P2SC/E2SC
A Look Back at Eleven Years

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—Eric H. Snider, Ph.D., P.E., and Hans VanderKnyff
When $P_{SC}$: Pollution Prevention in South Carolina first came on the scene in 1993, construction was just beginning on upstate South Carolina’s BMW plant. As the new facility’s environmental services manager, I found the simultaneous appearance of this new P2 publication very timely.

At the time, 146,000 tons of hazardous waste was being generated annually in South Carolina, hazardous waste was being shipped into our state at the rate of 250,000 tons per year, and much of it was landfilled daily. The state faced a serious environmental problem, and something needed to be done.

A few years earlier, in 1989, the South Carolina General Assembly had passed a bill creating a tax on the disposal of hazardous waste in the state, and a portion of those funds was to be directed to the Hazardous Waste Management Research Fund administered by the Institute of Public Affairs (now the Institute for Public Service and Policy Research) at the University of South Carolina. Another portion of those funds was earmarked for hazardous waste research and for disseminating information about best practices for avoiding the generation of waste. And that’s where $P_{SC}$ came in.

Since its debut, forty-one issues of $P_{SC}$ and its successor publication $E_{SC}$ have been published and distributed to environmental professionals in industry and in government. The body of knowledge presented in the magazine has been comprehensive. The topics, to name only a few, have included waste minimization, waste treatment, reuse opportunities, and many case studies and best-practice examples.

Guest commentaries have offered thought-provoking topics designed to advance the P2 mindset as well as the technology. The comments from the commissioner of South Carolina’s Department of Health and Environmental Control have alerted readers to issues of relevance from the viewpoint of the public and the regulatory agencies. Most importantly, contributors from all across our state—and beyond—have shared success stories and best practices.

It’s difficult to precisely gauge the impact of $P_{SC}$ and $E_{SC}$. Between 1993 and 2001, South Carolina’s gross domestic product increased 52 percent.¹ During that same period, hazardous waste generation per GDP decreased by 18 percent.² Hazardous waste has not been landfilled in South Carolina since 2000. And recycling outlets have grown; the recycling of basic packaging and byproducts—paper, metals, pallets, and certain plastics—has grown substantially since 1993. Many companies are recycling large percentages of their waste that was previously disposed of. Some corporate leaders have completely eliminated sending waste to landfills.

How many of this magazine’s readers have read an article and said, “I could implement that at my facility!”? Was it the elimination of chlorinated solvents? The conservation of energy? The recycling of used oil for energy recovery? The elimination of toxic or hazardous chemicals through product reformulation or substitution? How many of South Carolina’s businesses have asked their suppliers of industrial chemicals to provide nonhazardous substitutes as a result of successful experiences reported in $P_{SC}$ and $E_{SC}$? Today, many of us are better informed about best practices for managing many types of waste.

Contributors to the magazine have included the Center for Waste Minimization at DHEC. This nonregulatory program, designed to facilitate waste minimization, has been aligned with the magazine from inception.

In 1996, the International Organization for Standardization published ISO 14001, the first international environmental management system standard. During the development of the standard, the magazine provided information to South Carolina companies and facilities about the benefits of ISO 14001 and systematic methods for compliance and continual improvement. Today, there are more than fifty South Carolina companies registered,³ and many more with voluntary programs. Again, this magazine has offered case studies of several of these successful businesses.

But all great endeavors eventually come to an end, and this is the final issue of $E_{SC}$. The reduction in hazardous waste generation and the elimination of hazardous waste land disposal in South Carolina have dried up the magazine’s funding source.

We should all thank the individuals whose foresight, hard work, and dedication have made this magazine the great success it has been. I’d like to see Guest on page 3.
Throughout E²SC’s eleven-year publication, the South Carolina Department of Health and Environmental Control (DHEC) has worked with the magazine to educate South Carolina’s citizens about the importance of issues that affect our environment. We have been proud and honored to be associated with E²SC’s efforts.

As I reflect on current issues and those faced by my predecessor, Doug Bryant, it becomes even more clear that protection and enhancement of the environment in South Carolina goes beyond what a single agency or organization can do. Rather, it is an effort in which we all have a part if we live, work, or play here because, in doing so, we become responsible for our state’s resources.

We have not been given those resources simply to use as consumers. Rather, they have been entrusted to us, along with the responsibility to act as wise resource custodians. That responsibility is one we hear about quite often, but we don’t always consider its true implications. We must share the environment with our children and grandchildren for them to enjoy and protect.

Theodore Roosevelt said, “The nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased, and not impaired, in value.”

On both national and local levels, discussion has continued about the link between environmental protection and public health.

We strongly believe that an objective system of checks and balances, in which environmental permitting and compliance are handled independently, is best. This way we ensure not only the continued protection of the public’s health, but also ensure that we indeed can pass along a quality of life to our children equal to, or better than, that which our parents gave to us.

The central issues that concern us as environmental custodians include:

- Air quality attainment standards—we must ensure that the state’s air quality stays clean
- Reduction of water pollution—we must ensure that the state’s waters are fishable and swimmable year-round
- Education of future generations about waste reduction and recycling issues
- Protection of our coastline, one of South Carolina’s most valuable resources

Each of these issues is a small piece of a much larger puzzle. Each piece has its proper position and, when placed correctly, it forms the big picture of environmental excellence. Without all the pieces in their proper places, we can never reach, much less see, the goal of environmental excellence.

As Thomas Jefferson said, “The earth belongs to each generation during its course, fully and in its own right. No generation can contract debts greater than may be paid during the course of its own existence.”

When we step back from the completed health and environment puzzle, we will see the excellence we as a society created. We can then bequeath that excellence, debt-free, to generations to come. They can then follow our example by continuing to fulfill our vision of “healthy people living in healthy communities.”

Thanks to E²SC, its contributors, and—most of all—you, its readers; our state is a safer and healthier place for future generations.

Guest from page 2

recognize Dr. Doug Dobson, the founder of the magazine and its first publisher; Dr. Eric Snider, who served as editor in chief; Hans VanderKnyff, the associate editor and senior writer; and, most of all, the countless contributors whose willingness to share their experiences and ideas made E²SC an effort that, in one way or another, has enriched the lives of all South Carolinians.

2. Compliance Monitoring Section, DHEC Bureau of Solid and Hazardous Waste Management.

Gary Weinreich is the environmental services manager at BMW Manufacturing Co., LLC, located in Spartanburg County, South Carolina.
Environmental Excellence in South Carolina

In 1997, after a year of dedicated effort, a group comprising business, environmental, governmental, and academic interests unveiled a new environmental leadership program at the Environmental Symposium. The new creation was to be called the South Carolina Environmental Excellence Program (SCEEP), and I’m pleased to report that it has evolved into the kind of entity that I believe its founders envisioned.

What’s the purpose of the SCEEP? It recognizes those South Carolina companies and facilities that demonstrate a commitment to superior environmental performance through pollution prevention, energy and resource conservation, and the use of an environmental management system. The program allows the sharing of environmental knowledge and expertise so that other companies and facilities will understand and appreciate the importance of environmental excellence. In this manner, the SCEEP hopes to encourage more entities to become environmental leaders.

Any South Carolina company or facility—private or public—that demonstrates the necessary commitment to waste reduction and continuous environmental improvement is eligible to participate.

A seventeen-member advisory committee, representing nonprofit organizations, governmental agencies, and trade associations, provides oversight of the SCEEP. The committee carefully reviews all applications to ensure that the program maintains its high standards of excellence.

At the federal level, we find a similar, although entirely separate, program: the EPA’s National Environmental Performance Track. The EPA wanted its own recognition program, and the Performance Track recognizes companies and facilities “that go the extra distance to reduce or prevent pollution and exceed regulatory requirements.” The SCEEP and the Performance Track work closely together here in South Carolina, but each maintains ownership over its own domain and relies on a different application process. When it seeks to qualify South Carolina applicants to its own program, the EPA approaches the SCEEP, whose advisory committee provides the requested information, if available. Most of the South Carolina entities applying for Performance Track membership have already gone through the SCEEP approval process, so that information is readily available. For entities that have not gone through the SCEEP process, however, the advisory committee is unable to provide the requested information.

Companies and facilities seeking Performance Track membership are not required to go through the SCEEP process first. Nevertheless, I should point out that the SCEEP imposes more stringent criteria for membership than the EPA does. To summarize, then, the EPA makes the final decision on Performance Track applications, but, in South Carolina, the agency relies heavily on the SCEEP for information on compliance and other matters. It’s a partnership, really, and it has worked out very well. South Carolina is the only state that has such a diverse advisory board providing oversight at the state level.

So we have a state program and a federal program that are quite similar. Which one is best suited to your own company or facility?

I encourage companies and facilities to become members of both programs. The main difference between the two is that the Performance Track requires you to have had an EMS in place for one year, even though it doesn’t have to be certified. The SCEEP does not require having an EMS in place, but you have to commit to implementing one. EMSs are where it’s happening today in the environmental arena, and we certainly encourage you to implement one.

If you’re interested in a no-cost membership in the SCEEP, just let me know and I’ll send you all of the information you’ll need. You can reach me at 803-777-7463, or at steagall@sc.edu. If you’re interested in the Performance Track, you can check out its Web site at www.epa.gov/performance TRACK.

I hope to see your company’s name on the SCEEP membership roster soon! 

