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*Pollution Prevention Success Stories
In the Cuyahoga River Watershed*

Introduction

AN OUNCE OF PREVENTION POLLUTION PREVENTION SUCCESS STORIES IN THE CUYAHOGA RIVER WATERSHED

"We have the capacity and ability to create a remarkably different economy, one that can restore ecosystems and protect the environment while bringing forth innovation, prosperity, meaningful work and true security."

— PAUL HAWKEN,
THE ECOLOGY OF COMMERCE

We are all consumers who create streams of pollution that affect the quality of our local environment. In the Cuyahoga River Basin, sediments are heavily contaminated by PCBs due to industrial discharges over the last century, yet the current source of PCB discharges are leaking landfills where batteries and transformers are disposed. The main reason for beach closings along Lake Erie is due to bacterial contamination from leaking septic tanks. Fish advisories for mercury exist in every watershed in Ohio and the main source is air deposition from utility emissions, a by-product of the electricity we all use.

The good news is that industries, municipalities, and institutions throughout the Cuyahoga River watershed are finding they can improve the local environment, cut costs, create jobs, and increase productivity by reducing their waste stream through pollution prevention (P2). These innovators are incorporating creative processes into their businesses, such as employing energy efficiency technology which reduces energy consumption and thus reduces mercury emissions. *An Ounce of Prevention: Pollution Prevention Success Stories in the Cuyahoga River Watershed* highlights a selection of the many Cuyahoga River businesses now taking advantage of the financial and operational benefits pollution prevention offers.

By employing the latest P2 technologies, the businesses that comprise the case studies are saving on their operational costs today and into the future. The owners and managers of these companies have realized that P2 is a sound method by which to reduce the cost of doing business. When they told their P2 success-stories, these leaders were excited — whether they had been saving for months or years. These leaders took pride in knowing their creative business practice not only saved dollars but also gave back to their community — by improving the environment of the Cuyahoga River watershed for generations to come.

Section One addresses the benefits to business of reducing toxics use and reviews the Cuyahoga River watershed that are improving their bottom line and the environment through pollution prevention fundamentals. *Section Two* outlines case studies of businesses in the Cuyahoga River watershed that are improving their bottom line and the environment through P2 technologies. *Section Three* provides a resource list for funding and technical assistance. *Section Four* is a mail-back request for information and survey.

The Ohio Environmental Council is thrilled to tell the story of these innovative companies and share these stories with colleagues throughout the Cuyahoga River watershed. Congratulations to these farsighted community leaders!

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A special note of appreciation to the Case Western Reserve University Center for the Environment's Northeast Ohio Sustainable Business Council Project, Ohio Dept. of Development Office of Energy Efficiency and the Ohio EPA Office of Pollution Prevention for their assistance in identifying companies and organizations for case studies and advising on content.

The Ohio Environmental Council is solely responsible for the content of this report.

About The Ohio Environmental Council

The Ohio Environmental Council (OEC) is a private, 501 (c)(3) not-for-profit environmental advocacy organization consisting of more than 100 Ohio-based organizations and 400 individuals. Founded in 1969, the the OEC works to unite and assist citizens in developing, advocating and implementing policies and practices to protect and restore the environment and conserve natural resources.

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Benefits of Reducing Toxic Use

As we enter the 21st century, comprehensive pollution prevention programs that reduce toxic chemical use have become key components of business strategy for firms ranging from large multi-nationals such as 3M and DuPont to small, family-run dry cleaners and printers. Environmental and business concerns are complimentary when considering long term profitability and competitiveness. Aggressive campaigns to cut waste and increase efficiency are yielding both substantial economic returns and a cleaner environment.

Basic Elements of P2 Programs

While the specifics of a pollution prevention program will differ for each company, successful pollution prevention efforts share common elements.

Purchasing procedures

*Reducing toxicity of
materials used in
operations or substituting
non-toxic materials*

*Opportunities in
process changes*

*Reducing packaging
where possible*

*Reusing products
or materials*

FINANCIAL BENEFITS

When planning for reducing or eliminating pollution, managers analyze both up-front capital costs (plant equipment, construction, and production process changes) as well as long-term operation, maintenance, worker safety and training, and research/development costs. Designing toxics out of their production processes can help companies to reduce or eliminate the following:

Disposal fees. Amendments to the Resource Conservation and Recovery Act (RCRA) in the 1980s banned the land disposal of many hazardous wastes. While the EPA promoted incineration as the best disposal option, growing evidence of the health threats from incinerator emissions increased public opposition to their siting. Some states and localities have declared moratoriums on their construction and expansion. As disposal options diminish, treatment and disposal costs will continue to rise.

Chemical use & waste through process efficiencies. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) levies substantial taxes on many groups of chemicals. Some state laws also charge fees on chemicals stored or released from facilities. Increasing process efficiency and pollution prevention measures such as good housekeeping and closed-loop recycling can reduce waste production, prevent wasted materials, minimize toxic chemical use and safeguard against chemical price increases.

Pollution control equipment & maintenance costs. Many regulations mandate costly "best available technology" pollution control equipment, which quickly becomes outdated as new technology emerges. As regulations tighten and technology improves, keeping

current with pollution control and emissions testing equipment will likely comprise an even higher portion of a facility's operating costs. Finding alternatives to regulated wastes eliminates costs of associated pollution control equipment and maintenance.

Worker Safety Costs. Companies using hazardous substances are subject to added provisions under the Occupational Safety and Health Administration (OSHA) to track worker health, provide safety training programs, ensure proper records and reporting and provide extra insurance.

Regulatory uncertainty. Current rules cover only a fraction of the toxic chemicals in production. Regulations are continuing to broaden to encompass additional substances. Long-term environmental planning can safeguard against these risks.

Costs of lawsuits, clean-up and liability insurance. The 1980 enactment of Superfund expanded liability for all hazardous and toxic waste generators, transporters, and site owners. A generator may be in compliance with existing statutes, but if the company's waste contributed to any portion of a site's contamination, the government or individuals can sue for the entire cost of site cleanup. They may also be held responsible for future damage to natural resources, property, economic, or personal injury claims. Insurance premiums have risen 50-300% due to accidental spills, leaking disposal sites and a growing concern with occupational safety.

Penalties, fines and violations. Current environmental regulations authorize EPA to fine up to \$250,000 for hazardous materials spills, and the public continues to exert pressure to raise penalty limits. In addition, the U.S. Justice Department and Ohio Attorney General are investigating willful and knowing violations of hazardous waste laws as criminal, not civil, cases. In 1991, 67% of companies inspected by the Ohio EPA were cited for hazardous waste violations.

BENEFITS OF POSITIVE RELATIONS

A solid record of environmentally-responsible practices can reinforce a positive corporate image and help build favorable relationships and loyalty with customers, employees and the community.

Using a materials waste exchange

Reusing and repairing durable goods

Engaging in preventative equipment maintenance

Promoting employee training and involvement in pollution prevention efforts

Employing good operating procedures

Scheduling and planning production

Cost Accounting that assigns costs of all air, land, and water discharges, treatment and utilities to specific processes or products that use the resources or generate the waste

Boost corporate image. Pollution problems at many corporations have often led to product boycotts and negative publicity, causing serious damage to their reputation, performance, and profitability. A public relations campaign to counteract a tarnished image can drain staff and financial resources.

Increase market share. Many consumers purchase "green" products and items produced by companies that can demonstrate environmentally-friendly practices. An innovative pollution prevention program can help distinguish a company from its competitors, and can provide an advantage in global markets, such as Germany and Japan, that have stricter environmental requirements for their products.

Improve employee relations. Companies can raise employee loyalty, morale and productivity by demonstrating a strong commitment to minimizing workplace exposure to environmental hazards. Some unions, such as the Oil, Chemical, and Atomic Workers Union (OCAW), have negotiated contracts that protect workers from dangerous substances.

COMPETITIVE ADVANTAGES

Increasingly competitive local and global markets are dictating that reducing costs and increasing efficiency will separate the successful companies from those that stagnate. Innovative environmental technology now plays a crucial role in these decisions.

Economic forecasts. In 1972, U.S. pollution control for industries cost \$26 billion, with 61% of these costs borne by the private sector. The U.S. EPA predicts that by 2000 pollution control will cost \$160 billion annually or about 3% of the Gross National Product. Such forecasts indicate not only that investments in pollution prevention can not only save U.S. businesses billions of dollars but help fuel a growing industry that in 1991, employed almost one million workers in 70,000 companies and had sales exceeding \$130 billion.

Global marketplace. Pollution prevention measures are already giving some foreign corporations a competitive advantage, helping them to realize larger profits or offer lower prices. For example, Japanese industry on average uses half the amount of resources required by American industry to produce cars and other appliances.

Steps for Establishing a Pollution Prevention Program

To optimize the financial and environmental benefits pollution prevention can offer, businesses should integrate P2 activities into a comprehensive, long-term program that prioritizes and integrates waste reduction activities.

1. *Obtain support from top management. Write a policy statement and build consensus within the facility or company.*
2. *Launch the program. Name a task force, state goals, increase employee awareness and involvement, and train employees in P2.*
3. *Conduct a preliminary assessment. Review and describe the facility's manufacturing processes to determine sources of waste generation and define a baseline inventory in order to set goals and evaluate progress. Establish priorities for further assessment based on the results.*
4. *Write the P2 program plan.*
5. *Conduct a detailed assessment.*
6. *Identify P2 opportunities for the facility.*
7. *Determine all costs of current waste generation, management and disposal. Establish a system of proportional waste management charges for waste-generating departments.*
8. *Prioritize P2 options based on technical, economic, and environmental feasibility analyses.*
9. *Write an assessment report and include the report in the program plan.*
10. *Implement the plan. Select projects, secure financing, and install projects.*
11. *Measure progress. Evaluate specific P2 projects as well as company-wide progress of the program.*
12. *Continue to re-evaluate the program to reflect changes in process equipment technologies, economics and regulations.*

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Ashland Chemical (a division of Ashland Inc.)
Foundry Products Division

Cleveland West Plant

2191 West 110th Street; Cleveland, OH 44102
Jack Matson, Plant Manager (216) 961-4690
no. of employees: 60
products: foundry binders, release agents and catalysts

Cleveland East Plant

4600 East 71st St.; Cleveland, OH 44125
Randy Helmick, Plant Manager (216) 883-8200
no. of employees: 50
products: foundry coatings and specialty chemicals

Ashland Chemical headquarters: Dublin, OH; operations in 42 states

Founded: 1967

Worldwide annual sales: \$4.05 billion in 80 countries

No. of employees: 7,100

Products: distributor of fine ingredients, industrial chemicals, fiber-reinforced plastics materials and thermoplastics in North America; supplier of specialty chemicals worldwide. The Foundry Products Division manufactures foundry sand-binding resins, core and mold coatings, and other metal casting products.

DRIVERS FOR ENVIRONMENTAL IMPROVEMENTS

BAN ON OZONE-DEPLETING SUBSTANCES—1,1,1-trichloroethane was designated by the U.S. EPA as an ozone-depleting agent and banned from use in the 1990's.

U.S. EPA RISK MANAGEMENT PLAN (RMP) RULES INCREASE PUBLIC SCRUTINY OF HAZARDOUS CHEMICAL USE—In 1999 facilities which use hazardous substances must begin disclosing information to the public about potential chemical accidents. The RMP rules require each facility to provide maps showing a site's "vulnerability zone," with circles indicating how far a toxic cloud could travel off-site in the event of a major chemical accident.

Environmental advocates and community groups aim to use this information to increase public focus on chemical accident risks, encouraging industry to reduce the threat of potential accidents. The concept of "inherent safety" can help decrease the size of vulnerability zones. Rather than simply adding safety controls to a dangerous process, inherent safety examines changes in the basic chemical process that could significantly reduce risks. Cuyahoga County's Local Emergency Planning Committee has for several years promoted this concept through its Risk Reduction Award.

VOLUNTARY PROGRAMS—

U.S. EPA 33/50 program. The U.S. EPA launched the 33/50 voluntary program in 1988 and set aggressive goals to reduce emissions of 17 toxic chemicals by 33 percent in 1992 and 50 percent by 1995. Ten Ashland Chemical manufacturing plants, including its two foundry products plants in Cleveland, utilize 33/50 Program chemicals. The EPA's reduction goals were

consistent with company's overall environmental objectives to meet or exceed environmental regulations and its investment of millions of dollars for environmental, health and safety efforts. Ashland became one of the first companies to join the 33/50 program.

