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Corporate Environmental Management and Public Policy

Bridging the Gap

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Environmental policies have brought dramatic improvements in air and water quality during the past 25 years, but further expansion of command-and-control regulations is likely to have diminishing marginal returns. Corporations are taking new initiatives in managing their environmental impacts in ways that reduce their costs, increase their efficiency, lower their liabilities, and enhance their competitiveness while reducing pollution, conserving resources, and eliminating waste. In the future, significant gains in environmental quality are more likely to come from widespread adoption of pollution prevention practices than from more stringent regulation of end-of-pipe emissions. Bridging the gap between public policy and the trends in private-sector management will require fundamental changes in federal and state governments' approaches to regulation. New policies must use economic incentives to encourage clean manufacturing and the adoption of pollution prevention technologies and forge public-private partnerships for improving environmental quality.

A sea change is occurring in the way American corporations deal with environmental management. Since the late 1980s, an increasing number of American manufacturing corporations and multinational enterprises operating in the United States have adopted proactive environmental management systems. These policies not only commit firms to comply with environmental regulations but go well beyond compliance to seek ways of preventing pollution at the source rather than simply cleaning it up at the end of the pipeline. Although some firms still see regulatory compliance as a burden and attempt to reduce its costs, most large corporations and many smaller ones now see environmental protection as a necessary and integral part of total quality management. Many corporations integrate proactive environmental management practices into their overall business strategies to reduce costs, to improve efficiency, to compete more effectively, and to develop new products and services (Berry & Rondinelli, 1998).

Stringent environmental regulations have clearly contributed to dramatic improvements in environmental quality in the United States. Air pollution

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emissions dropped significantly during the 1980s and 1990s. Between 1988 and 1997, carbon monoxide emissions, for example, decreased by 25%, volatile organic compounds (VOCs) by 20%, sulfur dioxide by 12%, and lead by 44% (United States Environmental Protection Agency [USEPA], 1998). These reductions in air pollution occurred during a period when the U.S. economy grew by 114%, vehicle miles traveled increased by 127%, and the national population expanded by 31%, in large part because corporations pursued innovative ways of reducing the adverse environmental impacts of their operations. For nearly two decades, the National Stream Quality Accounting Network (NASQAN) has recorded continuous reductions in fecal coliform, dissolved solids, nitrate, suspended sediment, and total phosphorous. The open burning of garbage, a widespread practice before 1970, has been virtually eliminated. Significant strides have been made in reducing the land disposal of untreated hazardous wastes and in cleaning up more than half of the 1,227 sites on the U.S. Environmental Protection Agency's (EPA) Superfund National Priorities List (Davis & Mazurck, 1997).

The EPA, however, is not set up to regulate industry's operations effectively or to provide adequate incentives to corporations for taking innovative actions that go beyond regulatory compliance. Public policies at the national, state, and local levels do not yet reflect the new trends in corporate environmental management. Because of the fragmented adoption and amendment of environmental legislation in Congress, the EPA has no comprehensive policy for improving environmental quality. The complex, costly, and inflexible command-and-control regulatory system that still dominates environmental policy in the United States neither encourages nor rewards corporate environmental management systems that exceed compliance requirements. Although regulation has played an important role in achieving a cleaner environment, more stringent legal controls are increasingly criticized as ineffective in achieving higher levels of environmental performance. Critics argue that the marginal returns in environmental quality to more extensive regulations are declining in the United States, and the costs of implementation and compliance are increasing (National Academy of Public Administration [NAPA], 1995). The gap is growing larger between the objectives, methods, and accomplishments of public environmental protection policies and the potential for proactive environmental management practices in the private sector to achieve improvements in environmental performance.

In this article, we review the limitations of depending too heavily on regulatory approaches to environmental policy in the public sector, the emerging trends in proactive corporate environmental management, the forces driving corporations to integrate environmental management into their overall business strategies, and means of bridging the gap between corporate environmental management practices and public policy.

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LIMITATIONS OF GOVERNMENT ENVIRONMENTAL POLICIES

Public environmental policy in the United States relies heavily on a command-and-control regulatory approach. The number of federal, state, and local environmental rules and regulations in the United States increased from about 2,000 in the 1970s to more than 100,000 at the end of the 1990s. While environmental regulations were becoming more complex, they became more costly for both the public and the private sectors to enforce. Environmental regulations are listed in more than 789 parts of the Code of Federal Regulations. Individuals, businesses, and governments spend more than $121 billion annually on pollution abatement and control. The total cost of complying with environmental laws since 1970 now exceeds $1 trillion.

As environmental regulations have become more numerous and expensive to implement, federal and state environmental regulatory agencies have come under increasing criticism. A report to Congress by NAPA (1995) summarizes objections by many businesses, state and local governments, and public interest groups to EPA's command-and-control approach to environmental management. The NAPA report pointed out that because Congress passed environmental legislation piecemeal, consolidated diverse environmental regulations under EPA's control, and added new environmental rules and regulations without reviewing the scope and impacts of previous laws, EPA lacks a coherent mission and a clear direction. More than 40 committees and subcommittees of Congress have some type of oversight responsibilities or jurisdiction over EPA. More than a dozen statutes govern EPA's mandate to control pollution and require the agency to organize into numerous offices with different environmental management philosophies, control strategies, and "legal cultures."