Christine Steagall is with the University of South Carolina’s Institute for Public Service and Policy Research where she serves as the program coordinator for the SCEEP. She is also the state representative for the National Environmental Performance Track.
Eleven and a half years. For a non-profit environmental magazine, the duration represents a gratifying publication run. But the number—eleven and a half—may strike us as peculiar. Not a clean-cut span such as a decade, it somehow conveys an impression of unfinished business, as though the writers and editors had laid down their pens, turned off their computers, and simply walked away in mid-task. An inaccurate perception, to be sure, but the business is finished nonetheless.

With the closing a few years ago of the hazardous waste landfill near Pine-wood, South Carolina, E:\SC’s funding source disappeared. What funding was left in the pot after the landfill’s closing has now run out, and this issue you’re reading is the final one.

Nevertheless, we’re pleased and proud to have been publishing E:\SC and P:\SC for as long as we have. Along the way, we’ve garnered the generous support of various companies and organizations who have contributed financially toward the magazine’s success. We’re grateful for their help and for their belief in what we were doing.

We’re grateful, also, to everyone who contributed articles and columns, or who graciously agreed to be interviewed. Their technical expertise and real-world experience gave the magazine its true substance.

And we wish to extend our thanks to those people who have made this magazine possible: Dr. Doug Dobson, our first publisher, whose vision of a P2-focused magazine became a reality; Marcie Leaphart, our design/production editor, who has been the artistic talent behind the magazine since 1995; and Pinkie Whitfield, whose behind-the-scenes efforts as managing editor helped keep the magazine going. E:\SC and P:\SC would not have been the same without their invaluable contributions.

As for ourselves, we—Eric Snider and Hans VanderKnyff—feel privileged to have served this publication as editor in chief and as associate editor/senior writer, respectively. It’s been a great journey.

And so we come to the end of this venture. In parting, we extend our best wishes to you, our readers; may you enjoy continued success in your environmental efforts. We’re glad you came along.
In many ways, the magazine’s evolution over the past eleven years parallels the evolution of pollution prevention in South Carolina. Many of you may remember E₂SC magazine by its original name, P₂SC: Pollution Prevention in South Carolina. The magazine was a product of the South Carolina Hazardous Waste Management Research Fund and an extension of the Fund’s legislative mandate to support education and outreach on P₂ and waste minimization. Much of the original emphasis on use of the Fund monies was in addressing hazardous waste issues during a time when it was the focal point of regulatory issues in the state. The Fund was established in the same legislation that created the Center for Waste Minimization at the South Carolina Department of Health and Environmental Control (DHEC). The Center became and is still today the agency’s nonregulatory, P₂ technical assistance provider.

Over the years, the Hazardous Waste Management Research Fund supported a variety of P₂ research-related and technical assistance activities. The magazine provided a forum in which research results, case studies, success stories, and technological challenges in P₂ could be shared. It was an important and unique opportunity to publicly promote the P₂ message.

When P₂SC evolved into E₂SC in the late 1990s, it was consistent with the increased emphasis at the national and state level to work with the regulated community to improve environmental performance and to move beyond regulatory compliance. At the
time, and again with the financial support of the Hazardous Waste Management Research Fund and under the leadership of the former director of the USC Institute of Public Affairs, the South Carolina Environmental Excellence Program was created. The magazine became a showcase for the facilities that exemplified environmental stewardship and undertook innovative approaches to improved environmental performance. P2 did not take a back seat to environmental excellence; rather, it was an integral part of the environmental leadership movement. In fact, demonstration of P2 and waste reduction activities in measurable terms is one of the key criteria for initial and continued membership in the Environmental Excellence Program.

While the magazine is in its twilight, P2, environmental excellence, and innovations continue to move forward. What will be sorely missed in the future, however, is the forum provided by E₂SC to reinforce and to remind us of the importance of these activities and their place within the environmental regulatory framework. This article attempts to provide some perspective on the intertwined nature of P2, environmental excellence, and innovation, along with some thoughts on their future directions.

The Pollution Prevention Act

When the federal Pollution Prevention Act was enacted by Congress in 1990, it established a national policy that favored P2 and source reduction over recycling, treatment, and disposal. The Act defined source reduction as a fundamentally different concept than waste management or pollution control. Source reduction refers to practices that reduce the amount of hazardous substance, pollutant, or contaminant before it enters the waste stream or is otherwise released into the environment. The Act required the Environmental Protection Agency to establish a source reduction office, develop strategies, serve as a clearinghouse, and provide grants for state technical assistance programs.

While the Act was important for giving form and substance to source reduction and P2, one of the criticisms was its lack of enforcement teeth. While it established the national objective, it did not mandate the adoption or reporting of P2 practices, and it did not establish milestones that facilities were required to meet. Rather, the Act relied upon financial and technical assistance to encourage and promote P2 activities nationally and within the states. This approach separated the P2 mission from the compliance, inspection, and enforcement command-and-control framework. States are still wrestling with how to close the regulatory–nonregulatory gap to more effectively integrate P2 concepts into the environmental regulatory scheme.

The Center for Waste Minimization

In 1989, the South Carolina General Assembly enacted legislation that led to the creation of the Center for Waste Minimization at DHEC. Somewhat ironically, funding for the Center was provided in part through a portion of the fees paid by generators to dispose of hazardous waste at the commercial hazardous waste disposal facility in Pinewood, South Carolina. Section 44-56-165 of the S.C. Hazardous Waste Management Act required DHEC to use the fees for hazardous waste reduction and minimization activities. The Center was established within DHEC as a nonregulatory technical assistance unit within Environmental Quality Control (EQC) Administration. The Center provides confidential, on-site waste assessments to assist facilities in identifying and implementing P2 strategies. These assessments are still the cornerstone of the Center’s mission in addition to serving as an information clearinghouse and providing education and outreach to promote P2 practices.

One of the early struggles within the Center was how to ensure that its waste assessments would remain confidential and separate from the regulatory programs. Over time, the Center developed a protocol that allowed it to work with facilities without generating concerns that doing so would invite regulatory scrutiny and oversight. The proverbial “Chinese wall” between the Center and the regulatory programs was closely guarded and rarely breached (and in those cases only when a significant actual or potential threat to human health or the environment was present).

The EPA

While this approach has worked well over the past fourteen years, the current trend within the EPA is to focus on “integrated strategies.” Part of this strategy involves the mainstreaming of P2 activities as one of several tools to not only achieve but also to move beyond regulatory compliance. On November 5, 2002, the EPA released its Framework for a Problem-based Approach to Integrated Strategies. The Framework provides guidance for developing integrated strategies—meaning, giving upfront consideration to which tool or tools are best suited for use in addressing identified environmental problems. These tools may range from compliance assistance, enforcement,
and compliance monitoring, to the use of compliance incentives.

Much of the current emphasis on integrated strategies is based on an increased focus on compliance assistance. Within the EPA, efforts are ongoing to organizationally integrate compliance assistance, enforcement, and P2 activities. Within the past two years, compliance assistance coordinators have been named for each of the EPA’s ten regional offices. Part of the EPA’s current effort is devoted to better integrating compliance assistance activities with its enforcement and compliance assurance roles.

The EPA defines compliance assistance as assistance provided to regulated facilities to help them comply with and better understand environmental requirements. Triggers for the use of compliance assistance may include: issuance of new, or the modification of existing, regulations; partnerships with trade groups; complex regulations that are not well understood; chronic noncompliance within an industry sector; and opportunities to promote going beyond compliance.

The EPA outlines several compliance assistance tools that are available to work with the regulated community. They include workshops and training, development of information resources such as fact sheets and brochures, on-site visits, and Web sites. In documents supporting the EPA’s Framework, P2 is included as a compliance assistance tool to help facilities move beyond compliance. Other “beyond compliance” tools include implementing environmental management systems (EMSSs), adopting “best management practices,” and participating in leadership programs.

The EPA’s longer-term commitment to pursuing these integrated strategies is embodied in its 2003–2008 Strategic Plan as Goal 5, “Compliance and Environmental Stewardship.” In it, specific, measurable goals for compliance assistance and the use of P2 and innovations are described. Objective 5.2 states that “by 2008, improve environmental protection and enhance natural resource conservation...through pollution prevention and sustainable practices that include the design of products and the manufacturing processes that generate less pollution, the reduction of regulatory barriers, and the adoption of results-based, innovative, and multi-media approaches.”

DHEC

DHEC has also taken steps to better integrate its compliance, enforcement, and innovations programs. In January 2003, an organizational change within Environmental Quality Control resulted in combining responsibilities for coordination of enforcement, compliance assistance, P2, and the innovations programs within EQC Administration. This organizational restructuring was part of a larger commitment to implement “smart enforcement,” strengthen EQC’s compliance assistance activities, and integrate P2 and “beyond compliance” strategies. An explanation of each will help to illustrate the direction of the agency’s own “integrated strategies” for the future.

Smart enforcement is the phrase coined by J.P. Suarez, the former EPA assistant administrator for the Office of Enforcement and Compliance Assurance, in April 2003. DHEC has embraced the principles of smart enforcement as a more efficient way to achieve better environmental results. Smart enforcement refers to the use of the most appropriate enforcement or compliance tools to address the most significant problems to achieve the best outcomes.

This strategy involves five key elements: (1) addressing significant environmental, public health, and compliance problems; (2) using data to make good decisions about utilizing limited resources to address these problems; (3) using the most appropriate compliance and enforcement tools to achieve the best outcome; (4) assessing program effectiveness; and (5) effectively communicating environmental results and benefits of actions take.