Ohio Prevention First. Ashland joined this voluntary program designed by the Ohio governor's office aimed at demonstrating Ohio business and industry's effectiveness in achieving pollution reductions beyond compliance without requiring additional regulations.

Chemical Manufacturers Association (CMA) Responsible Care Program. Ashland Chemical strongly supports this CMA initiative to improve the industry's responsible management of chemicals. Ashland pledges to manage its business according to the following principles:

- recognize and respond to community concerns about chemicals and its operations
- develop and produce chemicals that can be manufactured, transported, used and disposed of safely
- make health, safety and environmental considerations a priority in planning for all existing and new products and processes
- report promptly to officials, employees, customers and the public information on chemical-related health or environmental hazards and to recommend protective measures
- counsel customers on the safe use, transportation and disposal of chemical products
- operate plants and facilities in a manner that protects the environment and the health and safety of employees and the public
- extend knowledge by conducting or supporting research on the health, safety and environmental effects of products, processes and waste materials
- work with others to resolve problems created by past handling and disposal of hazardous substances
- participate with government and others in creating responsible laws, regulations and standards to safeguard the community, workplace and environment
- promote the principles and practices of Responsible Care by sharing experiences and offering assistance to others who produce, handle, use, transport or dispose of chemicals

HIGH WASTE DISPOSAL COSTS—Ashland Chemical Cleveland West produces phenolic resins which included phenol and formalin, a toxic version of formaldehyde, among its raw materials. Manufacture of this product had created a waste by-product, which in the past was treated through off-site incineration. Disposal costs for this unusable waste stream totaled approximately \$1 million annually. These high disposal costs combined with the U.S. EPA and Ohio Prevention First program priorities for emissions reductions prompted Ashland to explore alternatives.

SOLUTIONS

QUALITY PLUS WASTE REDUCTION TEAM AND PROJECTS—Employees from production, quality control, R&D, and the applications laboratory formed a team to identify sources of waste. Their waste minimization initiatives are geared toward reducing or eliminating waste from customer returns, minitank washouts, spoilage, contamination and production errors

CLEVELAND EAST PLANT 33/50 PROJECT—In 1990, the Foundry Products Division offered products which gave its customers a highly-effective way to apply coatings to the foundry core and mold sand castings. This “cold” technology did not require ovens or heat but did use one of the target 33/50 chemicals — the highly evaporative, non-flammable 1,1,1-trichloroethane. The division established a goal of eliminating products that contained 1,1,1-trichloroethane by 1992.

In order to change this production, Ashland had to convince customers to make major investments in equipment and processing changes that involved either adding ovens to dry water-based products or switching to highly flammable alcohol based coatings. By the end of 1993, the Division achieved total elimination of 1,1,1-trichloroethane from its product line.

CLEVELAND WEST PLANT RESEARCH FOR CHEMICAL SUBSTITUTION—The high waste disposal costs and goal to reduce incineration as a waste management option gave rise to Ashland’s research into alternatives that could meet the stringent requirements of environmental regulations, manufacturing operations and product performance.

Ashland engineers applied “inherent safety” principles, seeking to reduce risk associated with this product. Working with technical staff and undergoing extensive testing with customers, they successfully substituted the non-toxic, powdered paraformaldehyde for formalin in one of the phenolic resin products. The substitute not only met the regulatory and performance requirements, but also enabled Ashland to turn an unusable, expensive waste stream into an adhesive sold to the pulp and paper industry for manufacture of plywood. Ashland cut by 50% the amount of formalin purchased in tank trucks which eliminates 50 truckloads annually from the manufacturing process. This reduced from 20,000 to 11,000 gallons the quantity requiring storage and its associated costs and risks.

BENEFITS

Exceeded 33/50 Program goals

- Together, Ashland Chemical and its parent company exceeded the 33% reduction goal one year ahead of EPA’s target date, achieving a 48% reduction in emissions from 1,368,099 pounds in 1988 to 656,914 pounds in 1991 of toluene, xylene, dichloromethane, methyl ethyl ketone, methyl isobutyl ketone, tetrachloroethylene, trichloroethylene, benzene, carbon tetrachloride, nickel, chromium, lead and 1,1,1-trichloroethane. In 1993, the company exceeded the EPA’s 1995 goal by reducing releases 52% from 1988 levels. Ashland had at one point used all 17 target 33/50 chemicals in its operations and by 1994 reported zero emissions of five of the target chemicals and eliminated them from its operations. Ashland had also achieved significant reductions in five other target chemicals since the baseline year.

Cleveland East Plant

- in 1996, reduced waste 15% while increasing production 30%
- reduced waste disposal costs by \$36,000 or 40% per pound of production
- saved \$12,000 in 1996 by reworking and using materials in production that, if not reworked, would have been disposed of as waste
- shipped over 200,000 pounds of water-based scrap materials to a cement manufacturer for an alternative raw material in their production process instead of disposing of it as waste at a cost of about \$8,700
- Ashland lost sales in the short-term when some customers continued buying competitors' products which still contained 1,1,1-trichloroethane. However, when 1,1,1-trichloroethane was designated as an ozone-depleting agent, the company had already completed the research and testing of alternatives and quickly recaptured market share. This long-term strategy also provided Ashland with a way to help their customers to quickly adapt to the new regulations.
- totally eliminated trichlorethane from its product line and successfully substituted water and alcohol-based products
- other environmentally-related plant improvements, including fugitive emissions reduction or elimination and dust collection improvements

Cleveland West Plant

- annual savings of: \$1 million in disposal costs, \$100-200 thousand in product manufacturing costs from chemical substitution
- reduced "vulnerability zone" from 1,500 ft. to 500 ft. on Risk Management Plan maps and associated liability
- generated \$1.7 million annual sales of plywood adhesive waste stream product
- other general waste minimization projects



Avery Dennison
Fasson Roll North America (FRNA) Division
7670 Auburn Road, Painesville, OH 44077
(440) 357-4833
Contact: James Fear, Director of Environmental Affairs

Founded: 1935
Annual Sales: \$3.3 billion
No. of Employees: FRNA Northeast Ohio: 927; Total FRNA: 1641
Total Northeast Ohio: 1,700; Worldwide: 16,200

Headquarters: Pasadena, CA; 200 manufacturing & sales facilities in 39 countries.
Products: Pressure-sensitive roll label materials

DRIVERS FOR ENVIRONMENTAL IMPROVEMENTS

REGULATIONS—The coating industry is becoming one of the most regulated industrial sectors, with tighter standards requiring control of regulated hazardous air pollutants and potential residual risks to the environment. As an example, the United States EPA identified the paper and other web coating industries as the number one source of methyl ethyl ketone and the number three source of toluene emissions in the Toxic Release Inventory (TRI). Therefore, it is one of the industry sectors subject to regulation under the Clean Air Act Amendments.

Producing pressure-sensitive label material (PS) requires coating a substrate material (paper, film or cloth) with a thin layer of adhesive to allow the product to bond to a surface on contact with pressure from hand or machine, without additional wetting, heating or curing agents. Manufacture of nearly all PS products requires two primary coatings: adhesives and releases. Adhesives, the heavier of the two coatings, comprise the highest solvent emissions levels (85 to 95 percent of total line emissions). Release coatings, which allow for easy removal of label liners, produce fewer emissions.

Five basic coating processes are used to apply both coatings: solvent-based, waterborne (emulsion), 100 percent solids (hot-melt), calender and prepolymer. Prior to 1992, nearly 75 percent of Fasson Roll North America (FRNA) PS products used solvent-based coatings that may have contained toluene, xylene, heptane, hexane and methyl ethyl ketone. Today, less than 12 percent of the coatings are solvent-based.

MANAGEMENT PHILOSOPHY, GLOBAL MARKET AND CONSUMER DEMAND—The company recognizes that the earth's natural resources are limited. It faces the challenge of protecting the environment while remaining profitable and increasing shareholder value in an ever-changing global market. Environmental improvements require integrating environmental awareness throughout the organization and gaining greater participation from departments outside of environmental affairs, such as research and development, engineering, and operations. In the decentralized, high-performance workplace, management of communication and collaboration, along with a sufficient level of resources and environmentally-trained staff, becomes key for success.

According to the company's 1997 annual report, growth drivers for the Worldwide Materials business sector include "changing market requirements for improved printing capability, clear package labeling and environmentally friendly products".

As a leader in the PS industry, Avery Dennison recognizes the value of protecting product and company image while pursuing growth opportunities. More than simply good public relations policy, the company's practices provide direct benefit to customers' profitability and demonstrate strategic development in shareholder equity, product innovation and service initiatives that reduce environmental effects from manufacturing.

As a growing number of institutions recognize environmental performance as an important influence on financial performance, potential shareholders consult organizations like the Investor Responsibility Research Center (IRRC) for impartial analysis. Avery Dennison's record of innovation, technological advances and environmental stewardship are critical to building a favorable investment profile.

OHIO PREVENTION FIRST—In 1994, Fasson Roll North America (FRNA) joined this voluntary planning initiative of the Ohio EPA to reduce the amount of pollution generated throughout the state. The Company then took steps to create and adopt its Stewardship Policy.

The chart below illustrates FRNA's total air emissions in tons with the growth of coated label material in billion square inches (BSI). The chart details FRNA's performance from 1990 through 1997 as having significantly lowered total air emissions while increasing the quantity of product produced.

STEWARDSHIP POLICY—Established measurement procedures show that effective implementation of stewardship concepts can generate substantial cost savings. Managing and measuring progress of business units towards reduced environmental impact requires high-level management support to secure essential budget and staffing. FRNA adopted an Environmental Stewardship Policy which requires each employee's participation and responsibility for implementing the following *stewardship principles*:

- *Integrate environmental impacts, costs, and opportunities into business decisions.*

Business Decisions	Environmental Impacts and Opportunities
new and existing products	regulatory requirements
process changes	pollution prevention
business acquisitions	energy conservation
material purchases	environmental accounting
land use decisions	

- *Design for environmental efficiency.* Place priority on substituting non-hazardous materials, source reduction and non-polluting technologies.
- *Plan to improve.* Develop implementation plans that include environmental goals and actions.
- *Promote partnerships.* Share environmental goals with internal and external stakeholders.
- *Inform the public and employees.* Communicate company-related environmental emissions, issues and actions through reports, education and training.
- *Verify compliance.* Evaluate compliance with applicable environmental laws and regulations through assessments. Effective environmental management systems support and ensure sustainable compliance.

SOLUTIONS

ENVIRONMENTAL MANAGEMENT SYSTEMS (EMS)—Each facility must establish and maintain an EMS. Such programs are built on a foundation of sustainable compliance, incorporation of quality management concepts, and fulfillment of community-driven environmental performance expectations. The system is proactive, rather than reactive, with environmental issues. It aims to create and assure adequate integration by implementing key environmental targets and objectives within operating strategic plans of each business unit.

Each facility's EMS system must establish and maintain the following processes:

- ***Environmental Management Plan.*** Prioritize, manage and implement significant environmental strategies and projects; communicate results via quarterly status reports.
- ***Regulations and Company Policies.*** Establish and maintain a process to identify existing, new and proposed environmental laws and policies; inform management of potential effects on the facility.
- ***Environmental Control Instructions (ECI's) and Operating Procedures.*** Developed by plant management and communicated to affected personnel, ECI's address environmental regulatory requirements at the business units.
- ***EMS Assessment.*** Enables management to determine the effectiveness of the business unit EMS and provides for continuous improvement of the system.
- ***Environmental Goals Aligned with the Strategic Business Objectives.*** In general, FRNA monitors the environmental performance compared to unit growth for the following areas: regulatory compliance, waste minimization, energy conservation, and EMS effectiveness.