Problems also arise from the fact that regulations focus on specific media of pollution (air, land, and water) and categories of pollutants (toxic substances, hazardous wastes, pesticides), rather than on overall environmental quality. Often the regulation of one medium increases pollution in other media, or restrictions on one category of pollutants lead to increases in other forms of pollution. Critics contend that EPA often fails to use accepted scientific findings as the basis for its regulations; explain its decisions in terms of reductions in risk; or take into consideration the costs to states, localities, or the private sector of complying with regulations. NAPA (1995) emphasizes that congressional attempts to micromanage environmental protection hobbles EPA with "overly prescriptive statues that pull the agency in too many directions and permit managers to little discretion to make wise decisions" (p. 1).

Moreover, critics argue that because of detailed congressional mandates, EPA must spend its resources on developing and implementing complex bureaucratic procedures rather than focusing them on improving environmental quality. The agency passes its bureaucratic requirements and burdens onto states and

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private businesses, exercising detailed oversight that often inhibits state environmental agencies from innovating or becoming more creative in improving performance. EPA's information requests often become burdensome for state and local governments and the private sector, and much information remains unanalyzed and unused by the agency. Many regulatory programs are only stopgap solutions to problems that require radical changes in markets and economic structures. Nevertheless, because EPA has no overarching environmental objective, conveying to the private sector the long-term business benefits of adopting proactive environmental management systems is difficult. Even voluntary programs focus on environmental issues and not the business benefits of sound environmental practices. The mutual lack of trust between the private sector and regulatory agencies makes it difficult for EPA to work with businesses in the most effective ways.

The U.S. General Accounting Office (GAO) (1997a) points out that although the system of environmental regulation in the United States is the most advanced in the world, its prescriptive complexity "often results in conflict and gridlock" (p. 12). GAO argues that this regulatory structure "has impaired EPA's ability to experiment with innovative and more cost-effective ways of reducing pollution [such as preventing pollution by eliminating or reducing it at its source, instead of containing it at the end of the pipe] or using market-based incentives [such as pollution or trading emission rights]."

Attempts by EPA to work with the private sector through the Common Sense Initiative (CSI) and other voluntary programs have been slow to take hold and have produced only limited results. The CSI was the centerpiece of EPA's "regulatory reinvention" efforts that began in 1994 to finding "cleaner, cheaper and smarter" ways of preventing or reducing pollution. CSI was designed to find strategies for controlling pollution in individual industries rather than controlling individual pollutants. EPA established a council and specialized subcommittees of industry representatives and other stakeholders that focus on the automobile manufacturing, computer and electronics, iron and steel, metal finishing, petroleum refining, and printing industries.

GAO (1997a) notes that CSI has achieved some success in establishing a process for multiple stakeholders to discuss environmental solutions in selected industries (p. 5). However, after several years of operation, CSI only "produced three formal recommendations to EPA, none of which has suggested the types of changes in the existing approach to environmental management that EPA expected." GAO's evaluations found that CSI's limited results were due, among other things, to

> the length of time needed to collect and analyze data; the difficulties stakeholders have had in reaching a consensus on the approaches needed to address large, complex issues or policies; and variations in stakeholders' commitments of time and understanding of the technical aspects of environmental issues. (p. 5)

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EPA measured success in terms of inputs—numbers of meetings and participants, for example—rather than results. Although EPA has spent more than $10 million on the process, failure to measure the actual reductions in pollution in the partnership industries rendered judgments about the cost-effectiveness of CSI impossible.

Other voluntary programs initiated by EPA have fared little better. The weaknesses in EPA's partnership programs arise primarily from the agency's inability to refocus them from regulatory compliance to wealth-creating benefits (the primary objective of businesses) for participating firms. EPA's voluntary programs cannot provide relief from costly regulation or help firms to avoid highly prescriptive, inflexible, and sometimes conflicting environmental statutes. The command-and-control system of which these voluntary programs are a part is designed by lawyers and public administrators and supported by environmental interest groups. They generally have little knowledge of business processes and practices or of the motivations—cutting costs, increasing revenues, improving efficiency and quality, and expanding market share—that entice businesses to develop beyond-compliance management systems. EPA's Green Lights program, for example, a "partnership" with corporations; utilities; nonprofit organizations; and state, city, and local governments that promotes conversion to energy-efficient lighting, seeks to reduce electricity use. More than 2,000 organizations have joined the Green Lights program since 1991. Although participants have saved more than 750 million kilowatt-hours of electricity annually, the program has fallen far short of its long-term objectives. The slow response by businesses may be due, in part, to the fact that EPA measures the results in carbon dioxide emission reductions and acres of trees not felled instead of cost savings and competitive advantages for participating firms.

Similarly, EPA's Transportation Partners, a cooperative program with businesses, local governments, citizen groups, and associations, seeks to develop new transportation options and improvements in mobility, efficiency, and quality of the environment by reducing vehicle miles traveled. However, it tends to focus on quasi-regulatory issues and to overlook the potential cost reductions and new market opportunities for businesses. Project XL, the flagship program in the Clinton administration's Reinventing Environmental Regulation initiative, testifies by its very existence to the flaws in the command-and-control approach to environmental regulation. The program encourages industries to develop alternative pollution reduction strategies but uses regulatory compliance rather than inherent benefits to businesses of better environmental performance as the benchmark of progress.