Part of the smart enforcement strategy depends on the capabilities of the agency to provide compliance assistance when appropriate. In an internal survey of EQC staff last June, respondents overwhelmingly stated that they viewed compliance assistance as an integral and critical part of their job responsibilities. However, much of the compliance assistance described by respondents was provided on an informal basis. For example, providing information during an inspection, assisting in completing a permit application, or responding to numerous daily telephone requests for information were all cited as routine occasions for providing compliance assistance. What was lacking, however, was a coordinated, strategic approach to compliance assistance that brought individual program and district office efforts together.

EQC is working to strengthen and better coordinate its compliance assistance activities. For example, EQC piloted a compliance assistance initiative for small municipalities called the Environmental Circuit Rider program through grant funding from the EPA. It was designed to help smaller municipalities understand and meet regulatory requirements,
particularly in the water and wastewater areas. In partnership with EPA Region 4, a workshop was held on the new Phase II NPDES Stormwater regulations with over 225 individuals in attendance. A series of regional training sessions have also been held to educate local building officials on the current asbestos demolition and renovations regulations. In January 2004, EQC partnered with the Sustainable Universities Initiative and EPA Region 4 to hold a two-day compliance assistance conference for South Carolina colleges and universities.

EQC is currently involved in a compliance assistance initiative focusing on the chemical industry sector. The first phase involved three regional one-day workshops designed to give participants a broad overview of the numerous programs and regulations applicable to this sector. The second phase involves conducting a series of on-site visits with small specialty chemical companies to assist them with compliance issues. This initiative began in response to an identified need based on past environmental incidences involving these types of facilities.

DHEC’s compliance assistance focus also includes expanding and integrating the role of the Center for Waste Minimization. Because P2 is an important tool in the compliance assistance framework, the Center has been actively involved in designing and participating in compliance assistance activities. Since compliance assistance is focused on helping regulated facilities to meet and move beyond compliance, the Center has had to look at ways in which it could interact more closely with EQC’s regulatory programs. This has, to some extent, broken down that “Chinese wall” between the regulators and Center staff. To what degree and in what form the role of the Center will change is still evolving, but there is no question that P2 will continue to expand its reach as compliance assistance expands its efforts within EQC.

For those facilities that are in compliance and have consistently maintained a superior environmental track record, opportunities to move beyond compliance exist through P2, EMSs, environmental leadership programs, and innovations. Like the EPA’s integrated strategies, these concepts are intertwined with the South Carolina Environmental Excellence Program and the South Carolina Environmental Innovations Pilot program.

The Environmental Excellence Program was created in 1996 to recognize and reward South Carolina facilities that demonstrated a commitment to superior environmental performance. Application for membership depends on a demonstration of P2 and conserving natural resources and energy. Membership may also be granted if a facility has an active EMS. To date, over twenty-five facilities participate in the Environmental Excellence Program.

The Environmental Innovations Pilot program was authorized by legislation enacted in June 2002. It is designed to test and demonstrate innovative approaches to environmental compliance through cooperative agreements between the participating facilities and DHEC. Up to ten cooperative agreements may be entered into by the agency. These agreements are designed to allow operational flexibility to achieve greater environmental results than would otherwise be achieved through existing regulations. To date, DHEC has finalized one innovations agreement with International Paper’s Georgetown Mill. One of the requirements for selection as a participating pilot facility is the presence of, or a commitment to implement, an EMS.

DHEC is continuing to look closely at the use of EMSs to achieve greater environmental results with regulated facilities. Recently, the EPA awarded a grant to DHEC to study the use of EMSs in the permitting process. This is part of a broader objective to see how EMSs can fit into the overall regulatory framework.

The future
The future direction of environmental regulatory actions will be performance-based and results-oriented. Increased pressure is being placed on the state to show how it is using limited federal and state resources most effectively and in ways that achieve measurable environmental results. Measures of success will be outcome-based. Have we helped facilities better understand regulations? Have we changed the behavior of facilities such that tangible human health and/or environmental benefits were achieved? Have we reduced the amount of pollutants or contaminants entering the environment? Through an integrated, strategic approach that combines “smart” enforcement with compliance assistance as well as opportunities to move beyond compliance through P2 and environmental innovations, we believe and expect we will achieve greater environmental results for South Carolina.

Robert W. King, Jr., is the deputy commissioner of Environmental Quality Control at SC DHEC. Claire H. Prince is the director of Enforcement and Compliance Assistance with Environmental Quality Control Administration at SC DHEC.
Since its conception in the late 1980s, pollution prevention (P2) continues to struggle to become the environmental management approach of choice for all organizations that use natural resources, consume energy, and generate solid and hazardous wastes. It has become increasingly clear over the years that P2 programs have been refocusing efforts to anticipate and meet new environmental challenges and maintain relevancy into the future in order to remain the service provider of choice. The evolution of successful P2 programs has been a process of finding new ways to work with organizations, while accepting a realistic level of public awareness and involvement as a driver for environmental performance and P2 results.

With the exception of environmental activists and citizens directly impacted by industry activities (e.g., those living near chemical or wastewater plants), mainstream America is essentially apathetic about environmental issues and P2. Consumers continue to have little impact on what gets done environmentally from a broader, societal perspective. This is based on the fact that being a driver of change requires a certain level of environmental awareness, interest, and effort, largely lacking in the public. Unfortunately, environmental concerns are just one thing competing for attention and it falls very low on the average American’s priority list. This isn’t surprising when one considers the range of other significant factors competing for an average American’s attention today—from the struggling economy to other pressures of everyday life such as job security, making sure dinner gets on the table, and taking the kids to soccer practice. While this establishes the public as a target for P2 awareness efforts, the lesson learned for the future is that environmental initiatives that require extra effort, a conscious decision, or extra cost on the part of the consumer are not likely to advance very far. More environmental courses with a P2 focus are emerging in all levels of the education system and, in the future, people may have a better understanding and appreciation for P2 in the workplace and as consumers. For now, responsibility for P2 and environmental achievements must rely largely on the evolution of P2 programs and an organization’s ability to transparently incorporate environmental improvements into products and services without a loss in product performance or an increase in cost.
Defining P2
The evolution of P2 programs has been a progression from “grass roots to suits”—a cycle of P2 culture developed at the local level that has moved to the centers of political leadership—hopefully for continued acknowledgment, funding, and respect. In the beginning, the mission and goal for state P2 programs was to help organizations prevent or eliminate environmental challenges on the front end rather than managing them at the end of the pipe. Initially, it was definitions and meanings (e.g., What is P2? What does P2 mean?). P2 programs were bogged down with numerous iterations of the P2 definition, which sparked significant debate over interpretation. Finally, we had it—almost. The Pollution Prevention Act of 1990 defined source reduction as “any practice that reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment or disposal.” The act embraced a multimedia approach and went further to explain that P2 meant feedstock substitutions, process and equipment modifications, product reformulation, and management practices or housekeeping alterations. The most significant breakthrough for me was the Environmental Protection Agency memo that stated: “P2 can also be defined as source reduction and other practices that reduce or eliminate the creation of pollutants through: increased efficiency in the use of raw materials, energy, water or other resources; or, protection of natural resources by conservation.” For the first time, it seemed that P2 programs could focus on overall resource management and contain or reduce cross-media pollution.

Still, P2 programs needed a coherent and coordinated approach to environmental management and supported P2 planning and programs for organizations. Several states required P2 plans, while the rest adopted voluntary P2 plans and programs. P2 programs were challenged by the principle that P2 plans and programs were voluntary and not a regulatory requirement. The P2 programs’ role was promoting and cheerleading to inform organizations about the benefits of incorporating P2 policies. Alternative measures, such as governor’s P2 awards and environmental leadership programs, served as drivers for organizations to implement P2.

Key elements of P2 plans and programs included a P2 policy, waste assessments, development of options, opportunities and champions, setting goals, and measuring results. P2 fact sheets, checklists, and anecdotal stories for different sectors multiplied, and P2 programs focused on being brokers of P2 information through training and other media. During this period, many P2 programs and organizations felt that the easily implemented and cost-effective P2 techniques and methodologies were put in place—the “low-hanging fruit” had been picked. Unfortunately, the truth is that there is lots of low-hanging fruit still to be picked or lying on the ground rotting. For P2 programs to continue to evolve and succeed, P2 practitioners must accept the challenge of training and assisting organizations to be “better and higher fruit pickers.” P2 programs, such as the Kentucky Pollution Prevention Center (KPPC), continue to expand and embrace other emerging global environmental concepts such as sustainability, eco-efficiency, and cleaner production to help maintain the ongoing P2 evolutionary process.

Setting the Stage for a Paradigm Shift
The early focus for P2 programs was minimization. This minimization perspective was seen in P2 assessment reports as opportunities for reduction in the use and losses of materials, water, and energy. However, many organizations focused their perspective on optimization—increased market share, reduced setup and cycle time, reduced defect and reject rates, and improved flexibility of production. This apparent divergence of perspectives actually moved P2 programs into a new phase of evolution by forcing them to consider integrating P2 into existing programs within an organization. For example, how does P2 fit into productivity enhancement, quality management systems, preventive maintenance, inventory control, and product development? The stage was set for a P2 paradigm shift—a change in our programs’ basic beliefs in order for there to be a major P2 breakthrough for our customers. The old paradigm could be described as investigation and implementation of P2 projects, usually accomplished with a champion from the organization’s environmental department. The new paradigm called for long-term organizational change and an integrated systems approach that involved employees from a variety of the organization’s departments.