DESIGN FOR THE ENVIRONMENT (DFE) INITIATIVES—DFE is the systematic evaluation of design issues during the early stages of product and process development to minimize risks and impacts over the entire product life cycle. Important factors the company considers when evaluating pollution prevention opportunities include cost savings, conservation of natural resources and reduction of pollution to the environment. The company has identified several DFE initiatives that allow for cost/benefit analysis. They include:

- ***Equipment and Process Design Tools*** used by engineering to ensure compliance, reduce pollution, and conserve energy.
- ***Product Design Tools*** to assist R&D in understanding the regulatory impact and liability of chemicals and other components early in the product design stage, allowing for reformulation if necessary to reduce or eliminate cost penalties and other consequences.
- ***Supply Chain Agreements*** that require suppliers to meet specific environmental performance standards can ensure compliance, improve packaging take-backs, and reduce potential liabilities.

BENEFITS

Financial:

- Improved profitability through effective waste reduction-reduced direct waste costs from \$19,000 to \$15,500 per unit production
- Increased shareholder value
- Competitive advantage in global marketplace

Management and Strategic Planning:

- Created a quality process for making effective business decisions by integrating core environmental operating principles
- Establishes management and employee accountability and responsibility for achieving objectives
- Establishes management process to review and assess EMS
- Provides coordinated business plan

Process and Product Design:

- Identifies environmental effects associated with manufacturing processes and products
- Provides a vehicle for environmental strategic planning throughout the design phase of product or process

Environmental

- Reduced emissions (see Regulated Emissions chart)
- Conserved energy (see Energy chart)
- Assured internal and supplier compliance with environmental standards

Communications with internal and external stakeholders:

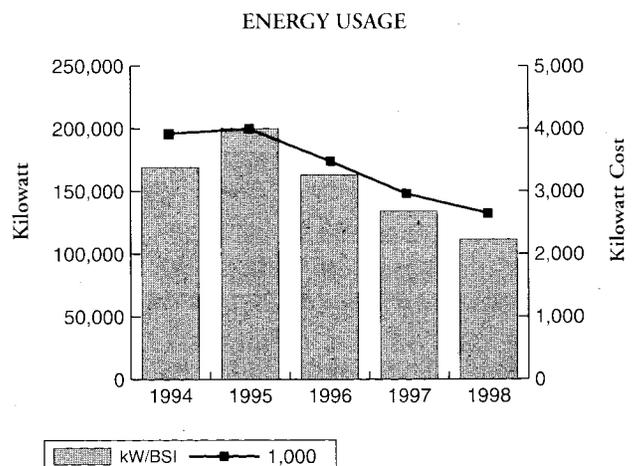
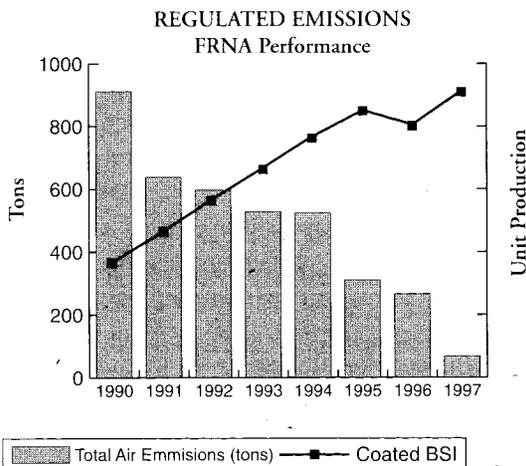
- Positive community relations
- Demonstrate sustainable environmental compliance
- Recognition that management of environmental affairs is among the highest business priorities

Human Resources

- Enhanced professional development of environmental resources (staff)
- Provides guidelines for allocation of proper resources to achieve objectives on a continuing basis

NEXT STEPS

Cost/benefit analysis for further reduction of select regulated components within water-based coatings. The analysis will likely resemble a limited life cycle evaluation.



BP
200 Public Square, Cleveland, OH 44114-2375
(216) 586-5607
Contact: Wendy Hileman, Director External Affairs

Founded: 1909
Annual Sales: \$2.5-3.0 billion in Ohio
No. of Employees: 7,000 in Ohio; 56,450 worldwide
Headquarters: London
Products & Services: exploration and production of crude oil and natural gas; refining, marketing, supply and transportation; manufacturing and marketing of petrochemicals; growing activity in solar power generation

After pending merger with Amoco

DRIVERS FOR ENVIRONMENTAL IMPROVEMENTS

1992 RECESSION SPURRED INNOVATIVE SOLUTIONS—Like many companies, BP suffered a downturn in the '92 recession. This crisis triggered a sea change in how BP viewed its operations. CEO John Browne was instrumental in taking steps to refocus and decentralize the organization, leading to a flatter, more agile management structure. BP began placing a greater emphasis on partnering, strategic alliances and giving business units substantial flexibility and decision-making authority. Decentralization encouraged solving problems from multiple angles, and sparked “out of the box” thinking, an approach and philosophy that has led to BP’s proactive climate change strategy four years later.

OPPORTUNITY TO DISTINGUISH BP FROM ITS COMPETITORS—The Global Climate Coalition (GCC), which represented the primary - mainly U.S. - fossil fuels industries, was mounting opposition to the proposed international climate agreement requiring the U.S. to reduce its level of CO₂ emissions. The GCC questioned the validity of the science and warned that cuts in CO₂ emissions could cripple the U.S. economy. They proposed equal application of the climate agreement to industrial and developing countries, despite the contribution of industrial countries for a disproportionate share of the greenhouse gas generation. Environmentalists and developing countries strongly criticized the GCC position. BP withdrew from the coalition in 1996.

RECOGNITION OF SCIENTIFIC CONSENSUS ON CLIMATE CHANGE—In his May 1997 presentation at Stanford University, John Browne announced to the world that BP accepts the emerging consensus on global climate change.

“There is now an effective consensus among the world’s leading scientists and serious and well-informed people outside the scientific community that there is a discernable human influence on the climate, and a link between the concentration of carbon dioxide and the increase in temperature. The time to consider the policy dimensions of climate change is not when the link between greenhouse gases and climate change is conclusively proven but when the possibility cannot be discounted and is taken seriously by the society of which we are part. We in BP have reached that point.”

He acknowledged BP's contributions to greenhouse gas emissions and put forth an action agenda to reduce internal emissions and to partner with other organizations around the world to reduce human impact on climate change.

GROWING MARKET FOR RENEWABLE ENERGY—For nearly 20 years, BP has been gaining experience in the design, manufacture and installation of solar photovoltaic systems. One of the world's leading solar panel manufacturers, it currently holds 10% of the world market for solar power. BP sells products ranging from batteries to electronic control and load equipment in more than 60 countries.

In 1996 BP Solar, Inc., a subsidiary of BP America, acquired the production operation in California of Advanced Photovoltaic Systems. The re-engineering of the plant to produce BP Solar's proprietary "Apollo" thin-film technology will make this site one of the largest thin-film manufacturing facilities in the world.

The aggressive greenhouse gas reductions proposed in the international climate change agreement would stimulate a global market for renewable energy technologies. Wind, photovoltaics, solar-thermal and geothermal supply power needs with no carbon emissions.

PARTICIPATION IN CLIMATE CHANGE POLICY DEBATE—BP is engaged in the climate change policy debate through the World Business Council on Sustainable Development and government-led initiatives in the U.S. and U.K. BP supports meeting broad policy objectives with wide-ranging market-based solutions "without denying the developing world the right to improve their living standards".

SOLUTIONS

DEVELOPING A CLIMATE CHANGE STRATEGY—BP put into practice its new emphasis on partnerships by holding a series of environmental forums in the U.S. and Europe. Environmental NGO's and other health, safety and environmental experts discussed issues of concern with top BP executives. Specific recommendations considered the feedback from these off-the-record meetings along with evaluation of other key factors. The resulting climate change strategy proposes solutions in four areas: conservation, new energy technologies, joint implementation and international processes.

Monitor And Control CO₂ Emissions Of BP Global Operations. BP's Health, Safety and Environmental Performance goals are stated as "no accidents, no harm to people and no damage to the natural environment," and business plans provide measurable targets. In September 1998 BP set a goal to cut greenhouse gas emissions of its global operations by 10% below 1990 baseline levels by 2010.

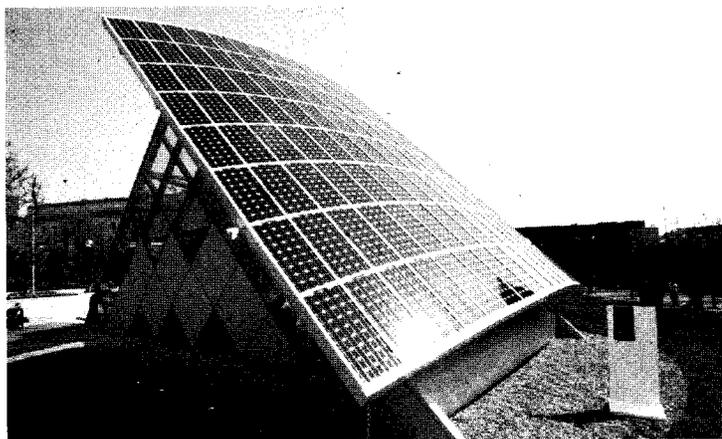
BP's CO₂ emissions result from burning hydrocarbon fuels to produce heat and power, from flaring feed and product gases and directly from the process of separation or transformation. To date, reductions have come mainly from a 20% improvement in energy efficiency of production processes over the past 10 years. To achieve additional improvements, BP pledges to:

- seek continuous improvement in its own energy usage and applying advanced technology to produce less waste and demand less energy;
- refine systems for monitoring and controlling its emissions, including CO₂ sequestration and developing industry consensus on measurement protocols;

- eliminate flaring and venting of feed and product gases, including volatile organic compounds;
- encourage customers, suppliers and partners to conserve energy

Technology transfer: solar power and other new energy technologies. BP has promoted its solar business to a corporate status equal with other business units: exploration & production, refining & marketing and chemicals. BP will continue to grow its solar business and promote efficient technologies. It has also set a long-term priority to develop alternative fuels.

To help guide its long-term strategic planning, BP was the first corporate sponsor of the Global Energy Strategy to Address Climate Change. This effort joins 13 national and international research organizations in developing a technical strategy to speed the development and diffusion of low-cost, low-carbon emission technologies.



Joint implementation. BP is promoting partnerships involving technology cooperation between countries that result in reductions of greenhouse gas emissions and seek to demonstrate its viability. It has partnered with the Nature Conservancy to conserve 1.5 million hectares (over 3 million acres) of Bolivian rainforest. Browne has called for a flexible policy of CO₂ sequestration, allowing multinational companies to reduce greenhouse gas emissions in the countries where the reduction is greatest and the marginal cost is lowest. It will also design new BP facilities in developing countries with the cleanest available technology.

International processes and pilot demonstration projects. As an active participant in the climate change policy debate, BP will investigate innovative solutions such as tradable permit schemes and contribute to the design of new international institutions and processes

- **CO₂ pilot emissions trading system.** In partnership with the Environmental Defense Fund, the company has recently launched a pilot CO₂ emissions trading system to develop a cost-effective mechanism for reducing greenhouse gas emissions within BP. Based in the U.S., Europe and Australia and representing 25% of BP's CO₂ emissions, the 12 participating business units are helping BP reduce its emissions profile and gain experience before bringing on additional business units. Demonstrating BP's commitment to addressing climate change, the pilot system will also provide practical input into the design of future national and international trading systems.

- **Pew Center on Global Climate Change.** Established in 1998 by the Pew Charitable Trust, this center brings together major companies and other organizations to participate in the policy debate and educate the public on the risks, challenges and solutions to climate change. BP is one of 19 multinational corporations forming the Business Environmental Leadership Council in policy debate supporting market-based solutions.

The Center accepts that enough is known about climate change to warrant taking action to address its consequences. It believes that businesses can and should take concrete steps now to establish and meet their emissions reduction goals, and that adopting reasonable policies, programs and transition strategies can address climate change and sustain economic growth in the U.S.

BENEFITS

Competitive Advantage

- proactively creating policy rather than slowing the course of change enhances its ability to for long-term strategic planning and adapting quickly to changing and growing markets
- expands market opportunities by redefining its mission as “providing mobility,” rather than simply selling petroleum products

Environmental

- raises public expectations about environmental actions of multinational corporations and creates a new benchmark for corporate environmental responsibility and behavior, challenging other companies to meet or exceed BP’s initiatives
- reduces CO₂ by 10% from 1990 levels by 2010

Enhanced Corporate Image

- helps to communicate BP’s commitment to take responsibility for the connection between itself, the rest of society and the earth’s natural resources
- BP’s proactive position attracted the attention of the Clinton administration, BP’s competitors and the business press, positioning the company as a leader in responsible corporate environmental policy

Financial

- investment to increase solar photovoltaic manufacturing aims to reach a ten-fold increase in sales over the next decade to one billion dollars.