Even the ostensibly more successful EPA partnerships often fail to focus on, or to document, the benefits of voluntary programs to businesses. The more than 500 organizations that participate in the Waste Wise program to reduce or eliminate waste through prevention and recycling have eliminated 344,000 tons of materials through waste prevention and an additional 4.2 million tons

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through recycling. Nevertheless, EPA has never adequately calculated the huge cost savings for businesses nor promoted the program on its cost-cutting and efficiency-promoting features. Other programs such as Climate Wise focus on short-term ways of reducing greenhouse gas emissions but ignore the more fundamental long-term issue facing industries and society—how to shift from a carbon-based economy. Underlying the failure of EPA's voluntary programs is the lack of understanding of what motivates businesses, the lack of flexibility in providing regulatory relief or incentives, mutual distrust between regulators and the business community, and the failure to promote programs on criteria that are important to the private sector.

PROACTIVE CORPORATE ENVIRONMENTAL MANAGEMENT

Although regulations are necessary for achieving a cleaner environment, new environmental management practices in business and industry that go well beyond regulatory compliance are now contributing more significantly to reducing environmental hazards. Since 1990, an increasing number of U.S. corporations and multinational firms operating in the United States have adopted proactive environmental policies and practices that can potentially achieve better performance at a lower cost than regulatory controls alone. In addition, progressive companies are more closely monitoring and auditing environmental performance and accounting for environmental costs and savings (Rondinelli & Berry, 1997). More firms are adopting life-cycle analysis to improve their products and manufacturing processes and many are applying their proactive environmental management practices throughout their supply chains. Firms are remanufacturing old products into new ones; redesigning their products to reduce adverse environmental impacts; finding new ways of recycling materials; conserving energy; and reducing their air and water emissions and their solid, liquid, and toxic wastes. Progressive companies are preventing pollution at the source through clean manufacturing and supporting community activities that conserve natural resources, clean up environmental damage, and prevent environmental degradation.

PROACTIVE ENVIRONMENTAL POLICIES AND MANAGEMENT SYSTEMS

Most large corporations in the United States have adopted environmental management systems (EMSs) that go well beyond legal requirements, and many are adopting international standards of environmental management that transcend and exceed national environmental regulations. The 3M Corporation (1997) adopted a proactive environmental policy in 1975. It committed 3M to solve its own environmental problems, to prevent pollution at the source wherever

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possible, to develop products that have minimum effect on the environment, to conserve natural resources, to meet and sustain government regulations, and where possible, to help government agencies in environmental activities.

Procter & Gamble's (P&G) environmental quality policy assures stockholders, customers, and the public that its operations will comply fully with the law and that all of the company's products, operations, and packages will be safe (Shimp, 1997). P&G commits to managing resources and waste wisely and to responding appropriately to societal expectations for environmental progress. The company implemented a management system that by 1997 allowed more than 95% of the raw materials purchased by the company to be transformed into products. About 3% of the remaining materials are recycled and only 2% end up as solid waste.

When AT&T (1997) transformed itself from a vertically integrated manufacturing company to a communications services company, it adopted a proactive environmental policy and an environment, health, and safety (EHS) process based on international standards. The process allows AT&T to work closely with its stakeholders to identify, to solve, and to prevent environmental problems through technical and managerial assistance, performance evaluation, and auditing. Texaco (1997), like many United States–based multinational firms, applies its EHS policies not only in its facilities in the United States but in all of its global business operations. Texaco's policies cover environmental management administration, product stewardship, air emissions, spill prevention and control, and waste management as well as health and industrial hygiene and personnel and contractor safety.

Other corporations have also pioneered the adoption and use of proactive environmental management systems. Ashland Inc. (1998), a chemical and oil company, developed an EHS policy that pledged the corporation to conduct its business in compliance with environmental health and safety laws, integrate EHS activities fully into its business planning and operating practices, and continuously improve and report on its progress. The medical products company Baxter International (1997) developed a state-of-the-art environmental management system in 1991 and applied it to all of its facilities in the United States, Asia, South America, and Europe by 1996. Baxter has 85 full-time and full-time-equivalent employees in its environmental program; more than 200 other employees work on environmental management concerns in connection with their primary job responsibilities.

By mid-1998, more than 200 major corporations had officially certified their environmental management systems at sites in 37 states under ISO 14001. Many other companies used ISO 14000 guidelines to design or improve their environmental management systems without seeking official certification. Almost all companies in the chemical and petroleum industries have committed themselves to operate worldwide at government or company standards—whichever is more stringent—and to abide by the "Responsible Care" principles adopted by the members of the Chemical Manufacturers' Association (Bond, 1996).

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ENVIRONMENTAL AUDIT AND ACCOUNTING

Most firms with proactive environmental management systems audit their facilities for compliance with both national and local environmental regulations and company policies. Baxter International, for example, requires all of its operating units to perform environmental self-audits annually and outside auditors to evaluate 25% of its divisions each year using the company's rigorous environmental audit protocol. Baxter's headquarters hold operating unit managers responsible for closing audit action items quickly. Baxter also pioneered the development of a corporate environmental financial statement that accounts for the costs of basic environmental programs, remediation, waste, and other environmental responses, and for income, savings, and cost avoidance related to environmental activities.