The old P2 paradigm of investigation and implementation focused on setting up P2 programs, establishing new channels of communication, and implementing existing P2 opportunities. The long-term change paradigm began with a focus on integrating P2 with existing programs, using existing channels of communication, and preparing for, and initiating,
new P2 opportunities. While the initial focus was on information transfer, changes occurred that began to give way to information analysis and moved from creating P2 awareness to promoting action. The initial premise for using P2 program services for P2 projects was built on trust, but long-term change in an organization required increased credibility of the program and its practitioners. Overall, the shift was from modifying existing activities to modifying the contexts and framework for manufacturing design, production, shipping, and after-life of products and services.

The P2 assessments also became more integrated in examining systems and practices to ensure that P2 strategies were tailored to an organization’s objectives and targets. The integrated P2 assessment investigated management’s goals and policies; organizational structure; amounts and types of planning; and perspectives on current operations to determine management’s commitment, priorities, and triggers for P2 implementation. Purchasing and procurement methods and relationships with suppliers and quality assurance were examined more closely to determine the potential for more coordination and to establish a policy for environmentally preferable purchasing. Support functions and services within an organization were better scrutinized for cost accounting and overhead allocation, the capital budgeting process, training programs, and the quality program’s methods and tools used by the employees. This information provided a more accurate cost for environmental management, a clear picture of the quality of resources available for P2 planning and implementation, and ways to integrate P2 into quality improvement efforts. At this point, P2 programs were performing P2 assessments that would soon be recognized as Environmental Management System (EMS) gap audits.

**Promoting the EMS**
The use of the EMS by P2 programs has slowly emerged and now proves to be an effective operational tool for promoting and achieving P2 objectives and targets. KPPC has promoted the EMS “systems approach” for seven years as a framework for organizations to use to implement P2 and energy efficiency (E2) concepts and projects through continual improvement. The EMS has also evolved through lessons learned, but started initially aligned to the elements of ISO 14001. The initial focus for P2 programs was to get management’s attention and commitment to implement an EMS because, without it, an EMS is not possible. The mantra was “environmental management system,” and leadership responded to the concept of improved environmental compliance and performance. Once an EMS is adopted, employee involvement is a must. However, the employees’ concept of the EMS initially was “environmental management system,” and they felt the environmental staff was responsible for implementing and maintaining the system. In order to get their involvement and commitment, the long-term viability of the organization to survive was tied to overall environmental performance, economic productivity, and individual and community needs—the “three legs” of sustainability. This stage of EMS evolution was called the “sustainability management system,” and it recognized the need for sustainability as a core value that drives the long-range strategy for continual improvement of resource management and the ability to exist. Sustainability is a criterion for determining the significance of an organization’s environmental impacts and resource management.

KPPC’s latest version of an EMS is the “Environmental Sustainability Management System” (ESMS) that recognizes the need for sustainability as a core value that drives long-term strategic planning and resource management and uses the EMS as the operational tool to achieve annual environmental objectives and targets. Think of an ESMS as a construction project: Sustainability is the structure you want to build; the sustainability strategy is the blueprint; the EMS represents the construction codes and standards; P2 and E2 are the choices to use the highest quality materials; and compliance is the foundation. Sustainability is the overriding environmental goal for P2 programs and “higher fruit pickers,” and the environmental management systems approach is the framework for meeting P2 challenges.

**Bringing in Technology Diffusion**
About the same time the EMS emerged as an operational tool, P2 programs began to implement technology diffusion to promote the use of innovative P2 technologies. Technology diffusion is a method used to achieve adoption of P2 solutions that are commercially available but have not achieved widespread market penetration. Organizations need technology education assistance to create P2 technology awareness and promote understanding of technical principles. Therefore, P2 programs began offering this type of support to address uncertainty issues associated with how to implement the technology. This is often accomplished through demonstrations
and pilot trials. This P2 program method is based on the University of Illinois Waste Management and Research Center’s (WMRC) successful Accelerated Diffusion of Pollution Prevention Technologies (ADOPT™) program.

A technology diffusion initiative extends the P2 assessment phase into more in-depth data gathering, better identification of proven P2 technologies for organizations, and continued technical assistance during the implementation phase of the project. A primary goal of the technology diffusion approach is to document barriers to the implementation of innovative P2 technologies and to document how those barriers were overcome. The P2 programs that offer this type of assistance focus on several sectors, such as metal-finishing, printed circuit boards, painting and coatings, and reinforced fiberglass plastics. The P2 programs using this approach provide on-site technical assistance to the organizations before, during, and after implementation of these P2 opportunities. Again, a special effort is made to assist in a cost/operational justification and in the documentation of barriers addressed, and to ensure an adoption commitment. It is important to mention that the principles of technology diffusion also apply to idea-based innovations, such as an EMS and chemical management service programs.

Looking Ahead at P2
In the future, survival and competitive advantage will move P2 programs into product life-cycle assessment, design of sustainable products, and product stewardship. P2 programs must work with organizations to design and develop products that not only result in minimal environmental impact when manufactured, but also have a minimal environmental impact when disposed of. Europe leads the way in this area and provides good examples of what must be done. European white goods manufacturers demonstrate the design-to-disposal life-cycle approach by: using paints with no more than 5 percent (by weight) organic solvents; using no cadmium, chrome, nickel, or nickel compound plating; using plastics containing no substances based on cadmium, lead, mercury/mercury compounds, or chlorinated/brominated paraffins; using plastic parts labeled for ease of recycling at end-of-service life; requiring a plan that describes a method and estimates costs of disposing of white goods at end-of-service life; and packaging materials with no additives containing metals.

In the future, it will become increasingly important for P2 programs and organizations to understand that it is more effective to prevent environmental damage and to prove there is no safer way of proceeding in production of products, a guiding principle of cleaner production. This will require an integrated approach for resource use and consumption and an understanding that environmental risks cannot be shifted among workers, consumers, or media—land, air, and water. This multimedia approach to P2 will ensure that source reduction of wastes occurs, not just cross-media pollution where, for example, pollution control techniques remove air pollutants only to place them in water or solid waste streams.

In the post-9/11 era, P2 programs have an extraordinary opportunity to evolve and make a unique contribution to homeland security and provide a new driver for P2 implementation. The time to design and implement a more preventive, risk-reduction approach based on P2 protecting human health, the environment, and the community is now in this new arena of environmental security. P2, E2, and EMS audits can be expanded into vulnerability assessments by adding cyber security into the process. Using P2 methods, such as substituting less-toxic materials in production, environmentally preferable purchasing, and process modifications, will result in organizations having less hazardous material and waste on-site and, therefore, a reduction in vulnerability. This preventive approach will gain in popularity as organizations realize that simply responding to incidents as they happen may not be the best approach for protecting the environment, human health, and the community.

The job of informing and involving interested stakeholders in P2 requires constant attention and change. Change management is the focus of many P2 programs’ new initiatives, starting with EMSSs, E2, design for the environment (DfE), and environmental security. While P2 programs have accomplished a great deal through their evolution, there are still many challenges ahead in defining sustainable development within the context of P2. Through partnerships and P2, we can turn the considerable potential for sustainable development concepts into reality and success. Please continue to support and expand our P2 programs’ efforts to reduce the generation of all wastes and the use of toxic chemicals, to improve resource conservation, and to expand environmental security through P2.έēśě

Cam Metcalf is the executive director of the Kentucky Pollution Prevention Center at the University of Louisville.
How the Environmental Excellence Movement Is Being Driven by the EMS Concept

Phillip E. Barnes, Ph.D.
Continual improvement of environmental management techniques and tools has been ongoing for many years due to environmental regulatory requirements. Industry’s first response to those regulations was to put together environmental management programs that monitored processes related to regulations. During the development of environmental management tools to assist in staying in compliance with regulatory requirements, regulatory management systems were created. The need for better management practices evolved into informal environmental management system (EMS) programs, mainly for regulatory compliance.

Through the development of a management systems approach to meeting regulatory requirements, managers often found benefits in other ways, such as reducing operational costs or creating additional revenue streams through recycling or material reuse.

Using a systems approach to environmental management has been enhanced by national and international organizations whose memberships are usually a mix of public- and private-sector representatives. These organizations have been the key factors in demonstrating the importance of an EMS foundation in building environmental excellence programs.

This article discusses the increase in EMS implementation through initiatives of public- and private-sector organizations. It also gives a description of the EMS progress in each sector, along with examples of organizations that have implemented the EMS.

Environmental Excellence and EMS

How does an organization achieve environmental excellence? Is it ever achieved? The South Carolina Environmental Excellence Program (SCEEP) is “a voluntary program for companies committed to continuous environmental improvement in order to protect and preserve South Carolina’s environment” (SCEEP, 2004). In meeting this requirement for continuous improvement, companies have two options for demonstrating they have environmental programs in place that strive to continually improve their organizations’ operations. As shown in Table 1, the SCEEP requires the organization to have in place either a program that encompasses a management systems approach to environmental management, or an environmental excellence plan that shows a commitment to include an EMS.

Other state environmental excellence programs (EEPs) are similar to the SCEEP. The environmental excellence program is supported by the Environmental Protection Agency and based on the principles established through the Environmental Council of States and the EPA in 1998 (Virginia’s EEP, 2004).