Cuyahoga County Public Library

CASE STUDY

Cuyahoga County Public Library (CCPL)
2111 Snow Road, Parma, OH 44134-2792
Contact: K. Michael Morley, Facilities Division Director
(216) 749-9438
mmorley@cuyahoga.lib.oh.us

Founded: 1922

Annual Budget: \$44 million

No. of Employees: more than 1,000

Facilities & Services: The Cuyahoga County Public Library consists of four large regional libraries, 24 branch libraries, and an administration building serving more than 608,000 residents in 47 suburban communities. One of the nation's ten busiest library systems, CCPL loaned 10.4 million items in 1997 from its collection of nearly 3 million print, audio, video and other information resources.

DRIVERS FOR ENVIRONMENTAL IMPROVEMENTS

STEWARDSHIP OF PUBLIC FUNDS—Beginning in 1985, 6.3% of the State Income Tax has been designated to fund public libraries and local governments. In 1992, because of a stalled state economy, library funding was frozen at 1991 levels. In the next biennium budget, the funding level for libraries was temporarily set at 5.7%, which was placed into permanent law in 1996.

Due to spiraling inflation and static income in the early 1970's, CCPL, along with other libraries throughout the state, asked the public to approve operating levies to supplement their budgets. Every five years since then, CCPL has placed an operating levy on the ballot in the 47 suburban communities it serves. Operating levy funds provide approximately 40% of the annual budget.

HIGH UTILITY COSTS AND FACILITIES MAINTENANCE—CCPL's 29 buildings total 600,000 sq. ft, ranging in size from a few thousand square feet to 150,000 sq. ft. The Facilities Division needed to evaluate the multitude of different system types and their ages in order to best manage and service them. In 1993, utility bills totaled \$1.3 million annually, or about \$2 per sq. ft.

SOLUTIONS

COMPREHENSIVE ENERGY CONSERVATION PLAN TO—

- Establish a method of providing accurate and “real-time” utility tracking
- Upgrade existing mechanical and electrical systems to improve efficiency and reliability
- Establish energy efficiency as a primary criteria for new construction or renovation
- Support the Maintenance Department via training, utility management technology and effective maintenance of newly installed and existing building systems

ENERGY AUDIT AND RENOVATION DESIGN—In 1994, CCPL hired an energy consultant to determine an energy usage baseline and to identify energy conservation measures (ECM) for all Library buildings. The audit identified options estimated to yield \$301,315 in energy cost savings per year. The consultant then developed engineering specifications, construction drawings and retrofit guidelines.

PROJECT FINANCING THROUGH PERFORMANCE CONTRACTING—Typical of most publicly-funded agencies, CCPL had limited resources for the up-front capital expenditures required to realize the long-term savings. Without a “guarantee” of savings, the Board of Trustees, faced with significant non-energy capital improvement needs, was hesitant to fund the energy projects. They issued a Request for Proposal for a Performance Contract based on the energy audit. After thorough review and analysis, they chose a contractor who provided financing of \$1.2 million and guaranteed \$180,000 annual cost savings, yielding a 6.8% per year simple payback and 15% return on investment.

FACILITIES MAINTENANCE TEAM—A coalition evolved to include in-house members (*Facilities Director, Contract Project Manager and Facilities Engineering Technician*), outside contractor (*Landis & Staefa, Inc.*), subcontractors (mechanical - *Vadakin Refrigeration Inc.*; electrical *Alliance Electric, Inc.*) and an energy consultant (*Gene W. Ross Engineers, Inc.*). The team worked to ensure proper implementation of the ECM design.

ENERGY ACCOUNTING SYSTEM—The Facilities Team purchased utility accounting software to establish utility profiles for each building and report monthly on utility use patterns compared to a baseline year prior to ECMs. This enabled the team to accurately monitor and report monthly to the Board on the energy and cost savings of the CCPL Energy Conservation Initiative.

ENERGY EFFICIENT DESIGN GUIDELINES—The ASHRAE 90.1 energy efficiency standard is an integral part of CCPL specifications for new building construction and renovation. The library developed a verification system to ensure compliance with the standard throughout the facility design process.

ENERGY CONSERVATION PROJECT SCOPE—

- **Lighting retrofit** in 19 buildings using T8 lamps, motion sensors and HID lighting
- **Variable Air Volume Retrofit** in 12 buildings, which converted constant volume air handlers to variable volume type
- **Direct Digital Control Building Management Systems** in all buildings was installed with a central monitoring station located at the Administrative Office Building.

The installation of this system aimed to provide:

- efficient scheduling and control of building systems
- “real time” utility use data via utility meter interfaces
- rapid response capabilities regarding comfort or building alarms
- tool for proactively managing and maintaining building systems
- integration with energy accounting system to enable immediate identification of equipment malfunctions

BENEFITS

Financial

The Library saved \$299,235 in 1997, and 1998 data indicates a similar or greater savings. During this same time period, computer usage increased and 40,000 sq. ft. of building additions and renovations were completed. Rather than covering excess energy costs, the annual savings allow CCPL to invest in services to the public—books, computers, buildings or administrative talent.

Building Comfort

- The staff and public enjoy higher quality lighting, fewer drafts, more uniform air distribution and personalized temperature control.

Communications with internal and external publics

- Enhance ability to demonstrate accountability and prudent use of public funds. Helps to favorably position CCLP for the next operating levy request.

Environmental

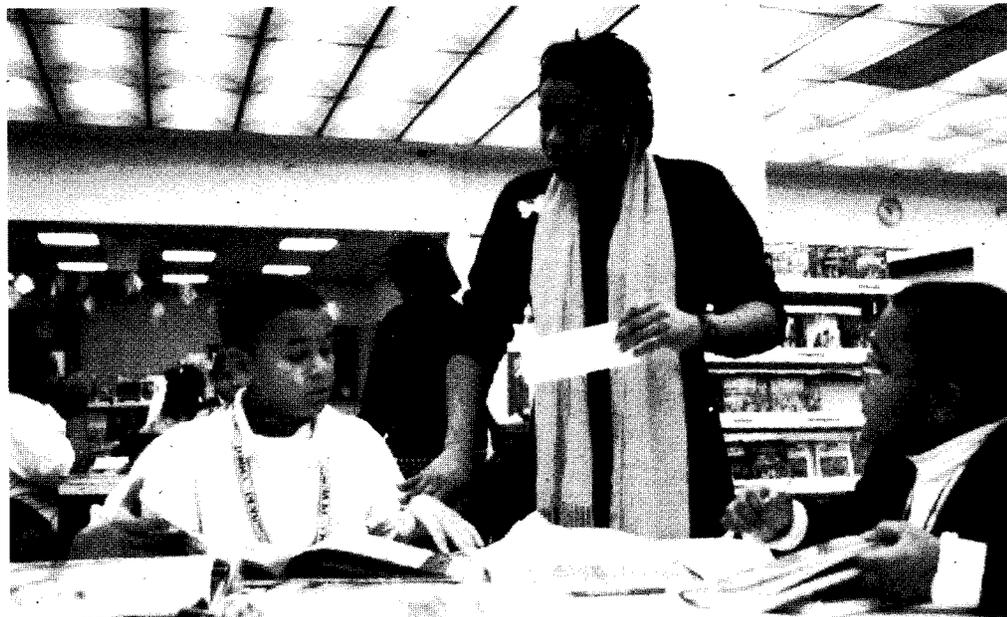
- Reduces pollution associated with electricity production through energy conservation. Each kilowatt-hour of electricity not used prevents 1.5 pounds of CO₂, 5.8 grams of SO₂ and 2.5 grams of nitrogen oxides.

Human Resources

- Training of maintenance personnel in effective operations of new and existing building systems.

Management and Strategic Planning

- Ability to identify, quantify and prioritize renovation projects.
- Provides vehicle for optimizing energy efficiency and associated environmental benefits during the early design stage, at which decisions can be made to yield the most effective cost- and energy-savings measures.



FabriCare Technology Center

CASE STUDY

FabriCare Technology Center
c/o The Small Business Environmental Assistance Center
Cuyahoga Community College
UTC, Room 240
2415 Woodland Avenue, Cleveland, OH 44115
(216) 987-3060
email: sbeac@tri-c.cc.oh.us

Initiated: 1998

Service Area: 1000+ fabric care companies and allied trade organizations in state of Ohio;
open access to similar organizations in US and Canada

DRIVERS FOR ENVIRONMENTAL IMPROVEMENTS

REGULATIONS—Over 80% of the nation's fabric care professionals clean garments with the organic solvent perchloroethylene or "perc". More commonly known as dry-cleaning fluid, perc is considered hazardous to both the environment and human health. Dry-cleaning operations of any size are therefore capable of generating hazardous waste, air emissions and wastewater—making them subject to regulation under the federal Resource Conservation and Recovery Act (RCRA), Clean Water Act (CWA), Safe Drinking Water Act (SDWA), and Clean Air Act (CAA).

THREATS TO CONTINUED EXISTENCE—Most dry-cleaning companies remain small, family-run operations. With limited staff and little to no in-house technical expertise, staying aware of changing environmental regulations — and complying with them properly - is usually difficult. So too is finding the capital to invest in new equipment or processing techniques. Yet regulatory restrictions on perc - as well as its cost — are rising steadily. If the industry does not begin moving toward alternatives now, a large number of these small businesses could be forced out of operation.

UNCERTAIN ALTERNATIVES—Active efforts are underway within the industry to identify, test, and adopt feasible alternatives. Yet no single technology has proven fully capable of processing ALL garments regardless of fiber content. Definitive cost-benefit analyses are still to be completed. Reforms in care labeling - necessary to reduce garment liability concerns - remain mired in controversy. Support from garment manufacturers remains unknown. Faced with such widespread uncertainty, most operators are reluctant to make an investment in change - preferring instead to simply "wait and see".

AMBIVALENT CONSUMER ATTITUDES—Consumer awareness of perc and its possible hazards is rising. Yet most consumers remain unconcerned about how their garments are processed. Their focus is simply on how good a garment looks — not on how it gets that way. Until consumer demand dictates a change toward more environmentally friendly processing, few cleaners are willing to risk a possible loss of process quality — or of customers.

SOLUTIONS

Recognizing the environmental plight of small businesses in every sector, Cuyahoga Community College initiated its "Small Business Environmental Assistance Center" (SBEAC) in 1996. Supported by funding from the U.S. Small Business Administration, the Center's mission is to help small companies operate more cleanly while still retaining profitability. One of its major responsibilities is to provide "technology demonstration" sites where owners can see, use and evaluate alternatives before they invest.

Working with a team of cleaners, regulators, manufacturers reps, and financial experts, the SBEAC began development of a technology demonstration and training site specifically for the dry-cleaning industry in early 1997. The "FabriCare Technology Center" or "FTC" opened in July, 1998. The FTC is one of only two facilities in the United States dedicated exclusively to education and training on alternative garment-care technologies.

TECHNOLOGY DEMONSTRATION—Located in downtown Cleveland, the FTC features 3,000 sq. ft. of instructional and production space. "Wet-cleaning" technology is first on the demonstration schedule. This process utilizes plain water - coupled with highly sophisticated equipment and specially formulated, non-hazardous chemicals - to clean fabrics ranging from wool to leather. In many cases, the wet-cleaning process outperforms perc-based cleaning by leaving garments softer, less yellowed, and fresher smelling.

Cleaners can see and test wet-cleaning machines in a wide range of sizes, with prices ranging from \$1,000-\$30,000. They can then decide the best way to begin integrating this technology into their operations - and to begin reducing their dependence on perc. Plans call for the demonstration of additional technologies, such as petroleum and liquid carbon dioxide, as they become feasible within the industry.

TRAINING—The FTC offers a variety of courses and seminars for both owners and their employees. Most focus on "hands-on" wet-cleaning instruction. Courses in traditional processing and business operation are also offered, however, to ensure the facility's relevance to current production methods. All instruction emphasizes methods and techniques to protect the environment, and is available at low or no cost.