The Aluminum Company of America (Alcoa, 1997) requires all of its business units to formulate annual action plans for environmental management and to set specific targets. Alcoa has done environmental audits since 1982 but substantially revised its system in 1992. The updated system requires an environmental audit of all of its facilities in the United States and overseas at least once every 3 years. The audits—conducted by multifunctional teams of central-resource experts, business-unit managers, and external representatives—identify environmental problems or deficiencies and make recommendations for improvements. Alcoa corporate headquarters developed detailed audit guidelines for every major environmental activity at its sites worldwide (Alcoa, 1995). Audit teams diagnose the site's environmental conditions and report unsatisfactory performance. Facility managers must provide an analysis of the deficiencies, outline corrective action that will be taken, and submit quarterly progress reports. Sites with unsatisfactory ratings are audited again within a year (Rondinelli & Vastag, 1998).

Similarly, Ashland Inc. requires all of its divisions to prepare audits for all principal operations at least biennially. Facilities conduct self-audits and Ashland uses independent EHS consulting firms to critique the division audits. Many divisions also audit outside suppliers to ensure that they meet Ashland's environmental standards.

ENVIRONMENTAL LIFE-CYCLE ANALYSIS AND SUPPLY CHAIN MANAGEMENT

An increasing number of firms are adopting principles of "extended product responsibility" that commit them to assessing the environmental, health, and safety impacts associated with their products and services throughout their life cycles and supply chains. Dow Chemical, Intel, Hewlett-Packard, International Paper, Xerox, and Northern Telecom, for example, determine environmental impacts at all stages of a product's life cycle. Many of these firms study the environmental effects of products both within the factory during production and

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externally in terms of raw and semifinished materials' procurement, processing, distribution, use, and disposal. Baxter International uses checklists and life-cycle analyses to forecast the environmental, health, and safety consequences for people who will handle all proposed new products and their packaging.

Eli Lilly (1998) implemented a New Product Environmental Requirements Tracking (NPERT) program in 1995 that assigns environmental professionals to its product teams to identify all regulatory or environmental quality requirements early in the manufacturing scale-up process. The environmental experts work with research and development and scale-up production facilities in designing waste management and pollution prevention measures and in ensuring that customer expectations concerning product stewardship are met. AT&T requires all suppliers bidding for contracts to complete prequalification applications that include environmental requirements. AT&T managers do field checks to assure that suppliers' performance meets AT&T's environmental standards. Life-cycle analysis helps executives at the 3M Corporation (1997) to understand, to manage, and to systematically evaluate opportunities to improve the environmental impacts of its products. Five life-cycle stages—materials' acquisition, research and development operations, manufacturing, customer use, and disposal—are evaluated for environmental impacts, energy and resource use, and health and safety implications. Xerox has remanufactured its products for more than 25 years and is now converting its equipment by adding new features to old models (e.g., converting copiers into printers and adding facsimile capability) to extend the life of its products and reduce the need for duplicate equipment (Falkman, 1995).

REDUCTION OF WASTES AND AIR AND WATER EMISSIONS

Environmental management systems guide corporations in reducing potentially harmful air and water pollutants and liquid and solid wastes. By making new investments in its refineries to improve production and increase operating efficiencies, for example, Texaco reduced Toxics Release Inventory (TRI) emissions by 80% between 1989 and 1996 while refinery production increased by 12%. By adopting more stringent water resource protection policies—including a pollution "curbing" system that collects oil leaks, a platform shutdown safety system, computerized remote monitoring and controls on off-shore facilities, and minimized on-platform storage capacity—Texaco succeeded in reducing water-polluting spills by 21% since the beginning of the 1990s. Ashland Oil reduced its toxic releases of 17 target chemicals by 33% before the end of 1992 and by 50% by the end of 1995.

Between 1986 and 1996, Baxter International reduced its per unit air toxic and chlorofluorocarbon emissions by 94%, its nonhazardous waste by 45% (34 million pounds), and its hazardous waste by more than 48%. The firm recycled 58 million pounds of materials in 1996 alone. From 1990 to 1996, the 3M Corporation cut its air emissions by 70%, its water releases by 52%, and its solid

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waste by 32% in its worldwide operations. Since 1991, Dow Chemical (1997) decreased its emissions of compounds by 53% (more than 51,000 pounds) in its facilities around the world. Xerox reduced hazardous-waste generation by 50% between 1990 and 1995. Nortel, the Canadian-based telecommunications (multinational corporation), established specific targets for the years 1993 to 2000: a 50% reduction in pollutant releases, a 50% reduction in solid wastes, a 30% reduction in paper purchases, and 10% improvement in energy efficiency (Kerr, 1995). The 3M Corporation attained a 70% (140 million pounds) worldwide reduction in its volatile organic compound emissions by 1996 and a 78% reduction in its TRI emissions.