The major point here is that no matter the state or the private industry program, the EMS is the foundation of environmental excellence. Whether the EMS is based on ISO 14001 (an international standard), the EPA’s Code of Environmental Management Practices (CEMP), or an industry-specific EMS such as the American Textile Manufacturers Institute’s Encouraging Environmental Excellence (E3) program, it follows the continuous improvement cycle of Plan-Do-Check-Act (PDCA), sometimes called

| Table 1 |
| Criteria for Demonstrating Environmental Excellence in S.C. (SCEEP, Website Application for Membership) |

| A. Submitting documentation of registration, certification, or active participation in a national, regional, or state recognized program or project (e.g., ISO 14001, ATMI E3 program, CMA Responsible Care program, AF&PA Environmental Health, and Safety Principles) that encompasses the objectives set forth in Section B; or |
| B. Submitting an environmental excellence plan signed by the company’s corporate officer or by the facility’s plant manager that includes: |
In the 1950s, W. Edwards Deming proposed that business processes should be analyzed and measured to identify sources of variations that cause products to deviate from customer requirements. He recommended that business processes be placed in a continuous feedback loop so that managers can identify and change the parts of the process that need improvements.

**PLAN**: Design or revise business process components to improve results.

**DO**: Implement the plan and measure its performance.

**CHECK**: Assess the measurements and report the results to decision makers.

**ACT**: Decide on changes needed to improve the process.

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**EMS Model**

- Policy
- Management Review
- Implementation
- Checking Corrective Action
- Planning

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The Deming or Shewhart cycle. Simply, PDCA is the scientific method for continual process improvement. Table 2 shows the original Deming PDCA model and the EMS model based on PDCA.

Deming’s PDCA was first used in manufacturing for quality improvement and in the first ISO Quality Management System (ISO 9000 Series). The PDCA was applied to the ISO 14001 EMS standard in its development in the 1990s and is included in the standard’s documentation, as well as in the majority of all EMS models. The EMS policy statement is the driver for the EMS PDCA.

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Table 2

**The Plan-Do-Check-Act Cycle**

(Balanced Scorecard, 2004) *(The EMS Model, ISO 14001, 1996)*

In the 1950s, W. Edwards Deming proposed that business processes should be analyzed and measured to identify sources of variations that cause products to deviate from customer requirements. He recommended that business processes be placed in a continuous feedback loop so that managers can identify and change the parts of the process that need improvements.

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**EMS Model**

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A virtual clearinghouse, it is specifically designed to aid local, county, and state governments that are considering implementing or have implemented an environmental management system (EMS) and want to access the knowledge and field experience of other public entities that have done so.

Public entities are increasingly pressured to manage their operations in a better, cheaper,
faster, safer and greener manner. Environmental management systems provide the tools and processes that can help organizations make decisions that are both environmentally and economically sound (EPA PEER Center, 2004).

As federal and state agencies promote EMSs and put programs in place to assist their facilities in implementing an EMS, many other public and private organizations are involved. One example is the U.S. Department of Defense (DOD). The DOD partnered with the EPA in 1997 in a pilot program of sixteen DOD installations that included the Army, Air Force, Navy, and Marines. This pilot program also brought in other stakeholders to be included in EMS communication and objectives and targets. In 2001 through 2003, each of the DOD service branches began developing guidelines for EMS implementation in all appropriate installations in states across the U.S. As DOD installations implement their EMS programs, other state and local entities become involved, such as the state and local regulatory agencies and institutions of higher education. Therefore, the signing of one executive order has promoted and driven the EMS implementation and environmental excellence programs into thousands of organizations. For example, most federal agencies now have in place, and will continue to make more demands on, contractors and suppliers to implement an EMS, continuous environmental improvement and environmental excellence is an automatic benefit to the organization, the community, and the state(s) where their facilities are located.

The Increase in EMS Implementation—The Private Sector

Although the ISO 14001 EMS has become the most known and used EMS model for various types of organizations, when the standard was published in 1996, it was mainly used by manufacturing and process related industries. Based on the popular ISO 9000 Quality Management System series published in 1987 and revised in 2000, the ISO 14001 standard could be implemented by most manufacturers and linked to already existing management elements, such as training, document control, records, operational control, corrective action, auditing, and management review.

The ISO 14001 EMS was the second ISO management system standard published. It was quickly implemented by European multinationals, and it slowly began to be implemented by U.S. companies due to competitive factors. As multinational companies implemented the standard, they saw benefits for suppliers to implement the standard, too.

The ISO 14001 standard defines an EMS as:

A structured framework of environmental management that includes organizational structure, planning activities, responsibilities and authorities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the organization’s environmental policy (ISO 14001,1996E).
The principles of ISO 14001 (Table 5) are based on the PDCA and, although the terminology is changed for the industry sector adopting the standard, the requirements are the same.

Table 5
Basic requirements of ISO 14001 EMS

The basic requirements of ISO 14001 are that the EMS incorporate the following principles:

**Environmental Policy** containing the commitment of management to regulatory compliance, continual improvement, and prevention of pollution. This policy is to be made available to the public.

**Planning** to identify the environmental aspects associated with the organization’s operations, set objectives, and develop a management plan.

**Implementation and Operation** addressing responsibilities, training, communications—both internal and external—documentation, document control, operational control, and emergency preparedness/response.

**Checking and Corrective Action** that measures and records achievement against the planning goals, identifies and tracks correction of deficiencies, and reviews the effectiveness of the EMS.

**Management Review** to monitor the program and make corrections when appropriate.

The principles of ISO 14001 (Table 5) are based on the PDCA and, although the terminology is changed for the industry sector adopting the standard, the requirements are the same.

There are many examples of companies implementing ISO 14001 in their facilities worldwide. With each multinational company requiring its facilities to implement ISO 14001, the result is that hundreds of facilities throughout the U.S. are implementing and developing a program for continuous improvement and environmental excellence.

For example, many of the first U.S. companies to implement and register to the ISO 14001 EMS standard were automotive manufacturers. Ford Motor Company was the first automotive company to register all of its manufacturing facilities worldwide to the ISO 14001 standard. In 1999, Ford also became the first U.S. automaker to require ISO 14001 EMS certification of all of its suppliers and manufacturing facilities. This requirement, which applies to about 5,000 organizations worldwide, began with “calls for suppliers to certify at least one manufacturing site by the end of 2001. The requirement also states that all of the suppliers’ manufacturing sites shipping products to Ford must be certified by July 1, 2003” (CSRwire, 2001).

A survey response from 113 organizations in a poll that asked, “Is it important that your suppliers implement ISO 14001?” 32 percent currently required or would require EMS by suppliers in the next two years, 17 percent would require ISO 14001 EMS by suppliers in the next two to five years, and 17 percent were considering requiring suppliers to implement ISO 14001 or a similar EMS (ISO 14000 Information Center, 2000).

Some multinationals—such as BMW, Philips Electronics, and Dow Chemical—registered their facilities to the ISO 14001 EMS, but required or encouraged their suppliers to conform to the ISO 14001 EMS only through self-declaration, not through a formal registration. Verification of conformance to the ISO 14001 EMS was usually done through an independent auditor, or through the supplier’s customer organization.

According to Reinhard Peglau, Federal Environmental Agency, Germany, as of December 2003, there were 61,287 organizations in the world registered to the ISO 14001 standard—3,447 of those were in the U.S. Significant growth of EMS implementation based on the ISO 14001 standard began in 2001. In private industry the market was the main driver, and many companies saw the EMS as a part of their business system. “Cost, efficiency, productivity, and environmental performance, all become part of the same decision-making process” (Wolfe, 1997, p. 18).

Since ISO 14001 is a voluntary EMS standard, it is the market, the hope of regulatory benefits, and the liability issues that are placing the EMS as a required environmental management tool for business sustainability in today’s global market. In the process of managers making sure they stay competitive in their market, they are implementing an EMS tool that will change their environmental management culture and build the foundation for environmental excellence.

**Conclusion**

The EMS movement is catching on and organizations in the public and private sectors are using EMS as the basic foundation for achieving environmental excellence.

Significant growth of EMS implementation began in 2001. The major reasons for EMS implementation were increasing or keeping market share,
The major reasons for EMS implementation were increasing or keeping market share, reducing liability, and demonstrating environmental stewardship. In the past three years, managers in various types of organizations have found that the EMS is a key ingredient in the overall business management system. Due to the increasing requirements in some industry and government sectors for EMS implementation, environmental managers and company executives are realizing that the EMS is built on continual improvement. In the Plan-Do-Check-Act cycle, the EMS allows the organization to put resources into improving management practices, thereby allowing better protection of the environment while increasing business efficiency.

Although there are different models of EMS structure, they are all built upon continuous improvement of the management system, which provides the potential for improved environmental performance.

The ISO 14001 standard has been the catalyst for EMS implementation and the driver for environmental excellence. The military branches of the DOD are using the ISO 14001 EMS as the model for their installations. Many public organizations that are not registering to the ISO 14001 EMS are using parts of the standard’s requirements, or developing an ISO 14001–like EMS.

The EMS has been and will continue to be the driver for environmental excellence. The basic EMS, such as ISO 14001, has several other supporting and guidance standards that provide an organization with the ability to continually improve its environmental management program. Based on continuous improvement of the EMS, achieving and maintaining environmental excellence is an ongoing process that will continue to be an important ingredient in an organization’s sustainable development.