FINANCIAL LINKAGES—Selecting the right alternative is only a first step in adoption. To ensure that owners will be able to purchase new equipment, the FTC provides information and linkages on low-cost financing sources, including the SBA, the Ohio Clean Air Resource Center, and other technology acquisition programs. Owners are free to select the program that best fits their financial needs, and to negotiate the best possible rates and terms.

OUTREACH FOR INDUSTRY SOLIDARITY—The perc situation clearly presents a threat to the entire dry-cleaning industry. Yet only a small percentage of owners are active in state or national organizations. Recognizing solidarity as an essential ingredient for change, the FTC now offers owners an informal, supportive place to meet on a regular basis. "Industry Outreach" meetings are held on the first Thursday of every other month, allowing local members to meet one another, exchange information, and share ideas. At the owners' request, each meeting also features a presentation and discussion on a relevant business or personal development topic.

BENEFITS

Environmental

- understanding of compliance with environmental regulations
- access to non-threatening information and technical support
- improved relationships with regulatory agencies
- proper handling and disposal of hazardous materials
- reduction or elimination in use of perc

Competitive Advantage

- provides high-quality, low-cost employee training in latest technologies
- prepares companies to operate profitably while meeting stricter environmental regulations
- enables companies to offer to customers an environmentally superior service and promotes consumer education about benefits of alternative technologies
- promotes positive public image through improved employee and community safety and retention of neighborhood business base

Financial and Management

- informed capital decision-making
- lower loan and financing costs
- support for future industry investors
- industry solidarity and support

Rockwell Automation (a business unit of Rockwell)
Control and Information Group
1 Allen-Bradley Drive
Mayfield Heights, OH 44124-6118
(440) 646-6000

Contacts: John Tepfenhart, Director of Facilities Planning & Administration
Energy Management: Alan McGinty, Manager, Facilities Engineering
Environmental: Tom Neff, Regional Environmental Coordinator

Founded: 1904

Annual Sales: \$4.5 billion

No. of Employees: northeast Ohio: 2,000; worldwide: 23,000

Headquarters & locations: Milwaukee, WI; 70 manufacturing & 620 sales/support facilities in 80+ nations; 5,600 distributors, system integrators and agents worldwide

Products: integrated industrial automation products including control logic, sensors, man-machine interface, motors, power devices and software used by manufacturing and process industries that include mining and metals, water/wastewater, pharmaceuticals, food processing, material handling, petroleum and chemicals, transportation, machine tools, plastics, forest products, packaged goods and government.

DRIVERS FOR ENVIRONMENTAL IMPROVEMENTS

SETTING A CORPORATE POLICY FOR GLOBAL ENVIRONMENTAL LEADERSHIP—Setting its sights on ranking as “the best electronics company in the world” and “a leader in environmental management,” Rockwell established its Environmental Commitment in 1990 as a path toward reaching these goals and to position the company ahead of its competitors. Translated into six languages and distributed to all Rockwell employees, the policy aligns health, safety and environmental goals with corporate economic objectives.

ENVIRONMENTAL GOALS—Rockwell challenges its employees to participate and accept responsibility for achieving the following goals:

- ***Reduce, minimize or eliminate the generation of waste*** or the release of potentially hazardous materials to the environment.
- ***Prevent adverse impacts of operations*** on the environment and on the health and safety of the communities of which we are a part.
- ***Place priority on environmental concerns and conservation of energy and raw materials*** in evaluating new and existing products, land use decisions, process changes, material purchases and business acquisitions.
- ***Recognize and respond to community concerns*** about the environmental impact of operations.

POLICIES AND PROGRAMS—The Environmental Commitment includes the following elements which serve as guidelines for action steps:

- ***Compliance.*** Comply with environmental laws and regulations. Voluntarily adopt standards based on U.S. models in locations where laws and regulations are less stringent than in the U.S.

- **Operations.** Operate all facilities in an environmentally responsible and sensitive manner. Pursue positive programs for waste minimization at every facility and monitor environmental compliance through periodic assessments of all operations.
- **Management Practices.** Make environmental responsiveness and resource conservation an integral part of business management and a criteria for evaluating management performance, new projects, processes and purchases. Systematically review customer (including government) specifications, and work with customers to revise or modify them to adopt processes and raw materials with less environmental impact. Establish a program to solicit environmental improvement ideas from employees, including rewards and recognition for implemented concepts.
- **Community Relations.** Inform the community of hazardous materials used at its facilities, participate in the community contingency planning process and respond to community concerns about operations.
- **Public Policy Development.** Cooperate with government agencies in analyzing emerging environmental issues and developing cost-effective, scientifically-based environmental policy. Work with community, government and industry to support programs designed to make recycling and resource recovery economically feasible and to develop solutions where problems have been created by historic waste handling and disposal practices.

CUSTOMER DEMAND—European and Pacific Rim countries are placing higher priority on preserving resources and preventing pollution. Many customers prefer to do business with an environmentally conscious organization.

EMPLOYEE RECRUITMENT AND RETENTION—Rockwell understands that hiring and keeping the best employees is the cornerstone to becoming the industry leader. Placing high priority on environmentally responsible practices contributes to building employee loyalty, commitment and pride in working with Rockwell.

LONG-TERM COMPETITIVE ADVANTAGE—Many large companies currently require suppliers to have certification in the ISO 9000 quality standards, and will likely want suppliers to adopt the ISO 14000 environmental standards in the future. Early adoption of the standards will prepare Rockwell Automation (RA) to immediately meet such guidelines.

SOLUTIONS

ISO 14001 ENVIRONMENTAL CERTIFICATION—Rockwell Automation's Twinsburg, Ohio plant became the first U.S. manufacturing plant and the fifth plant worldwide in any industry to earn this certification of the International Standards Organization, based in Geneva, Switzerland. The standards specify and provide guidance on the requirements of an organization's environmental management system, including how the system is to be used and evaluated and how it relates to specific businesses, processes and products. The standards also address such issues as environmental labeling, life-cycle analysis and environmental aspects of product standards.

ROCKWELL AUTOMATION CARES PROGRAM—The company developed a team that has certified 17 additional facilities to date, including two in Canada and two in Mexico. An ongoing effort to identify environmental issues and measure progress towards continuous improvement, the CARES program provided impetus to broaden compliance standards into far-reaching management principles.

Rockwell Automation established an Environmental Vision and Policy consistent with its parent company's Environmental Commitment. RA's vision is to be #1 in the world in environmental management by setting and achieving global standards for waste reduction/recycling, pollution prevention, resource conservation, process/life cycle evaluation and environmental awareness. It promotes a policy to go beyond strict regulatory compliance and emphasizes a culture of trust, teamwork, accountability, partnership and communication with employees, suppliers, customers and outside organizations.

PRODUCT STEWARDSHIP OR PRODUCT LIFE-CYCLE MANAGEMENT —

Rockwell seeks to reduce the environmental impact of its products and processes by re-evaluating the materials and energy used in their manufacture and to find those that are the most environmentally benign while maintaining product quality. Rockwell has concentrated on the substitution or elimination of materials used in numerous manufacturing processes. Rockwell's Science Center promotes and conducts leading-edge research for the business units that includes processes that are better for the environment.

ROCKWELL AUTOMATION ENERGY MANAGEMENT SYSTEM—In the course of consolidating eight buildings (519,928 sq. ft.) from various locations around Greater Cleveland into its present 460,000 sq. ft. Mayfield Heights building, the facilities team set a goal to reduce energy usage by 10% and energy costs by 25%. Key to this energy savings was to demonstrate exact control of every item of electrical usage via a customized programmable logic control (PLC) system.

PAPER REDUCTION—This program aims to replace paper, news bulletins, documentation and catalogs with electronic distribution.

BENEFITS

ISO 14001 certification process

- provides impetus for RA to examine and improve its environmental practices
- heightens environmental awareness among all levels of the organization
- led to formation of teams among RA's environmental and quality assurance groups that developed detailed action plans to address various environmental situations, aiming to become "world class," based on four successive stages of responsiveness — reactive, compliance, proactive and world class
- developed employee training in ISO 14001 standards and related internal training materials
- audit identifies continuous improvement opportunities

Rockwell Automation Cares Program

- Instrumental in driving several major permanent changes in the company's waste materials handling, product packaging and implementation of property improvements to reuse natural resources.

Energy Usage and Cost Savings (from 1995 to 1998)

- reduced energy consumption by 26% (combined electricity and gas from 60,180 to 44,611 MMBTU)
- lowered energy costs by 57%, saving \$3,360,000 from 1995 to 1998

Waste diverted from landfills through recycling

- 210 tons paper and cardboard, 33 tons bonded scrap material, 10 tons yard waste, 8

tons wooden pallets, 2 tons toner cartridges, 1.5 tons cooking oil, 4 tons lead-acid batteries, 247 lbs. plastic, 685 lbs. glass and 10.5 tons aluminum cans and metal and 3 tons spent fluorescent lamps. Three tons of obsolete computers were donated to educational partnership schools.

Awards

- Ohio Manufacturers Association award for leading-edge environmental management programs
- U.S. EPA Green Lights “World Class Energy Efficiency Award” for its Mayfield Heights facility
- Rockwell “Gold Environmental Award” for fiscal years 1997 and 1998 for successful demonstration of a 60% waste diversion rate

Voluntary adoption of U.S. environmental standards

When working in countries with less-stringent regulations, RA’s policy to adopt U.S. environmental guidelines raises the standard by which the public and other companies judge the practices of all firms operating in these countries.



Venture Lighting
Advanced Lighting Technologies, Inc. (ADLT)
32000 Aurora Road, Solon, OH 44139
(440) 836-7700
Contact: Christopher J. Cole, ADLT Director of Environment, Health & Safety

Founded: 1983
Annual Sales: \$164 million (ADLT)
No. of Employees: northeast Ohio: 433; worldwide: 1,275
Headquarters: Solon, OH
Products: Metal halide lighting systems, including lamps, lamp materials, ballasts, fixtures and lamp manufacturing equipment for commercial, industrial and residential applications

DRIVERS FOR ENVIRONMENTAL IMPROVEMENTS

MARKET TRENDS—Metal halide (MH) lighting today represents the fastest growing segment of the global general lighting market. It combines superior illumination with long-lamp (bulb) life, good color rendition, compact size and a wide range of wattages from 50-2000W. MH is five times more energy-efficient than incandescent lamps and therefore reduces energy usage and the associated environmental impacts.

The global market for energy efficiency is expected to grow from \$80 billion in 1996 to \$115-140 billion annually by 2015. Soaring energy prices (including the high cost of power plant construction) in developing nations as well as the United States are contributing to the rising demand for energy-efficient products. In this market, energy service companies (ESCO's), whose profits depend upon reducing their clients' energy costs while ensuring high quality services, are seeking products with maximum energy efficiency.

REGULATIONS—Regulatory policies have also increased the demand for energy-efficient products. The U.S. Energy Policy Act of 1992 bans the use of certain inefficient products including lamps and includes provisions for adopting efficiency standards for buildings and appliances.

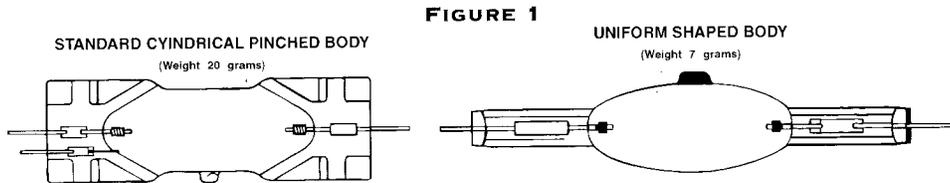
Environmental regulators have tightened limits on air and water pollutants such as nitrogen oxides, sulfur dioxide, carbon dioxide and mercury. Of all the industrial sectors, electric utilities, which use non-renewable fossil fuels to produce 71% of U.S. electricity, release the highest level of these pollutants to the atmosphere. Consequently they are obliged to take steps to reduce them.

The deregulation of electric utilities is fostering competition through the development of utility-operated for-profit ESCO services that are raising consumer awareness of choices, and promoting the use of energy-efficient products. For utilities, this creates a way to continue selling energy services while better managing the demand on their generating capacity.