Large firms have taken the lead, and many smaller companies have followed their example, in finding new ways to lower costs by reducing solid and liquid waste from their production systems and in recycling and reusing materials to prevent waste generation. Since the late 1980s, PepsiCo (1997) has reduced the amount of materials in its packages (aluminum cans by 35%, polyethylene terephthalate [PET] in plastic bottles by 28%, and glass in bottles by 25%). It eliminated 300 million pounds of corrugated cardboard that had been going to landfills by substituting reusable plastic trays for cardboard containers in distributing plastic bottles of soft drinks. PepsiCo also bottles and cans its products in containers using recycled plastic and aluminum and has decreased waste in its U.S. and Canadian plants by 50% to 75% through recycling used packing from incoming materials.

United Parcel Service (UPS) (1998) has reduced plastic-bag waste by 1,000 tons a year by using reusable nylon-mesh bags in its package sorting operations and uses recycled computer paper, paperboard for express mail, and recycled paper for delivery notices, saving more than 30,000 trees a year. Since 1995, UPS has diverted more than 34% of its total wastes—whiteboard, cardboard, mixed paper, glass, pallets, plastic, metal, and aluminum—from local landfills. Baxter International reduced packaging for its medical products by nearly 40 million pounds between 1990 and 1996. Ashland Inc. recycled more than 53 million gallons of used motor oil in 1996 alone. SC Johnson, P&G, Johnson and Johnson, and other firms have reduced the packaging in their products and cut waste disposal costs for themselves and their customers.

DESIGN FOR ENVIRONMENT

Companies using quality management principles attempt to design or redesign their products to decrease or eliminate adverse effects on the environment. Dell Computer Corporation (1996), for example, developed a new personal computer chassis in 1996 that was not only 100% recyclable but also allowed the computer to be serviced and upgraded more easily. By designing the machine to be easily upgraded rather than replacing the entire computer, Dell can extend its life and reduce disposal problems. Philips Electronics now uses eco-design principles to develop new products that are cleaner to make, to use, and to dispose of,

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such as Philips Green TV that reduces energy consumption and eliminates hazardous materials. Philips's low-mercury fluorescent lamps increase energy efficiency and eliminate toxic hazards in disposal (Pizzorusso, 1998). The Ford Motor Company (1997) works with suppliers to redesign parts and equipment to reduce adverse environmental impacts. Ford and its suppliers, for example, redesigned the alloy used in the production of heat exchangers to eliminate chromium coating and painting requirements and to replace a trichloroethylene vapor degreasing process.

ENERGY EFFICIENCY AND CONSERVATION

Corporations that decrease their energy use also achieve significant cost savings and improve the efficiency of their operations. UPS uses a variety of alternative fuels and engines, including compressed and liquid natural gas and propane- and electric-powered engines in its delivery trucks to lower their use of fossil fuels and vehicle fuel emissions. It has purchased thousands of electronic fuel-injected engines to reduce gasoline consumption. By using a turbine-powered cogeneration plant at its Los Angeles Refinery, the ARCO (1996) Corporation could double the productivity of its natural gas fuel. In addition, it achieved energy savings equal to 4,000 barrels of crude oil a day and reduced daily nitrogen oxide emissions by an equivalent of the emissions of 162,000 vehicles.

Baxter International's energy conservation programs in 59 of its facilities curtailed energy consumption by 30% to 40% by 1996 and stabilized energy use despite increasing production. Unisys Corporation reduced energy use by 9.9 million kilowatt-hours a year for an annual saving of $872,000 in one plant in Pennsylvania alone by replacing heating, ventilating, and air-conditioning (HVAC) chillers; installing variable frequency drives and automated controls; improving reduced wattage fluorescent lighting with parabolic lenses; and using occupancy sensors (Commonwealth of Pennsylvania, 1997).

POLLUTION PREVENTION AND CLEAN MANUFACTURING

Firms of all sizes have begun to develop and adapt technologies, methods, and processes for preventing pollution through clean manufacturing to eliminate environmentally harmful materials in the production process rather than controlling emissions at the end of the pipeline. Pollution prevention saves both companies and governments the costs of pollution control, waste disposal, and environmental cleanup. A survey of 256 large and small firms in the United States found that more than 60% of them used new or improved process technology, and about 58% used new product technology to prevent pollution (Florida, 1996). By adopting new paint processes in its paint and body shops, for example, UPS could decrease paint usage by 40% to 50% and solvent and paint cleanup waste by 95%. Applying new technology in its parts' washers to extend solvent life allowed it to decrease solvent disposal by 78%. The Olin Corporation—a

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specialty chemicals, metals, and aerospace products corporation—substantially reduced air emissions of carbon tetrachloride by applying technologies that reclaim the material for reuse in several of its production processes. It also reduced 1,1,1-trichloroethane by 80% by altering its production processes to wash parts using water-based cleaners instead of chlorinated solvents (USEPA, 1995).

The increasing cost of emissions control is pushing internationally competitive firms such as Ford, General Motors, and Chrysler to adopt pollution prevention measures in sourcing, production, and distribution (Hemenway, 1996). These measures have become easier to apply with the proliferation of new technologies and processes that allow firms to reduce or eliminate waste. Toyota's "lean production" system, for example, seeks ways of reducing or eliminating the production of goods that are not in high demand, extraneous processing steps in manufacturing, unnecessary transportation of people and materials, and storage of parts and inputs to cut its costs while simultaneously preventing pollution.