Phil Barnes is a research professor at USC’s School of the Environment.

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Uncertain, at first, of the most effective format and the most appealing environmental topics, we allowed the magazine to evolve as we listened to our readers and gained our footing. In 1993, South Carolina Senator J. Verne Smith, who was instrumental in forming the Hazardous Waste Management Research Fund, wrote the introduction to the first issue of $P_2$SC: Pollution Prevention in South Carolina.

When we created the Hazardous Waste Management Research Fund and the Center for Waste Minimization, the General Assembly sought to build a strong partnership between industry, our academic resources, and government. This partnership will further our common goal to eliminate new pollution and to find more efficient ways to clean up existing problems.

It is my hope that $P_2$SC will be an important part of the answer. It will explore problems, summarize important research efforts, highlight successes, and identify resources that are available to you.

Has this magazine lived up to its promise and expectations? We’ll leave such judgments to more objective souls. Nevertheless, a look back at eleven years of our articles and themes might uncover the evolution, not only of the magazine, but also of the P2 concept.

Pollution Prevention
‘Our Common Goal’
A $P_2$SC/E$_2$SC Retrospective

Eric H. Snider, Ph.D, P.E., and Hans VanderKnyff
The Early Years

The inaugural issue of $P_{2}SC$ arrived in readers’ mailboxes in the spring of 1993. While subsequent issues of the magazine were, for the most part, centered on specific themes, the contents of the first issue did not adhere to any particular unifying concept other than the underlying one of P2. Uncertain, at first, of the most effective format and the most appealing environmental topics, we allowed the magazine to evolve as we listened to our readers and gained our footing.

And our readers responded loudly right from the beginning: “The magazine is too big to fit in an inbox or file folder!” they told us. We listened. We were contractually obligated to the printers for four issues of the larger size, but, after those issues were published and mailed out, we reduced the format to a more manageable size.

That first issue covered, in part, the elimination of chlorofluorocarbons (CFCs) at NCR’s Workstation Products Division in Clemson (which has since closed its doors). Joel Hirschhorn contributed a philosophical article titled “Pollution Prevention for Business Success,” a notion that became an underlying premise for most of the magazine’s history. Other articles in that issue included a profile of a Spartanburg dry cleaning firm, and the first installment of a three-part story on conducting a P2 audit. A mixed bag, to be sure, but the intent—in part—was to show that P2 could help “the little guy” as well as the big companies.

The themes for the five-year run of $P_{2}SC$ included the following:
- P2 in the electroplating and metal finishing industry
- P2 in the vehicle maintenance industry
- Remediation
- Air quality
- Solvents
- TQM and QEM
- Working with a P2 consultant
- P2 in the textile industry
- True cost accounting
- Environmental considerations in global competitiveness
- P2 at federal facilities in South Carolina
- South Carolina researchers in P2
- The regulatory side of P2
- Waste management options for used fluorescent lamps

If requests for reprints serve as a valid indication, the “true cost accounting” issue was the most popular one in our magazine’s publishing history.

In the Summer 1998 issue, we published a retrospective article covering the first five years of the magazine. It presented the highlights of those first years, mostly through excerpts from articles.

That retrospective issue represented the last issue of $P_{2}SC$; henceforth, the publication would be known as $E_{SC}$: Environmental Excellence in South Carolina. The new title captured the fresh focus we wanted to take and allowed us to explore beyond the strict confines of P2. The article you’re reading right now serves as another, and final, retrospective—this one of the $E_{SC}$ years, 1998 through 2004.

Looking Beyond P2 Ron DeHollander, corporate environmental protection manager for the KEMET Electronics Corporation and a long-time supporter of the magazine, contributed a “Guest Commentary” column to $E_{SC}$’s first issue: “I have observed,” he wrote, “that the issues reflected and discussed in $P_{2}SC$ over the past five years really provide a mirror image of the kinds of activities that have been going on within our company.” We took comfort in that sentiment, knowing we had struck a responsive chord in at least one industry.

Making sure we kept a firm footing in P2, we set out in new directions. $P_{2}SC$ had passed the baton to $E_{SC}$.

The inaugural issue of $E_{SC}$ stretched its newfound wings and, among other topics, looked at energy conservation and the abatement of environmental noise.

“While energy conservation has always been a component of pollution prevention,” read the first article, “little attention has been paid to it under existing pollution prevention programs.” Energy conservation offers one effective means toward reducing pollution. The other article referred to environmental noise as “the invisible pollutant.” “Protecting the health of the population is and continues to be the primary motive of all public efforts to control individual and community exposure to noise,” according to that article. Clearly, “noise pollution” represented a clean break from the traditional P2 we had been covering.

Continuing to enjoy the freedom of the magazine’s greater scope, the Winter 1999 issue offered two articles dedicated to the new generation of landfills. In accompanying articles, DHEC talked to $E_{SC}$ about solid-waste issues in the state, and the Recycling Market Development Advisory Council’s
Ted Campbell wrote about, well, the development of recycling markets, a vital issue in South Carolina. Once again, the magazine’s focus was shifting from its strict hazardous waste mandate.

A key environmental issue today is sustainability, and the Spring 1999 issue carried that topic as its theme. As then-Governor Jim Hodges wrote in the “Guest Commentary”:

As we move into the next century, the need for innovative thinking and new approaches to environmental issues becomes increasingly important. The “old ways” of doing business—in both the private and public sectors—no longer suffice in the new global economy, nor can they contribute to sustainable growth.

In another departure from the magazine’s original mission, the Summer 1999 issue took its readers on a tour of constructed wetlands, those “natural waste treatment facilities.” The following issue focused on the environmental management system, an increasingly important topic in the environmental arena.

Volume 2, Number 2—yes, we also changed our numbering system—covered the topic of “metrics for P2 measurement.” The articles included Tenneco Automotive’s Pollution Prevention Index and Carolina Power & Light’s Environmental Index, along with an overview of biometrics for use in wastewater management.

We then looked at “emerging trends in remediation,” a topic that took us back to the realm of hazardous waste. Conversely, the next issue took us into new territory again as it explored “community involvement in environmental excellence.” The articles covered the Neighborhood Environmental Partnership, communicating risk and dealing with the news media, Phinizy Swamp Nature Park, wildlife habitats, and community involvement in the Superfund process.

Under the banner of “Broadening the Reach of Environmental Excellence,” we reached for the sky and explored the ever-growing problem of light pollution—the use of excessive or misdirected outdoor lighting. In another departure from hazardous waste, a later issue covered the recycling and reuse of construction and demolition debris, a waste that has no business taking up diminishing, expensive landfill space. It’s a recyclable resource that’s simply being discarded.

Volume 4, Number 1, offered a close look at the recycling and proper disposal of batteries. With society’s ever-increasing reliance on electronics, e-waste and batteries represent major waste streams and a great environmental concern. Billions of batteries are bought, used, and discarded every year.

In a return to the magazine’s roots, the following issue explored the effective management of chemicals and materials. We glanced inside Tenneco Automotive’s chemical storage building, stopped by Fort Jackson’s Paint Reissue Center, and visited Charleston Air Force Base’s HAZMAT pharmacy. The issue also reviewed South Carolina’s Dry Cleaning Restoration Trust Fund. Rounding out that issue was a close look at Naval Weapons Station Charleston’s melding of that facility’s Hazardous Substance Management System and Geographic Information System, a setup that gives it superb control over its hazardous materials.

“Water quality” formed the theme for Volume 4, Number 3. One article described how a South Carolina charitable organization designed, built, and distributed water purifications systems to parts of the world that desperately need them. Another article explained the use of ozone injection to clean up contaminated groundwater at a former dry-cleaning site at Hilton Head. An idle industrial waste treatment plant, reported in another article, saw new life as the most technologically advanced centralized waste treatment facility in the Southeast. That issue of E2SC was rounded out by articles about the Reedy River Master Plan Project and Total Maximum Daily Loads (TMDLs).

A later issue focused on natural resources, another departure from the original hazardous waste mandate. And, finally, the most recent issue of the magazine paid tribute to the winners of the 2003 South Carolina Governor’s Pollution Prevention Award.

Closing thoughts
What conclusions can we draw from this magazine’s eleven-year publication run? For one thing, the concept of P2 has evolved to embrace the broader concepts of environmental excellence and sustainability. E2SC has tried to stay abreast of this evolution. For another, the lengthy run supports the view that a real need existed for a periodic publication that was geared to environmental professionals. We hope we’ve made a difference. E2SC
master index

P₂SC and E₂SC

This master index covers all issues of P₂SC: Pollution Prevention in South Carolina (spring 1993 through summer 1998) and E₂SC: Environmental Excellence in South Carolina (fall 1998 through present). It lists all of the feature articles and selected columns.

### P₂SC–Spring 1993
NCR’s ‘No-Clean Solution to Elimination of CFCs • Pollution Prevention for Business Success • This Dry Cleaner Cleans up the Environment • Conducting a Pollution Prevention Audit: Part One • The Waste Reduction Resource Center • Is Voluntary Pollution Prevention a Viable Alternative to Regulation as a Means of Improving Environmental Quality? • The Pollution Prevention Act of 1990: Setting the Stage for the Future • The Southeast Waste Exchange • Tips for the Dry Cleaning Industry.