TECHNOLOGICAL INNOVATION TO INCREASE MARKET SHARE—Ten years ago Venture Lighting, the metal halide lamp manufacturing subsidiary of Advanced Lighting Technologies, Inc., developed and introduced to the marketplace low-watt metal halide lamps (35W-150W) which combined pulse starting technology with the precision arc tube geometry of a "formed chamber" or "formed body" arc tube.

The arc tube is the sealed quartz tubing in which the light-generating electrical discharge occurs. Pulse starting technology uses a high-voltage pulse from a separate ignitor to jump-start

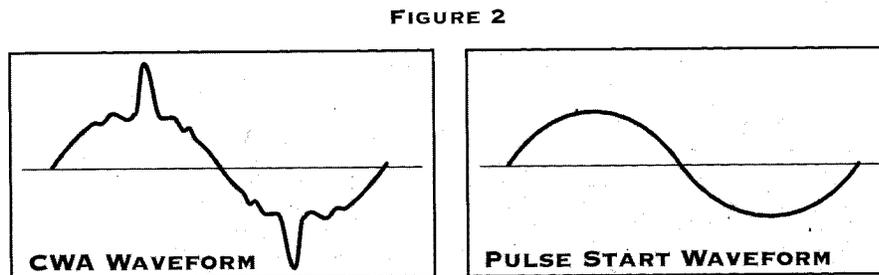
a precision formed two-electrode arc chamber, compared to the standard three electrode pinched arc tube, which has large pinch fins that draw heat away from the arc chamber (See Figure 1). With an ignitor pulse to start the lamp, ballast engineer no longer have to create the higher cost energy inefficient peaked waveform of the old standard CWA ballast (See Figure 2).



In order to take advantage of the inherent benefits of Pulse Start technology, Venture Lighting introduced low-watt metal halide lamps with arc tubes shaped by softening a piece of quartz tubing and blowing it out into a mold, like a balloon. This early Venture Lighting “formed chamber” offered many benefits over the standard “tubular pinch” arc tube. The design provided improved color uniformity and higher maintained light output over the lamp life, with faster warm-ups and re-strike times. From the perspective of energy usage, the energy efficient Pulse Start technology became the industry standard for low-watt MH lighting. However, the technique of ballooning shaped arc tubes was limited to low wattage arc tubes because of the problem in forming a uniform wall thickness necessary for larger, medium-watt arc tubes.

The standard 400-watt universal lamp, which represents 60% of the market today, was introduced 30 years ago and still uses a pinched body arc tube and CWA ballast. Overcoming the barrier to manufacturing true uniform body arc tubes for medium watt applications would enable ADLT to increase its market share by bringing the benefits of the “formed chamber” arc tube to the medium wattage lamps (175W+450W) used in commercial and industrial lighting applications.

Equally important, the innovations in arc tube design and manufacturing did not occur as an isolated technological improvement. It was recognized that optimal performance of the Uni-Form body required implementing a systems strategy, rather than separate improvements to lighting components. Lamp manufacturers had been constrained to design lamps for existing ballasts while ballast manufacturers were limited to improvements that operated with standard MH lamps. With a systems design approach, Venture Lighting’s improvements to both the arc chamber construction and ballast optimized the performance of the pulse start system over the lamp’s entire operating life.



SOLUTIONS

THE NEXT-GENERATION METAL HALIDE LIGHTING SYSTEMS—Applying pulse starting technology to medium-watt systems presented three challenges: balancing the operating parameters of the arc tube redesign, precision manufacturing the Uni-Form body arc tube and taking a system performance approach that included promoting the development of Pulse Start technology to the ballast and lighting fixture industries.

Redesigning the “formed chamber” arc tube. In 1994, Venture Lighting’s product development team launched a major arc tube redesign of the medium wattage lamps, and by 1995 developed the first prototypes. The arc tube shape resembles the curve of the electrical or plasma arc. Optimal performance requires precise, uniform balance of temperature and pressure inside the arc tube. The arc tube’s geometry and volume, materials added to it and operating wattage determine the temperature and pressure. The Uni-Form name refers to the consistent formation of a quartz arc tube with uniform wall thickness and shape that provides more uniform thermal characteristics and delivers superior color uniformity.

The efficiency of MH lamps is measured by lumens per watt. The lumens obtained from MH lamps are directly related to the temperature and pressure loading on the wall of the arc tube. Variations in the geometry of the arc chamber greatly alters the lumen and color output of the lamp.

Quartz sculpting. Venture Lighting developed a computer-controlled process using an automated lathe which eliminates the mid-chamber weak spots and precisely matches the shape and thermal characteristics with the wattage and length of the electrical discharge arc. The process gathers the heated quartz in a way that ensures uniform thickness of the arc tube wall. The company could now adapt the arc tube for use in medium wattage systems.

A Systems Approach to Lighting. The use of an ignitor allows the lamp to be operated with a lower wattage reactor ballast. With its lower peak waveform, a reactor ballast reduces lumen depreciation and cuts ballast energy losses by more than 50%. (See Figure 3).

PRODUCT STEWARDSHIP—Concurrent with the development of the medium-watt Uni-Form Pulse Start lamps, Venture Lighting developed a product take-back program based on the US EPA’s Universal Waste Rule and designed to encourage the return of spent mercury-containing lamps to Venture Lighting, in order to reclaim the mercury. MH lamps use less mercury per lumen than fluorescent lamps, but to date, no manufacturer has found a suitable substitute for the critical function served by mercury in MH lamps.

BENEFITS

Increases market share and sales with new products

- In 1997, Venture Lighting introduced 62 new Pulse Start products, ranging from 150 to 450 watts, to Venture Lighting Uni-Form Pulse Start system product line.
- Lamps, ballasts and controls used to produce the pulse start system are marketed to original equipment fixture manufacturers, and maintenance contractors retrofitting existing fixtures for more energy efficiency.
- New Uni-Form Pulse Start systems offer lower operating and maintenance costs over standard MH systems of similar lumen packages with 20% higher energy efficiency, and 40% higher maintained light output over a standard lamp life of 20,000 hours. Other selling points include improved color uniformity, 60% faster warm-up and restrike (re-ignition), better cold starting, and use in open rated fixtures, i.e. no lens cover.

- A 350W Uniform Pulse Start systems savings over standard a 400W MH system is 83 watts per fixture. This translates into a \$199.20 savings per fixture over the life of the lamp.
- By promoting this technology through the ballast and fixture industries, Venture Lighting estimates that within 3-5 years, 35% of the current standard CWA systems will be converted to pulse start systems.

Reduces adverse environmental impact

- Reduces from 20 to 7 grams the quartz used in the standard 400w MH arc tube. This reduction is significant since quartz is not recycled.
- Replaces a standard 400W metal halide lamp with a 350W lamp of equal lumen output, and decreases the mercury dose by 38% (from 55 to 34 milligrams per lamp)
- Reduces pollution and maximizes capital investment associated with electricity production through improvements in energy efficiency of the lighting system. Lighting accounts for 20-25% of U.S. electricity consumption, and each kilowatt-hour of lighting electricity not used prevents 1.5 pounds of CO², 5.8 grams of SO² and 2.5 grams of nitrogen oxides.
- The lamp take-back program facilitates the economic recycling of lamps in volumes as small as one case. Commercial recyclers typically restrict their recycling service to large volumes.

Cost Analysis of Metal Halide 350 Pulse Start System

Calculations: 83W x 0.001¹ x 20,000 hr, x \$.08 = \$132.80 savings/fixture

Savings: \$13,280.00 per 100 fixtures

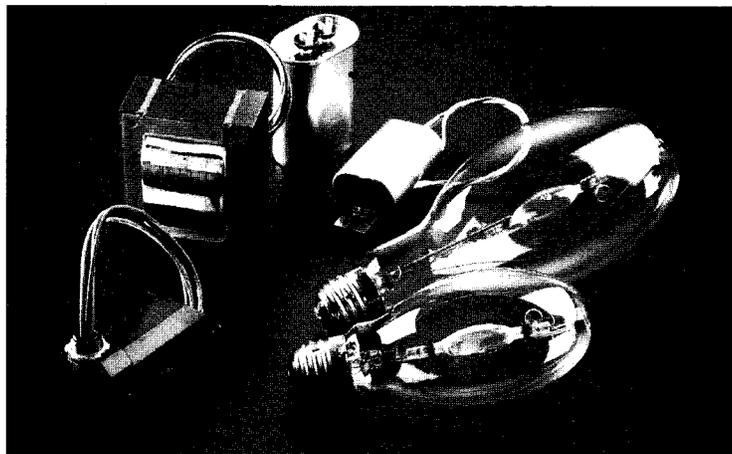
Number of fixtures	100
System watts saved per fixture	83
Lamp life in hours	20,000
Energy Rate/kwh	\$.08

¹0.001 is the conversion factor from watts to kilowatts

²system watts based on comparing the M59 standard to the M131

³estimate based on a rated life of 20,000 hours on a 277 volt linear reactor at a 120 hour burn cycle

**FIGURE 3
PULSE START SYSTEM COMPONENTS**



Technical and Financial Resources

Technical Assistance - National and International

The American Institute for Pollution Prevention (AIPP)

1616 P Street, Suite 100, Washington, DC 20036
phone: (202) 797-6567; Fax: (202) 797-6559
email: cd001001@mindspring.com
<http://es.epa.gov/aipp/>

Interactive directory of trade associations and professional societies working to make a difference for the environment.

Center of Excellence for Sustainable Development Sustainable Business and Industry Section

U.S. Department of Energy Office of Energy Efficiency and Renewable Energy
Denver Regional Support Office (DRSO)
1617 Cole Boulevard
Golden, CO 80401
phone: (800) 363-3732; fax: (303) 275-4830
email: sustainable.development@hq.doe.gov
<http://www.sustainable.doe.gov/business/buintro.htm>

Joint effort of various federal, state and local agencies to define sustainable development; provide a "tool kit," including manuals, workbooks, databases, case studies and model codes and ordinances; identify public and private sources of technical and financial assistance; and to develop a menu of energy efficiency and renewable energy programs.

Future 500

801 Crocker Road; Sacramento, CA 95864
phone: (916) 486-5999; fax (916) 486-5590
email: info@globalff.org
http://www.globalff.org/Future_500/frm-500.htm

Aims to cultivate the emergence of an economy where economic, social, and environmental goals are positively correlated. Aims to grow businesses that maximize total gain: economic, social, and environmental with an objective of a Factor Four gain in resource productivity: twice today's wealth, half the waste. Offers workshops, roundtables, and easy-to-use publications including Industrial Ecology.

International Institute for Sustainable Development

The Business and Sustainable Development Site

161 Portage Avenue East, 6th Floor
Winnipeg, Manitoba, Canada R3B 0Y4
phone: (204) 958-7700; fax: (204) 958-7710
email: info@iisd.ca
<http://iisd1.iisd.ca/business/default.htm>

Promotes sustainable development in decision-making internationally and within Canada. Contributes new knowledge and concepts, analyzes policies, identifies and disseminates information about best practices, demonstrates how to measure progress, and builds partnerships to amplify these messages. Its Business Strategies program area focuses on how sustainable development can improve competitiveness and create jobs while enhancing and protecting the environment. Publications cover corporate reporting, international standard-setting, entrepreneurial opportunities (EarthEnterprise™), and employment strategies.

P2 Gems

phone: (508) 934-3275; fax: (508) 934-3050
<http://www.turi.org/P2GEMS/>

For searching pollution prevention sites and information on the Web. Maintained by the Toxics Use Reduction Institute at the University of Massachusetts Lowell.

Sustainable Business Network

The EnviroLink Network

5808 Forbes Ave; Pittsburgh, PA 15217
phone: (412) 420-6400; fax: (412) 420-6404
email: sbnadmin@envirolink.org
<http://www.envirolink.org/sbn/>

A grassroots online community that unites organizations and volunteers around the world to provide comprehensive, up-to-date environmental resources. Offers The SBN Journal, a free monthly publication that culls news and articles from leading trade publications in sustainable business. Sustainable Business Opportunities links green businesses to investors, partners, distributors, licensees, and solicitations. Green Dream Jobs, a job listing service for businesses like recycling, renewable energy, green building, and eco-management. SBN Library provides resources including organizations, government agencies, publications, databases, mailing lists, fundingsources, and university programs.