The 3M Corporation carries out pollution prevention programs within its own plants and designs products that prevent pollution for its customers. For example, in 1996, it introduced hydrofluroether (HFE) fluids to replace chlorofluorocarbons(CFCs) and other ozone-depleting materials for commercial applications such as parts cleaning in the aerospace, computers, electronics, and medical-products industries. In its own operations, 3M reduced releases to the environment by 46% by mid-1996, and 57% of the reduction came from pollution prevention measures. By using a new solventless acrylic polymer hot-melt process in its medical tape manufacturing, for example, 3M eliminated 2.4 million pounds of solvent a year and reduced energy consumption by 77%.

ENVIRONMENTAL STEWARDSHIP AND COMMUNITY SUPPORT

Many corporations have increased donations and are supporting employee initiatives to conserve natural resources and enhance environmental assets in the communities in which they have facilities or operations. UPS, for instance, created a wildlife sanctuary at its 36-acre corporate headquarters campus in Atlanta. ARCO granted the California Fish and Game Department conservation easements on its 6,000-acre Coles Levee oil and gas fields in the San Joaquin Valley to establish an ecosystem preserve as a wildlife habitat. The company also works closely with the Texas Parks and Wildlife Department to turn unused oil production platforms in the Gulf of Mexico into artificial reefs as habitats for luxuriant octocorals, nomadic fish, and shellfish, and as recreation areas for sport fishers and divers.

Compaq Computer Corporation (1998) donates equipment for use in wildlife refuges, parks, and research facilities that benefit the environment or that provide environmental education programs. It sponsors middle school teachers to attend environmental training programs that help them develop the knowledge and skills to strengthen environmental courses in their schools. Ford Motor Company (1997) sponsors educational multi-image programs at five national

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parks in the United States, establishes "Wildlife at Work" sites on corporate-owned lands, funds a natural habitat zone at the Atlanta Zoo, and offers conservation awards to individuals and organizations that develop innovative natural resource conservation projects.

FORCES DRIVING CORPORATE ENVIRONMENTAL MANAGEMENT

Corporations are adopting proactive beyond-compliance environmental management systems for a variety of reasons (Berry & Rondinelli, 1998). Pollution prevention helps companies to avoid complex, inflexible, and costly regulatory processes by eliminating harmful air and water emissions and by reducing wastes in their operations. Proactive environmental management systems also help corporations to protect or enhance their ethical image, to avoid serious legal liabilities, and to satisfy the safety concerns of employees. Such systems also help companies respond more effectively to the demands of local governments and their own stockholders for responsible business practices. Some firms have also found that applications of life-cycle and supply chain analyses lead to the discovery of new business opportunities and new products, more efficient and effective production processes, and new sources of revenue. With the adoption of international standards of environmental management such as ISO 14000, American corporations that adopt environmental management systems can more easily remain or become competitive in world markets.

Many firms have adopted pollution prevention policies and integrated environmental management into their overall business strategies because they have found significant cost savings from waste reduction or elimination (Ehrenfeld & Howard, 1996). For example, between 1989 and 1996, Baxter International pursued proactive environmental initiatives that allowed it to reduce costs by more than $100 million. Ashland developed pollution prevention programs in seven of its facilities in Ohio that saved the company more than $1 million in the first year alone. The programs were designed to reduce waste by 6 million pounds by the year 2000. The 3M Corporation estimates that it has achieved more than $790 million in cost savings since adopting proactive environmental management policies in 1975.

A survey of 256 manufacturing firms in the United States found that nearly 78% of the respondents ranked pollution prevention as "very important" or "important" to corporate performance (Florida, 1996). About 84% of the companies were pursuing reduced emissions strategies and 16% were seeking zero emissions levels. Clearly, regulations and potential cost savings were significant factors in their corporate environmental strategies, but respondents also listed corporate citizenship, improving technologies, service to key customers, and improving productivity as crucial reasons for adopting proactive environmental management strategies.

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BRIDGING THE GAP: FROM REGULATORY COMPLIANCE TO ENVIRONMENTAL PERFORMANCE

Although many industries and corporations have moved well beyond compliance in their environmental management practices, many small- and medium-sized firms still struggle to keep abreast of complex, costly, and constantly changing regulations. Proactive environmental management has not spread faster, in part because most government environmental policies at the federal and state levels neither reflect market forces nor reward private-sector efforts. Closing the gap between public policies that are based almost exclusively on a command-and-control regulatory system and the potential for environmental improvements that can be gained by more widespread use of proactive corporate environmental management systems requires a thorough rethinking of environmental policy. Environmental policy in the United States simply does not take into account market forces or other pressures on businesses that determine how they react to environmental issues. NAPA's (1995) report to Congress recommended that EPA should "aggressively pursue a 'beyond compliance' initiative to allow industries and local governments greater flexibility in how they choose to meet national environmental standards" (p. 53). The Enterprise for the Environment Committee led by former EPA Administrator William Ruckelshaus (1997) contends that "the environmental protection system of the next century must become as efficient and low cost as possible without compromising environmental progress" (p. 3).

