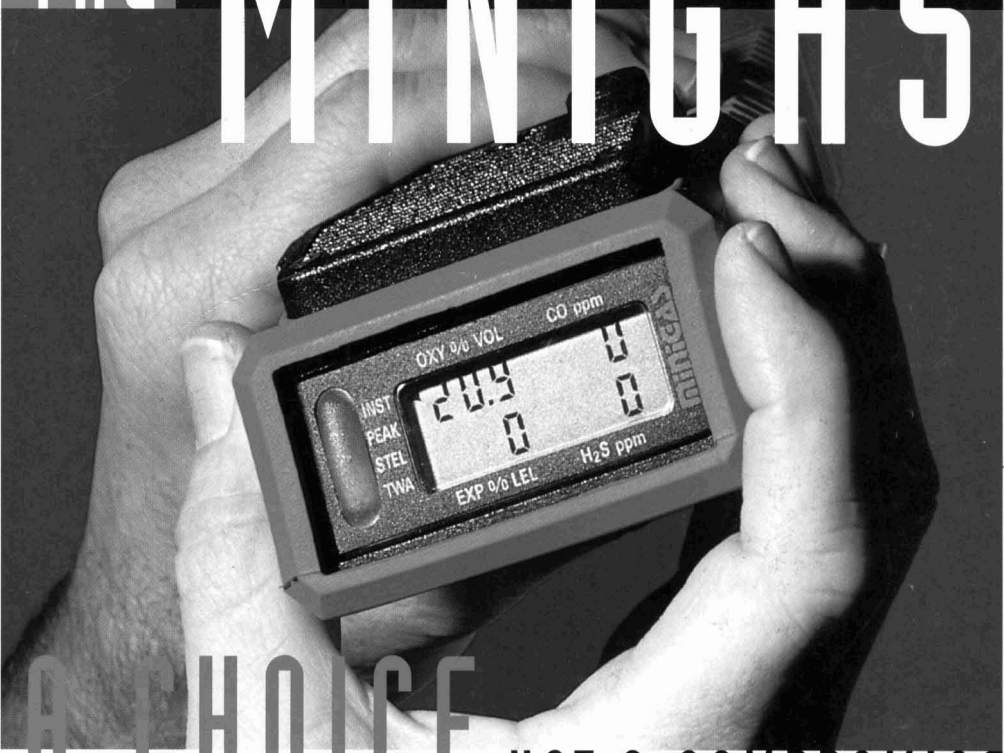
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