U.S. Dept. of Energy, Office of Energy Efficiency & Renewable Energy Network (EREN)

<http://www.eren.doe.gov/ee.html>

Manages four program areas: Building Technology and State and Community, Federal Energy Management, Industrial Technologies, and Utilities Technologies.

U.S. Dept. of Energy Office of Energy Efficiency and Renewable Energy Clearinghouse (EREC)

phone: (800)363-3732; fax: (703) 893-0400
<http://www.eren.doe.gov/consumerinfo/erec.html>

Provides free publications, research in response to technical and business questions, referrals to energy organizations. Serves a broad audience – consumers, businesses, utilities, government and others.

U.S. EPA Design for the Environment (DfE)

email: <mailto:oppt.dfe@epamail.epa.gov>
<http://www.epa.gov/opptintr/dfef/>

Encourages businesses to incorporate environmental concerns into products, processes, and management systems. Provides information on industry projects, educational initiatives, assessment tools and environmental purchasing among other topics.

U.S. EPA Enviro\$en\$e

<http://es.epa.gov/>

Integrates technical P2 information from other Federal programs, including news, resources, contacts, funding; pollution prevention programs, technical R&D information, compliance and enforcement, and links. Includes the on-line Small Business Development Guide: The Impact of Waste on the Bottom Line contains a variety of industry-specific P2 information.

U.S. EPA Office of Pollution Prevention

email: <mailto:oppt.homepage@epamail.epa.gov>
<http://www.epa.gov/opptintr/p2home/>

Encourages partnerships and participation in voluntary programs; provides technical assistance and incorporates pollution prevention into regulations. Services include grants, programs, projects, legal and other information.

U.S. EPA Pollution Prevention Information Clearinghouse (PPIC)

phone: (202) 260-1023; fax: (202) 260-4659
email: ppic@epamail.epa.gov
<http://www.epa.gov/opptintr/library/libppic.htm>

Provides information and services designed to reduce or eliminate industrial pollutants through technology transfer, education, and public awareness.

World Business Council for Sustainable Development

160, route de Florissant; CH-1231, Conches-Geneva Switzerland
phone: (41) 22 839 3100; fax: (41) 22 839 3131
email: info@wbcسد.ch
<http://www.wbcسد.ch/aboutus.htm>

A coalition of 125 international companies committed to the environment and to the principles of economic growth and sustainable development. Members are drawn from 30 countries and more than 20 major industrial sectors. Aims to develop closer co-operation between business, government and all other organizations concerned with the environment and sustainable development. Encourages high standards of environmental management in business. Participates in policy development, shares leading-edge practices and demonstrates progress in environmental and resource management in business. Also contributes through its global network to a sustainable future for developing nations and nations in transition.

Technical Assistance – State

Ohio EPA Division of Air Pollution Control Small Business Assistance (SBA)

contact: Rick Carleski
phone: (614) 728-1742
email: rick.carleski@epa.state.oh.us
<http://www.epa.state.oh.us/dapc/sba/sbaintro.html>

A free, confidential, voluntary non-regulatory program providing small businesses with technical assistance and financial assistance to help comply with standards and reduce emissions.

**Ohio EPA Office of Pollution Prevention (OPP)
Ohio Environmental Protection Agency**

P.O. Box 1049, Columbus, Ohio 43216-1049
phone (614) 644-3469; fax (614) 728-1245
email: P2mail@epa.state.oh.us
<http://www.epa.ohio.gov/opp/oppmain.html>

Works primarily with Ohio manufacturers on a voluntary, non-regulatory basis to help reduce pollution in a cost-effective and technically feasible manner. Provides a variety of services including FREE P2 assessments and internet-based resources. Also serves commercial facilities, state agencies, state and local organizations, and general public.

- **List of current OPP activities**

<http://www.epa.ohio.gov/opp/hi-lites.html>

includes programs such as Ohio Prevention First and Pollution Prevention Regulatory Integration

- **List Servers**

<http://www.epa.ohio.gov/opp/p2lists.html>

The OPP maintains a list of pollution prevention listservers that cover a variety of pollution prevention topics including general pollution prevention, industry specific and recycling and materials exchanges.

- **Pollution Prevention Assessments**

contact: Jeff Lewis
phone: (614) 644-2812; fax (614) 728-1245

OPP offers FREE, non-regulatory on-site pollution prevention assessments to companies to identify cost-effective measures to reduce wastes and pollution. A pollution prevention assessment is a survey and evaluation of a facility to identify ways to reduce pollution at the source. A pollution prevention assessment is not a compliance inspection or environmental audit.

- **Technical Assistance Resources for Pollution Prevention (TARP2)**

phone: (614) 644-3469
email: p2mail@epa.state.oh.us
<http://www.epa.ohio.gov/opp/tarp/tarp.html>

An extensive resource of P2 information and resources, including business and industry resources, federal state and local government programs, and links to other sites.

Technical Assistance – Local

Air & Waste Management Association Northern Ohio Chapter

contact: Bob Perry, Treasurer
phone: (216) 447-3217
<http://www.awma.org/index.html>

A non-profit technical, scientific and educational organization with more than 14,000 members in 65 countries, representing many disciplines: physical and social sciences, health and medicine, engineering and law. Provides a forum where all viewpoints of an environmental issue (technical, scientific, economic, social, political and risk assessment) receive consideration. Opportunities for technological exchange, professional development, public education and networking.

Cleveland Advanced Manufacturing Program, Inc. (CAMP)

4600 Prospect Avenue, Cleveland OH-44103
contact: Jeff Harrell
phone: (800) 669-2267 or (216) 432-5320
<http://www.camp.org/>

A Great Lakes Manufacturing Technology Center (GLMTC), providing services for manufacturing, technical and management assistance including advising on waste minimization through its Manufacturing Environmental Management Services.

Cleveland Engineering Society Environmental Division

3100 Chester Avenue, Cleveland, OH 44114-4683
contact: Mary Dugger, Manager
Membership & Programs
phone: (216) 361-3100; fax (216) 361-1660
email: cleveng@interax.com
<http://www.cesnet.org/>

Professional association with more than 900 members, with many members of the Environmental Division offering consulting services on pollution prevention. CES provides professional education on technological developments, related legislation and regulations.

Cuyahoga County Solid Waste District

323 Lakeside Ave. W. #400; Cleveland, OH 44113
Contact: Pat Holland, Executive Director
phone: (216) 443-3749; fax: (216) 443-3737
email: ccswd@en.com
<http://www.en.com/users/ccswd/>

Publishes a directory to help businesses and industries implement waste reduction programs. It lists recyclers of 28 waste materials commonly produced by businesses and industries, provides tips on waste reduction, sources

for recycling equipment, multi-material recycling services, and waste exchange. The District also offers free and confidential waste audits resulting in waste reduction strategies tailored to an individual company and publishes *A Guide To Office Paper Recycling and Pass It On: A Resource-Full Guide to Donating Usable Stuff*.

Environmental Health Watch

Inherently Safer Chemical Processes Program

4115 Bridge Ave. #104; Cleveland, OH 44114
Contact: Stuart Greenberg, Executive Director
phone: (216) 961-4646; fax: (216) 961-7179
email: sgreenberg@ehw.org

This not-for-profit organization addresses chemical hazards in the workplace and community. Working with the Local Emergency Planning Committee and others, they promote "inherent safety" or "primary accident prevention" activities to both reduce or eliminate the possibility of an accident and help cut costs on safety equipment and training, regulatory compliance and liability insurance. The chemical reductions result from the redesign of production systems or product, reductions in chemical inventories or substitutions for hazardous chemicals at the facility.

Environmental Technology Commercialization Center

25000 Great Northern Corporate Center
North Olmsted, OH 44070
contact: Michelle Gillcrist, Deputy Director
phone: (440) 734-2746; fax: (440) 734-0686

Set up by the EPA and Columbus-based Battelle Memorial Institute, this center is designed to help transfer to the private sector proprietary technology developed within the EPA. It is focused on giving small businesses access to the kind of high-level technical research they normally might not be able to afford. The center can license the technology outright or link companies and researchers in technical dialogues, as well as helping with support like identifying venture capital sources, connecting the company with manufacturers or product development researchers, and making available laboratory space or other resources.

Ohio EPA Northeast District Office

2110 East Aurora Road, Twinsburg, Ohio 44087
phone: (216) 963-1200; fax: (216) 487-0769

Covers Ashtabula, Carroll, Columbiana, Cuyahoga, Geauga, Holmes, Lake, Lorain, Mahoning, Medina, Portage, Stark, Summit, Trumbull, and Wayne counties. There are six divisions in the district; air pollution

control, drinking and ground waters, emergency and remedial response, hazardous waste management, solid and infectious waste and surface water.

Small Business Environmental Assistance Center

Cuyahoga Community College, Room 240, UTC Bldg.
2415 Woodland Ave., Cleveland, OH 44115
phone (216) 987-3060; fax (216) 987-3246
email: sbeac@tri-c.cc.oh.us

Serves Cuyahoga, Summit, Medina, Lorain, Portage, Lake and Geauga Counties to assist small businesses to run cleanly and profitably. Offers training in hazardous materials management, lead and asbestos abatement, confined space and ISO 14000. Provides outreach to area trade, commerce and governmental associations through conferences and workshops. Lends technical assistance via production analyses, environmental health & safety audits, regulatory compliance plans. Conducts research into new and innovative production techniques and technologies, waste stream characterizations, discharge profiles and other knowledge needs.

Technical Assistance - Industry-Specific

VARIOUS INDUSTRIES

Ohio EPA Office of Pollution Prevention (OPP)

(see Technical Assistance – State for addresses)
<http://www.epa.state.oh.us/opp/asst/oppasst.html>
For technical assistance with pollution prevention concerns, email: kirk.nofzinger@epa.state.oh.us

Maintains a list of some industry specific pollution prevention tip sheets including, dry cleaning, energy, metals, paint, printing, recycling and solvents. Also maintains a Pollution Prevention Online Assistance page.

Ohio EPA Office of Pollution Prevention (OPP) Ohio's Material Exchange(OMEx)

c/o Waste Alternatives, Inc.
P. O. Box 70, Mt. Vernon, Ohio 43050
phone: (888)718-OMEx (6639); fax: (614)397-7649
e-mail: Tryomex@aol.com
<http://www.epa.ohio.gov/opp/recyc/omex.html>

Maintains and distributes listings of materials available and materials wanted from participants. Through a materials exchange, one company's "waste" can become another company's raw material.

Ohio EPA Technical Assistance Resources for Pollution Prevention (TARP2)

(see Technical Assistance – State for addresses)
Contains a listing of industry-specific pollution prevention resources covering a variety of industries.

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

Room 5F-065, EE-20, 1000 Independence Ave., SW
Washington, DC 20585
phone: 800-DOE-EREC; fax: (202) 586-9234
<http://www.oit.doe.gov/>

Encourages the development of energy efficiency and pollution prevention technologies for the industrial sector. Also concentrates on seven "industries of the future": Agriculture, Aluminum, Chemical, Forest Products, Glass, Metalcasting, and Steel.

U.S. EPA Enviro\$en\$e

Small Business Answer Desk: 1-800-8-ASK-SBA
fax: (202) 205-7064

- Small Business Development Guide: the Impact of Waste on the Bottom Line Report:
<http://es.epa.gov/new/business/sbdc/sbdc.htm>
- Industry Specific Tips Web Page:
<http://es.epa.gov/new/business/sbdc/sbdc6.htm>

Report contains information on small businesses and waste reduction. Site also contains small business waste reduction tip sheets covering a wide variety of industries including construction, medical offices, dental offices, veterinary clinics, and photo processing.

AGRICULTURE

U.S. EPA Agriculture Compliance Assistance Center

Ag Center, 726 Minnesota Avenue
Kansas City, KS 66101
phone: (913) 551-7207; fax: (913) 551-7270
<http://es.epa.gov/oeca/ag/p2.html>

Provides pollution prevention information to the agricultural community.

U.S. EPA Agriculture in Concert with the Environment Program (ACE)

Office of Pollution Prevention and Toxics
401 M Street, SW, Washington, DC 20460
contact: Harry Wells
phone: (202) 260-4472
<http://es.epa.gov/new/funding/ace/ace.html>

A grant program designed to reduce the use of herbicides and pesticides and to promote sustainable agriculture.