PROGRAMS FOR IMPROVING CORPORATE PERFORMANCE

Two emerging voluntary business practices offer the potential to meet these goals of increasing business participation in environmental management: full-cost accounting and environmental management systems. Accounting systems should reflect changing perceptions of ownership rights, allow for accurate identification and measurement of the value of natural resources, and allocate responsibility for costs. Firms can and should account for environmental costs, which do not differ significantly from other regulatory costs that they normally consider in their financial analyses. Helping firms to adopt environmental accounting can have positive impacts on environmental performance because controlling pollution will ultimately depend on changing the behavior of industries and consumers, and their behaviors are more likely to be influenced by market-based incentives than by more stringent regulations.

Full-cost accounting. Full-cost accounting (FCA) is a management tool that firms use to identify, to quantify, and to allocate the direct and indirect environmental costs of ongoing operations. FCA identifies and quantifies environmental performance costs for a product, process, or project. FCA considers four

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levels of environmental costs: *direct costs* such as labor, capital, and raw materials; *hidden costs* such as monitoring and reporting; *contingent liability costs* such as fines and remedial action; and *intangible costs* such as public relations and goodwill. Many companies, including 3M, DuPont, Allied Signal, Baxter International, Amoco, and Monsanto, have discovered ways of offsetting environmental costs with revenues by selling waste by-products, adopting clean technologies, or selling unused pollution allowances. Improving environmental performance in any area of business operations contributes to the overall effectiveness of a firm's environmental management system (Ditz, Ranganathan, & Banks, 1995).

Voluntary environmental management systems. The use of voluntary EMSs is spreading between large American corporations and multinational enterprises. These systems also provide a framework for smaller firms, nongovernment organizations, and communities to manage more effectively their environmental obligations, including compliance with applicable statutes and regulations. In addition, EMSs can help companies to move beyond compliance, to improve overall environmental performance, and to make greater use of pollution prevention technologies and processes while meeting their environmental obligations more efficiently and maintaining their competitive position in the market.

Although several sets of international guidelines have emerged in recent years, ISO 14001, the international standard promulgated by the International Organization for Standards in 1996, is becoming the best known framework by which corporations and other organizations are developing proactive voluntary EMSs (Rondinelli & Vastag, 1996). ISO 14001 provides a framework for evaluating environmental performance, developing EMSs, environmental auditing, life-cycle assessment, and environmental labeling (Jackson, 1997).

EPA and state regulatory bodies are now examining the possibility of integrating EMSs into their environmental policies. EPA and several states are pursuing pilot projects with both private and public organizations to test the EMS as an instrument for improving environmental performance. However, attempting to make a voluntary management system part of the regulatory process can undermine the creative potential of businesses to protect the environment while reducing waste and gaining competitive advantage. A far more effective approach is for public agencies to provide incentives and rewards for companies that adopt beyond-compliance management systems. State and local governments may be better able than EPA to develop programs that appeal directly to corporate motivations for adopting proactive environmental management practices. They may also be better able to restructure environmental policies to provide support for a combination of regulatory and voluntary management systems that are more effective and less costly than current command-and-control approaches. Regulations should focus on performance criteria that allow businesses and industries to develop the most appropriate means of achieving desired objectives.

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CHANGES NEEDED IN GOVERNMENT ENVIRONMENTAL POLICIES

A sound regulatory system is the foundation for achieving environmental quality. But the regulatory system in the United States must be rethought and redesigned to leverage the resources of the private sector in achieving higher levels of environmental performance. GAO (1997b) notes that

> many state and industry officials have cited the need for statutory revisions, both in the near term to encourage experiments in alternative methods of achieving environmental compliance and in the longer term to achieve a more fundamental change in the conduct of environmental regulation. (p. 10)

Bridging the gap between command-and-control regulatory policies and proactive corporate environmental management requires making public environmental policies more market oriented and performance based. NAPA (1995) recommends that EPA and state regulatory agencies adopt beyond-compliance strategies in managing industrial pollution to encourage and reward companies that

> draft multi-media, facility-wide plans to reduce their emissions to a point that might be significantly lower than national standards. EPA or a state environmental agency would formalize the plans by granting an integrated permit, which would stipulate the plant's total allowable emissions. (p. 31)

Under such a plan, the incentive for the firm is to find the least costly and most effective approach to improving environmental performance through appropriate combinations of emissions control and pollution prevention that meet its business needs and operational capabilities.

A more effective national policy to encourage the adoption of cost-effective EMSs in the private sector requires moving from reliance on a command-and-control system to one that balances scientifically sound regulations with market-oriented incentives. Much more emphasis needs to be placed on environmental performance than on regulatory compliance alone.

Essential elements of a new policy framework include the following items.

A coordinated national environmental and energy policy with a clear end point vision. The principles of economic viability, energy conservation, and environmental quality are mutually interdependent. The financial resources derived from a health economy sustain a healthy environment. Economic viability, in turn, depends on reliable and sustainable energy supplies. A well-defined environmental policy that envisions a robust economy, driven by minimally polluting energy sources, with clear and achievable environmental quality objectives is crucial for promoting sustainable development.

A holistic and integrated approach to environmental management that focuses on performance improvements rather than regulatory compliance. A cross-cutting,

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three-dimensional (air, water, and land) policy framework that allows businesses and government to conceive of the environment as a whole rather than as separate environmental media is essential to improve environmental performance. Because the natural environment is composed of three inextricably interrelated media—air, water, and soil—what happens to one medium always affects the others. Segmented approaches to managing the environment are costly, inefficient, and ineffective, and invite continuing pollution displacement. Media-focused regulations create multiple bureaucracies to whom businesses must respond. Developing policies that reflect a holistic approach to environmental management can achieve performance improvements more effectively and reduce costly and unnecessary administrative burdens on businesses.