### P₂SC–Summer 1993
Electroplating and Metal Finishing
Meco USA: Cleaning up an Industry • Source Reduction Opportunities in the Plating Industry: Part I • Electroplating Wastewater: Pollution Control and Regeneration • Conducting a Pollution Prevention Audit: Part Two • Water Quality Criteria • South Carolina Restrictions on Wastewater from Electroplating Operations • A Management Look at Pollution Prevention • Tips for the Electroplating and Metal Finishing Industry.

### P₂SC–Fall 1993
Pollution Prevention at KEMET: Doing It because It’s Right • A Look at the Environmental Side of State Restructuring • Waste Minimization Makes Sense and Dollars • Conducting a Pollution Prevention Audit: Part Three • Economics of Pollution Prevention • KEMET’s Environmental Philosophy • Necessity and Satisfaction.

### P₂SC–Winter 1994
The Vehicle Maintenance Industry
A Profile of the Vehicle Maintenance Industry • Waste Minimization Opportunities for Transportation-Related Wastes • Floor Drains and the Environment • Recycling: Why Should I Bother? • Professor Helps Lead Charge to Better Batteries • Recycling at Your Fingertips • Key South Carolina Regulations Pertaining to Automotive Wastes • Source Reduction Opportunities in the Plating Industry: Part II • Tips for the automotive maintenance industry.

### P₂SC–Spring 1994
Remediation
Tips on collecting and disposing of used motor oil • Subsurface Cleanup: A Look at Five Remediation Technologies • Bioremediation: A Natural Process Technology to Treat Freshwater Contamination • The Limitations of Pump-and-Treat Systems in Ground-Water Remediation • SUPERB Program Aids Underground Storage Tank Cleanups • The South Carolina Used Oil Partnership • Waste Minimization Programs: EPA Takes an Aggressive Approach.

### P₂SC–Summer 1994
Air Quality
DHEC Talks about Federal Title V Air Permits: Part II • Ozone in South Carolina • Controlling the Cost of Compliance: Accidental-Release Prevention Programs under OSHA and the Clean Air Act • Legal Considerations in Title V • Solid Waste Reduction at MEMC Electronic Materials, Inc. • Should States or Regions Set Clean Air Rules? • Bob Burgess Heads the Center for Waste Minimization • The Enhanced Monitoring Program: Some Thoughts from the Regulated Industry Perspective • A Quick Guide to Selected Federal Environmental Legislation • Promoting Pollution Prevention in the Textile Industry.

### P₂SC–Winter 1995
Solvents
Solvents: The Alternatives • 3M Company–Greenville Site: Award-Winning Success in Reducing Solvent Emissions • Pollution Prevention at 3M: An Overview • 3M’s Corporate Environmental Policy • Savannah River Site Explores Solvent Solutions • Savannah River Site • SRS Solvent Pollution Prevention Successes • Replacing Solvent Cleaning with Aqueous Cleaning at Bosch, Charleston • A Conversation with the Manufacturing Engineer at Robert Bosch Corporation, Charleston • What Is DHEC Doing about Solvents? • Common Sense Initiative Selects Six Industries for Comprehensive Review.

### P₂SC–Spring 1995
TQM and QEM
The First Two Years: Looking Back through Our Readers’ Eyes • Total Quality Management: A Framework for Pollution Prevention • TQM: Findings and Lessons • General Electric Company Medical System Business Group, GE Magnet Systems–Florence, South Carolina • The Quality Answer to Environmental Compliance, Paula Keener-Chavis.

### P₂SC–Summer 1995
Working with a P2 Consultant
Working with a Pollution Prevention Consultant • Selecting a Consultant • Fluorescent Lamps: Watt’s the Scoop? • A Follow-up with 3M Company’s Greenville Site • The WCRSA Award: Recognition for Your Pollution Prevention Efforts • An Update on the Joint Industry/University Textile Project • SERA: A New Face on the Environmental Scene • Another Option: DHEC’s Center for Waste Minimization.

### P₂SC–Fall 1995
P2 in the Textile Industry
South Carolina’s Textile Industry: Committed to Environmental Excellence • Solid Waste Reduction at Springs Industries • Pollution Prevention in the Textile Chemical Industry • Land Application of Textile Biosolids: North Carolina’s Experience • Equipment Maintenance: Another Dimension to Pollution Prevention • Monitoring and Maintaining Textile Effluent: A Case Study • The Current Trend: Reducing the Consumption of Electric Power • 1995 Governor’s Pollution Prevention Award • 4th Symposium Considers Future Environmental Directions.
P,SC–Winter 1996 True Cost Accounting
The Benefits of Environmental Protection and Business Decisions • Accounting and Capital Budgeting for Pollution Prevention • Environmental Economics; What’s the Bottom Line? • Benchmarking Corporate Environmental Accounting • Set up a Waste-Accounting System to Track Pollution Prevention • Life-Cycle Assessment: Reducing Costs and Improving the Environment • Life-Cycle Assessment: An Evolving Environmental Management Tool • In Situ Remediation of Soils Contaminated with Solvents and Chlorinated Aromatics Using Microwave Energy.


P,SC–Summer 1996 Environmental Considerations in Global Competitiveness
ISO 14000, Pollution Prevention, and Global Competitiveness • ISO 14001: Guidance for Meeting the Socio-Economic Responsibilities of an Industrial Facility: Part 1 • The New Business Paradigm: Environmental Management as a Strategic Business Issue • WARR Is Good Business: Waste and Release Reduction at Hoechst Celanese, • Pollution Prevention in the Automobile Industry • Back to the Drawing Board: CCPCT Researchers Hope to Design Solutions to the Tough Pollution Problems Associated with Automobiles • Removing Petroleum Contamination from Low-Permeability Soils.

P,SC–Fall 1996 P2 at Federal Facilities in South Carolina
The Challenge of Managing Environmental Consequences at Federal Facilities • Savannah River Site Keeps Pollution Prevention at the Top • Shaw Air Force Base: On the Front Line against Pollution • Pollution Prevention Program Implementation Tools: Tri-Services, Pollution Prevention Technical Library • Environmental Solutions through Technology Transfer • Looking at P2 through New Glasses.

P,SC–Winter 1997 SC Researchers in P2
The Definition and Solution of Environmental Issues Using Innovative Research: SCUREF Programs and Approaches • New Life for Old Plastic: A Visit to Martin Color-Fi • Plastics and Recycling • Center for Environmental Policy: An Interview with Claire Prince • Eco-Efficiency: Holistic Thinking to Advance Sustainable Business Practices • Clemson’s Expanding Role in Waste Treatment Research • What Is Vitrification? • Lessons from the Governor’s Pollution Prevention Award Applicants.

P,SC–Spring 1997 Looking for P2 in Unexpected Places
Pollution Prevention—Here, There, and Everywhere • The Hazardous Materials Pharmacy (USAF case study), PRO-ACT/AFCEE • Staying Green with Integrated Pest Management • The Pallet Patch: A Second Chance for Scrap Lumber • Food for Thought: Recycling in the Food Service Industry • Managing Food Scraps • Sludge Dewatering at Amoco Chemicals’ Cooper River Plant • Fort Jackson Leads the Way in P2—and Saves Our Tax Dollars! • ISO 14001: Guidance for Meeting the Socio-Economic Responsibilities of an Industrial Facility: Part 2 • What Is ISO 14001?

P,SC–Summer 1997 The Regulatory Side of Pollution Prevention
The Regulatory Side of Pollution Prevention • Dave Willis—Dealing with Governmental Regulators • Good Intentions, Bad Results: Laws and Regulations Sometimes Discourage Pollution Prevention • EPA’s Changing Emphasis in Regulations • A Brownfields Primer.

P,SC–Summer 1997 Special Issue: Waste Management Options for Used Fluorescent Lamps
The Fluorescent Lamp and Its Contents • Disposal of Fluorescent Light Tubes, High-Intensity Discharge Lamps and Fluorescent Lamp Ballasts • Recycling Centers for Fluorescent Light Tubes, High-Intensity Discharge Lamps and Fluorescent Lamp Ballasts • Firm Will Give Competitors Access to Its Low-Mercury Fluorescent Bulb Technology • Disposal of Mercury-Containing Lamps and PCB-Containing Ballasts in South Carolina •

P,SC–Fall 1997 Industry Widens Its Environmental Focus
When Pollution Prevention Is Not Enough • Deregulation by Process Change: MEMC Spartanburg Pollution Prevention Case Study • Springs Industries Wins Award • Equal Opportunity and Environmental Challenges: South Carolina’s Voluntary Cleanup Program • Taking Environmental Awareness beyond the Plant Walls • Let’s Make a Deal: The Utilization of Supplemental Environmental Projects in Settlement Negotiations with the EPA.

P,SC–Winter 1998 What Comes after P2?

Sex, Drugs, and Pollution • A Dependable Way of Managing Used Industrial Drums • A Crown- ing Touch in Pollution Prevention • Brownfields and Beyond:
A Case Study • Environmental Excellence: The (R)evolution of Pollution Prevention.

P,SC—Summer 1999
A Five-Year Retrospective

E,SC—Fall 1998
Environmental Excellence Takes Many Shapes
Trends in the Arena of P2 and Environmental Excellence • Lowering Costs, Raising Standards • Energy Conservation: The Next Pollution Prevention Frontier • Santee Cooper and Cement Manufacturer Forge Fly-Ash Agreement • Looking ahead through the National Pollution Prevention Roundtable • What Is the National Pollution Prevention Roundtable? • Environmental Noise: The Invisible Pollutant.