Ohio EPA, Division of Surface Water Farm*A*Syst

P O Box 1049, 1800 Watermark Dr.
Columbus, OH 43216-1049
contact: Larry Antosch, Farm*A*Syst State Coordinator
phone: (614) 644-2878; fax: (614) 644-2329
email: larry.antosch@epa.state.oh.us
<http://www.wisc.edu/farmasyst/index.html>

*Farm*A*Syst's utilizes confidential environmental assessments to reduce pollution on farms and ranches.*

AUTOMOTIVE REPAIR

Coordinating Committee for Automotive Repair (CCAR) GreenLink

11301 Nall Ave. Suite 203, Leawood, KS 66211
phone: 1-888-GRN-LINK; fax: (913) 498-1770
email: ccarinfo@unicom.net
<http://www.ccar-greenlink.org/>

Contains numerous fact sheets and links for a variety of topics including pollution prevention for technicians and owners of auto body shops; auto repair shops; heavy duty service and repair shops; and new car dealer service departments.

COATING INDUSTRY

US Air Pollution Prevention and Control Division & Research Triangle Institute Coatings Alternative Guide (CAGE)

<http://clean.rti.org/cage>

An on-line pollution prevention assistance tool to help small and medium sized metals and plastics coating businesses reduce their pollution by implementing alternate coating technologies.

DRY CLEANING/WET CLEANING

Center for Neighborhood Technology

Alternative Clothes Cleaning Project
2125 West North Avenue, Chicago, IL 60647
contact: Sylvia Ewing-Hoover, Pollution Prevention
Manager
wet cleaning hotline: (773) 278-4800, ext. 299
fax: (773) 278-3840
email: sylvia@cnt.org
http://www.cnt.org/sus_man/wet_cln.html

An independent, non-profit providing technical assistance and information about wet cleaning an alternative to dry cleaning.

METAL FINISHING

National Metal Finishing Resource Center

phone: (800) 286-6372; fax: (313) 995-1150.
<http://www.nmfr.org/>

A comprehensive source of environmental compliance, technical assistance, and pollution prevention information for the metal finishing industry.

PRINTING

Printers National Environmental Assistance Center (PNEAC)

contact: Listserv Information: Wayne Pferdehirt,
(608) 265-2361.
phone: 1-888-USPNEAC
<http://www.pneac.org/>

Links trade groups, governmental agencies, and universities to provide compliance assistance and pollution prevention information to the printing industry. Maintains a listserv to encourage discussion about pollution prevention and regulatory compliance.

Printing Industry of Ohio

88 Dorchester Square, P O Box 819
Westerville, Ohio 43086-0819
phone: (614) 2300; fax: (614) 794-2049

Published "A Self-Help Guide to Environmentally Sound Printing Operations" covering practices and procedures, permits and recordkeeping and reporting.

SOLVENTS

U.S. Air Pollution Prevention and Control Division & Research Triangle Institute Solvents Alternatives Guide (SAGE)

<http://clean.rti.org/>

SAGE is a on-line guide providing pollution prevention information for solvents, and the cleaning and degreasing processes.

Financing – National

Finding ways to finance P2 projects through internal budgets or traditional lending sources often prove challenging, despite potential high return on investment. But a number of resources are available to help companies conduct financial analyses of P2 projects and identify sources of funding.

U.S. Dept. of Energy Office of Industrial Technologies Inventions and Innovations Program (IIP)

Room 5F-065, EE-20; 1000 Independence Ave., SW
Washington, DC 20585
fax: 202-586-9234
<http://www.eren.doe.gov/industry>

Works with business, government and other organizations to promote energy efficiency advances for industrial customers, especially in seven key industries: Agriculture, Aluminum, Chemicals, Forest Products, Glass, Metal Casting and Steel. IIP provides financial assistance through a competitive solicitation process at two levels: up to \$40,000 or up to \$100,000 - depending on the stage of development - for establishing technical performance and conducting early development of innovative ideas that have a significant energy savings impact and future commercial market potential. Also offers technical guidance and commercialization support to successful applicants. Also offer other financial support, mostly grants.

U.S. Department of Energy NICE3 Program (National Industrial Competitiveness through Energy, Environment, Economics)

Forrestal Building-EE-20; 1000 Independence
Ave., S.W.
Washington, D.C. 20585
contact: Sandy Glatt, Program Manager
<http://www.oit.doe.gov/Access/nice3/>

A grant program to encourage development and demonstration of advances in energy efficiency and clean production technologies for industry.

DOE Chicago Regional Support Office

ATTN: Juli Pollitt
One South Wacker Dr., Suite 2380
Chicago, IL 60606
(312) 886-8571

U.S. EPA Energy Star Program U.S. EPA Atmospheric P2 Division

401 M Street SW, (6202J)
Washington, DC 20460
phone: (888) STAR-YES; fax: (202) 564-9569
<http://www.epa.gov/energystar/>

- Energy Star Building Program
<http://www.epa.gov/appdstar/buildings/>
- Energy Star Green Lights Program
<http://www.epa.gov/greenlights.html>

Covers such areas as office equipment, lighting, small business and buildings. Programs encourage energy efficiency through voluntary partnerships with the private sector to reduce energy usage and air pollution. A small business program also contains a financial resources directory. Specific programs include:

U.S. Small Business Administration

phone: 1-800-8-ASK-SBA; fax: (202) 205-7064
<http://es.epa.gov/new/business/business.html>

Maintains an Energy and Conservation Loan Program to help small businesses finance products or services that conserve resources. (See Financing – Local for local office)

Financing - State

Clean Air Resource Center

50 West Broad Street, Suite 1901
Columbus, OH 43215-5985
contact: Mark Shanahan
phone: (800) 225-5051; fax (614) 752-9188

Assists small businesses to cost-effectively meet Clean Air Act requirements. Aids individual small businesses by analyzing state assistance programs; providing free, confidential help on pollution problems including referrals to experts about affordable alternative solutions and funding; disseminating information about rules and control technologies and networking with other states to share information. Assists in investigating and resolving small business complaints with the Ohio EPA. Provides analysis and comment on impacts of clean air rules, promotes small business participation in developing rules and encourages voluntary compliance via work with trade groups and small businesses.

Ohio Dept. of Development , Community Development Division

Office of Energy Efficiency (OEE)
77 S. High Street, 26th Floor; PO Box 1001
Columbus, Ohio 43216-1001
contact: Sara Ward, Chief
phone: (800) 848-1300; fax:(614) 466-1864
<http://www.odod.ohio.gov/cdd/oeef/iiea.htm>

The OEE's mission is to "Affect policy on energy efficiency and develop and strengthen public and private partnerships to enhance economic benefits and better the environment through energy efficiency in Ohio's commercial, industrial and residential sectors." The Commercial and Industrial Unit of the OEE has a variety of programs including:

• Integrated Manufacturing Assessments Revolving Loan Fund

contact: Susan Covey (614) 466-6797
email: scovey@odod.ohio.gov

Assists small & medium businesses to identify how energy efficiency, P2, and productivity improvements can together improve their competitive position.

• NICE3 (National Industrial Competitiveness through Energy, Environment, and Economics)

contact: John Greenway (614) 466-7406
email: jgreenway@odod.ohio.gov

OEE works with companies to secure federal funding for projects that combine energy efficiency with innovative industrial waste reduction. (See program description under Financing – National)

Ohio EPA - Office of Pollution Prevention

P.O. Box 1049; Columbus, Ohio 43216-1049
phone (614) 644-3469; Fax (614) 728-1245
<http://www.epa.ohio.gov/opp/pplp/pplpfact.html>

Maintains a list of programs, information and contacts for P2 project financing, including grants, loans, tax incentives and government programs. Call to order list.

• Pollution Prevention Loan Program

email: bill_narotski@central.epa.ohio.gov
<http://www.epa.ohio.gov/opp/pplp/funding.html>

Provides loans for the construction and/or purchase of pollution activities and/or equipment at small and medium sized businesses or facilities in Ohio.

Financing - Local

Great Lakes Environmental Finance Center (GLEFC)

Cleveland State University
Urban Affairs Building, Room 215
Euclid Avenue at East 24th Street
Cleveland, Ohio 44115
contact: Don Iannone
phone: (216) 687-6947; fax: (216) 687-9277
<http://www.csuohio.edu/glefc/index.html>

Provides information, technical assistance and training for both the public and private sector for use in Brownfield finance, pollution prevention and financial strategies.

Ohio Department of Development Regional Economic Development Centers

Region Eight (Lorain, Cuyahoga,
Geauga and Lake Counties)
615 W. Superior Ave., 12th Floor
Cleveland, OH 44113-1187
phone: (216) 787-3240; fax: (216) 787-3244
contact: Fran Migliorino
<http://www.odod.ohio.gov/factbook/region8.htm>

Serves as outreach centers that provide the delivery of economic development incentives and services to the Ohio business community, including Small Business Development Centers, Offices of Financial Incentives, and Regional Advisory Committees among others.

Shorebank Enterprise Group Greater Cleveland Recycling Initiative

540 East 105th Street, Cleveland, OH 44108
contact: Ken Patterson, Manager Business
Development
phone (216) 268-6100; fax: (216) 268-6107

Shorebank Enterprise Group (SEG) is a non-profit entrepreneurial services firm which pursues a market-oriented strategy to promote entrepreneurial business expansion, with services including administering a mezzanine and revolving loan funds to finance higher-risk business growth. SEG has recently partnered with CAMP, Inc. (a regional manufacturing assistance center) and the Cuyahoga County Solid Waste District to form the Greater Cleveland Recycling Initiative. The three partners bring expertise in the areas of enterprise development, manufacturing engineering, recycling market development, solid waste management, and finance. SEG is developing lending products to finance implementation of P2 projects.

U.S. Small Business Administration

11 Superior Ave. Suite 630
Cleveland, Ohio 44114-2507
Phone 216-522-4180

Provide loans and grants, but company should call for details regarding P2 requirements.

U.S. Small Business Administration Small Business Environmental Assistance Center

(Cuyahoga, Geauga, Medina, Lake, Lorain,
Portage or Summit Counties)
Cuyahoga Community College Room 240
Unified Technologies Center
2415 Woodland Avenue
Cleveland, Ohio 44115-3239
phone: (216) 987-3086; fax (216) 987-3246
email: sbeac@tri-ccc.oh.us
<http://www.en.com/users/cinder/index.html>

Encourages small business growth and profitability by finding ways to operate cleanly and profitably. The SBEAC provides training, outreach, technical assistance, research and information.

P2 Glossary

POLLUTION PREVENTION. The use of source reduction techniques in order to reduce risk to public health, safety, welfare and the environment and, as a second preference, the use of environmentally sound recycling to achieve these same goals. Pollution prevention avoids cross-media transfers of wastes and/or pollutants and is multi-media in scope. It addresses all types of waste and environmental releases to the air, water and land.

RECLAIM. A material that is processed to recover a usable product or it is regenerated.

RECYCLE. To use, reuse or reclaim a material. Recycling does not include incineration, burning waste as fuel, or other treatment.

REUSE. The reutilization of a material in an environmentally sound manner that will not result in a hazard to human health or the environment. A material is reused if it is either: 1) employed as an ingredient, including use as an intermediate in an industrial process to make a product, or 2) used in a particular function or application as an effective substitute for a commercial product.

SOURCE REDUCTION. Any effort to reduce, at the source, the quantity of waste generated, toxic chemical use, or any release into the environment. Source reduction measures include, but are not limited to, process modifications, feedstock purity, good operating and management practices, increases in the efficiency of machinery, and recycling within a waste generating or other production process.

TREATMENT. Any method, technique or process designed to change the physical, chemical or biological characteristics or composition of industrial waste or other waste; to neutralize the waste; to recover energy or material resources from the waste; to render the waste nonhazardous or less hazardous, safer to transport, store, or dispose of, or amenable for recovery, storage, further treatment, or disposal; to reduce the volume of the waste.

WASTE MINIMIZATION. Any effort to reduce or recycle the quantity of waste generated, and when feasible, to reduce or eliminate toxicity. Does not include treatment, unless the treatment is part of the recycling process.