Elimination of no-cost consideration provisions in rule making. All benefits have costs. Current policies, however, do not require environmental agencies to use cost as a major criterion in promulgating and implementing regulations. The federal government's Clean Air Act, for example, often sets standards that are economically unrealistic and impose enormous costs on both businesses and state and local governments to achieve objectives that many critics argue are only marginal. In making decisions, businesses consider alternatives and balance value, quality, costs, and payback; environmental policies seeking greater private-sector participation in environmental protection must reflect similar criteria.

Less emphasis on constantly changing environmental quality targets and more emphasis on pollution prevention. Once a sound regulatory system is established, significant improvements in environmental performance can come more efficiently and effectively from positive actions that reduce legal uncertainties and encourage business cooperation. The unpredictable and continual tightening of costly environmental regulations that are often based on debatable scientific evidence creates enormous uncertainty for the private sector and slows its responses to environmental policy. Programs that encourage the development, transfer, and adoption of new technologies and clean manufacturing processes in industry can be far more effective in protecting the environment than policies that rely only on end-of-pipe emission control regulations. Developing and selling new technologies are business opportunities; reliance on constantly changing environmental regulations adds to the costs of doing business.

Replacement of zero- or minimal-risk-based regulations with those that seek acceptable levels of environmental risks. Environmental regulations are often based on unrealistic assumptions of risk that in the face of scientific uncertainty do little more than encourage the practice of prudent avoidance. Risks are an integral part of human existence and policies that seek to eliminate risk or reduce them at any cost quickly become unaffordable and lose their credibility. Environmental policies must make clear distinctions between real and perceived risks,

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and environmental protection agencies must make transparent the assumptions on which they base their estimates of an environmental hazard.

Greater use of economic incentives for development and commercialization of clean manufacturing technologies and processes. Economic incentives and rewards for innovation and creativity can entice more businesses to adopt new technologies that improve environmental performance than continued reliance on regulatory compliance alone. In the past, command-and-control policies have not adequately prioritized environmental problems or identified alternatives that ensure environmental sustainability and economic viability. Providing financial incentives and regulatory relief to organizations adopting practices that lead to real, long-term solutions to environmental problems—such as the shift away from carbon-based economies—can create business opportunities and make use of market forces to achieve improvements in environmental performance. Adoption of performance credit options such as pollution banking and emissions trading are examples of market-based strategies that both create wealth and promote long-term environmental improvement.

Support for programs that show improved financial performance in businesses that adopt waste-reducing and pollution-preventing management systems. EPA and state environmental agencies must promote voluntary initiatives and government-industry partnerships in terms of the financial and competitive advantages to businesses. Environmental protection initiatives must show and emphasize the financial advantages for organizations that adopt proactive EMSs to increase voluntary participation.

More emphasis on encouraging local and state government problem solving in conjunction with the private sector. Decentralization of environmental policy making can help overcome the conflict and gridlock that characterize the current regulatory system. Although important "spillover effects" and regional and national impacts of pollution must be addressed by regulations, many environmental problems can be solved more effectively at local and state levels through dialogue and interaction than by federal environmental mandates. Local stakeholders generally understand local possibilities and constraints better than federal or state regulators. Business owners and managers often understand the operational and economic realities of dealing with environmental problems better than government officials. Even federal regulations can be improved by setting performance targets and allowing businesses and state and local governments to determine the most effective ways of reaching them.

Use of budget-based incentives to reduce unproductive bureaucratic burdens on the private sector. Budgetary allocations must be used to encourage federal and state regulatory agencies to develop new programs that help private companies to develop voluntary environmental management systems. The success of

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such programs depends on a clear recognition of the factors that shape decisions in the private sector. The reallocation of budgetary resources along with regulatory reinvention will be essential to create programs that help firms to adopt management systems that result in both greater financial gains and better environmental performance. Environmental protection agencies can play important roles in accelerating the adoption of EMSs by providing technical assistance and stimulating technology transfer, developing metrics that measure performance in terms of both environmental protection and economic impacts, and testing new technologies and processes that achieve environmental goals in cost-effective ways.

Ultimately, bridging the gap between public policy and corporate environmental management requires the adoption of a new philosophy in both the public and private sectors that emphasizes what the World Business Council for Sustainable Development (1996) calls "eco-efficiency" (p. 4). Eco-efficiency encourages businesses to become more competitive, innovative, and environmentally responsible. It recognizes that economic growth and environmental quality are mutually interdependent. Public policies can play a crucial role in encouraging businesses to integrate eco-efficiency practices into their overall business strategies and in rewarding them for doing it. Firms attain eco-efficiency by reducing the energy and material intensity of goods and services, reducing toxic dispersion, enhancing material recyclability, maximizing sustainable use of renewable resources, extending product durability, and increasing the service intensity of goods and services. Developing policies that promote eco-efficiency will require not only reinventing environmental regulation but forging new partnerships between federal, state, and local governments and between the public and private sectors to discover, to disseminate, and to adapt innovative processes and technologies for improving environmental quality.

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