E,SC—Winter 1999
Solid Waste Issues in South Carolina
Trends in the Arena of P2 and Environmental Excellence, Part II • The Anatomy of a Landfill • The Screaming Eagle Road Landfill: Achieving Environmental Excellence • DHEC Talks about Solid Waste in South Carolina • Recycling at Work.

E,SC—Spring 1999
The Promise of Sustainability
A 21st-Century Approach to Environmental Issues • One Problem with Scientists • Creating Sustainable Communities through Sensible Growth • The Urban Land Institute • Sustainability, My Company, and Me • Eco-Industrial Development: An Opportunity for South Carolina, Part 1 • Kalundborg: A Model Eco-Industrial Park • The Sustainable Universities Initiative: Balancing Economic, Environmental, and Community Needs • Environmental Leadership: A Natural Progression for Industry Environmental Initiatives.

E,SC—Vol. 2, No. 2
Environmental Management Systems: Is There a Payback?

E,SC—Vol. 2, No. 2
Metrics for P2 Measurement
Creating Business Advantage through Pollution Prevention Metrics • A Management Perspective on Pollution Prevention Metrics • Using History as a Guide: Tenneco Automotive’s Pollution Prevention Index • Biometrics Used for Better Wastewater Management • If You Don’t Measure It, You Don’t Know What It Is: CP&L’s Environmental Index.

E,SC—Vol. 2, No. 3
Emerging Trends in Remediation
Environmental Vision for the Air Force Reserve Command • Shaw AFB: Construction Completed of Underground ‘Walls’ to Clean up Ground Water • The Hazardous Waste Management Research Fund: Ten Years After • The Promise of Bioremediation to Clean up Chlorinated Solvents • Commonly Asked Questions Regarding the Use of Natural Attenuation for Petroleum-Contaminated Sites • It’s Nature’s Way: Marine Corps Air Station Beaufort • The Promise of Dense Phase Carbon Dioxide.

E,SC—Vol. 3, No. 1
Broadening the Reach of Environmental Excellence

E,SC—Vol. 3, No. 2
Making Environmental Programs ‘Part of the Business’
The Changing of Environmental Management • Pursuing Environmental Excellence in Forestry • Making the Environmental Department Part of the Business: How to Get Involved Up Front • Environmental Management in the Public Sector: The Charleston Commissioners of Public Works • Advisory Committees Spread Culture of Environmental Excellence at Universities • The Ongoing Struggle for Environmental Excellence • The Universal Waste Rule and Hazardous Waste Lamps.

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The Recycling and Reuse of C&D Debris
With Every Success, There Is a Plan • Environmental Management Is Good Business • The Economic Considerations
Behind Concrete Recycling
• From C&D Debris to Fish
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Artificial Reefs • The Torrington
Company–Clinton Plant: A P2
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Requirements • Developing a
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• Reusing and Recycling C&D
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Environmental Regulations
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Where We Differ: Some Major
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Environmental Quality Control
• International Paper–Eastover
Mill: Reducing Pollution While
Tackling Higher Energy Costs •
Obsolete + Electronics = E-waste
• South Carolina Prepares for
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and Recycling Techniques for
Rechargeable Batteries • Col-
lecting Used Batteries: A Simple
Process • A New Life for Spent
Batteries • Batteries: Part of the
Universal Waste Rule • Battery
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Reduction • Pollution Preven-
tion and Resource Conservation
in Columbia • Redirecting Light
Downward: Lighting Ordinances
Come to Greenville County.
environmental hotlines

Asbestos Ombudsman
Washington, DC
800-368-5888

Center for Environmental Research Information (CERI)
Cincinnati, OH
513-569-7562
es.epa.gov/program/epaorgs/ord/ceri.html

Central Carolina Technical College/South Carolina Environmental Training Center
Sumter, SC
803-778-1961
www.sum.tec.sc.us/conted/scetc/scetc.asp

CHEMTREC (non-emergency services)
Arlington, VA
800-262-8200
www.chemtrec.com

DHEC Center for Waste Minimization
Columbia, SC
803-896-8986
www.scdhec.net/eqc

DHEC Recycling Hotline
Columbia, SC
800-768-7348

Environmental Protection Agency (EPA) Region IV
Atlanta, GA
404-562-9900
800-241-1754
www.epa.gov/region4/index.html

Hazardous Waste Management Research Fund
Columbia, SC
803-777-8157

Hazardous Waste Ombudsman
Washington, DC
800-262-7937

Indoor Air Quality Information Clearinghouse
Washington, DC
800-438-4318
www.epa.gov/iaq/iaqinfo.html

National Lead Information Center
800-424-LEAD
www.epa.gov/lead/nlic.htm

National Pesticide Telecommunications Network
Corvallis, OR
800-858-7378
ace.orst.edu/info/nptn/index.html

National Response Center (oil and chemical spills)
Washington, DC
800-424-8802
www.nrc.uscg.mil

Office of Ground Water & Drinking Water
Washington, DC
800-426-4791
www.epa.gov/safewater

Pollution Prevention Information Clearinghouse (PPIC)
Washington, DC
202-260-1023
www.epa.gov/opptintr/library/libppic.htm

Rechargeable Battery Recycling Corp. (RBRC)
Atlanta, GA
1-800-8-BATTERY
www.rbrc.org/index.html

RCRA, Superfund & EPCRA Hotline
Washington, DC
800-424-9346
www.epa.gov/epaoswer/hotline/index.htm

South Carolina WasteXchange
Tallahassee, FL
800-441-7949
www.sc.wastexchange.org

Stratospheric Ozone Protection Hotline
Washington, DC
800-296-1996
www.epa.gov/docs/ozone/desc.html

Toxic Substances Control Act (TSCA) Assistance Information Service
Washington, DC
202-554-1404

USC Institute for Public Service and Policy Research
Columbia, SC
803-777-4568
ipspr.sc.edu

Waste Reduction Resource Center
Raleigh, NC
800-476-8686
919-715-1612
wrrc.p2pays.org
The South Carolina Environmental Excellence Program.
The SCEEP is a voluntary program for companies committed to continuous environmental improvement in order to protect and preserve South Carolina’s environment. It seeks to encourage companies to become environmental leaders by making a voluntary commitment to promote and practice pollution prevention, conserve energy and other resources, and strive for continuous environmental improvement.

The Center for Waste Minimization. A free, client-oriented advisory service promoting the voluntary implementation of waste minimization, the Center is a nonregulatory technical assistance program established to help business and industry identify waste reduction and recycling opportunities.

E2SC Online. As we wrap up this final issue of E2SC, we’re looking into our Web options. We plan to keep all issues of E2SC (1998–2004) posted as PDFs on our Web site for a few more years. We’re also exploring the possibility of posting all issues of P2SC (1993–1998), but that effort would take some time. We hope you’ll continue to look upon these publications as a valuable resource in your pursuit of environmental excellence.
1990–2003
GOVERNOR’S
POLLLUTION
PREVENTION
AWARD WINNERS

RECOGNIZING SOUTH CAROLINA’S ENVIRONMENTAL LEADERS

South Carolina governors have recognized the following winners and honorable mentions (*) over the years.

1990
Bommer Industries, Inc.
MEMC Electronic Materials, Inc.
KEMET Electronics Corp.*
Mobay Corporation–Bushy Park Plant*

1991
T&S Brass and Bronze, Inc.
Custom Cleaners, Inc.*

1992
NCR Corp.–Workstation Products Div.

1993
Duracell, USA
KEMET Electronics Corp.–Fountain Inn*
Robert Bosch Corp.–Charleston*

1994
Crown Cork & Seal Co., Inc.
3M Company–Greenville Site
Wentworth Printing Corp.
M. Craig Cabinetmaker, Inc.*

1995
Duke Power–Charlotte
DuPont Cooper River Site
Amoco Performance Products, Inc.*
Shaw Air Force Base–Environmental Flight*

1996
Carolina Plating Works, Inc.
Fiber Services, Inc.
KEMET Electronics Corp.–Fountain Inn
Beverage-Air*
The Pallet Patch*

1997
BMW Manufacturing Corp.
Cherokee Finishing Co.
Dependable Drum Co.
James River Corp.
Frigidaire Home Products*

1998
Dayco Products, Inc.
Marine Corps Air Station–Beaufort
Crown Cork & Seal Co., Inc.*

1999
Marine Corps Recruit Depot–Parris Island
Rhodia, Inc.
Cryovac Sealed Air Corp.–Simpsonville*

2000
Caterpillar Inc.–Precision Pin Products Group
International Paper–Eastover Mill
Richtex Brick–Hanson

2001
Circle Environmental
County of Georgetown–Compost Facility
The Torrington Company
International Paper–Eastover Mill*

2002
Dei-Tec Corp.
Rockwell Automation Gear Plant
Wellman, Inc.–Palmetto Plant
DAA Draexlmaier Automotive of America*

2003
County of Anderson–Keep America Beautiful
BMW Manufacturing Co.
Dayco Products, LLC
Naval Weapons Station Charleston
S.C. Dept. of Health & Environmental Control
Griffin Thermal Products*
Interlake Material Handling*
3M Company–Greenville Tape Plant*
Voridian, A Div. of Eastman Chemical Co.*

For information, contact Christine Steagall, USC IPSPR, at 803-777-7463 or steagall@sc.edu.