

101 Ways To Make Pollution Prevention Work

By James W. DeWitt

Business and government pressures are affecting change in the environmental management practices of metal finishing operations. Some companies have discovered that costs can be reduced, productivity improved, and waste reduced through some simple changes in technology or worker behavior.

Successful industrial pollution prevention programs are often unique, as companies adopt practices that make good business and environmental sense, yet basic concepts still apply to all industries.

Here are some ways that a company with metal finishing operations can improve its environmental performance and business climate.

Pollution prevention means different things to different people. Some think of pollution prevention as broadly synonymous with environmentally responsible behavior or sustainable manufacturing. Others define it narrowly as the reduction in the use of hazardous materials. And still others mean any method used to reduce emissions to the environment.

However defined, there is a growing consensus that pollution prevention is the preferred methodology for industrial environmental management. New strategies are being encouraged that promote processes, behaviors or products that reduce or eliminate the generation of pollutants and waste.

Pollution prevention demands change in:

- The technologies and chemicals used to produce a product or to provide a service;
- The level of responsibility delegated to employees;

- The measurement of productivity and waste generation; and
- The attitude and rules of government.

Yet change is particularly difficult within institutions, such as established metal finishing companies and environmental regulatory agencies, where belief in the success of current methods hinders the search for new and creative alternatives.

So how does one effect change where the *status quo* is such a beloved condition?

The following 101 action steps encompass seven management strategies:

- Corporate Attitude
- Employee Utilization
- Planning and Evaluation
- Optimizing Costs
- Technology Utilization
- Program Integration
- Public Policy Advocacy

Corporate Attitude

The success or failure of a company's environmental management program correlates closely with the corporate attitude, or culture. If attitude changes for the better, environmental performance will also improve.

The typical metal finishing or small manufacturing company has one to three individuals who predominantly influence the corporate attitude. A CEO who believes that environmental compliance is an unnecessary evil will drive the company toward environmental failure, including civil or criminal enforcement proceedings, unnecessary generation of waste, uncontrolled risk, and excessive spending.

On the other hand, creative, progressive and responsible leadership will prod the organization toward excellence in all facets of the operation, including environmental

management, workplace safety, and quality.

1. Expand responsibilities for environmental management. Draft job descriptions for all employees to include environmental management as part of their duties.
2. Adopt a new corporate policy. Create a written corporate policy or mission statement that states the environmental intention of the corporation.
3. Emphasize pollution prevention in strategic planning. Make pollution prevention an integral component of the company's strategic plan for quality assurance, increasing productivity, and for improving the condition of the workplace.
4. Find a "tree-hugging" board member. Appoint to your board of directors or advisory group an individual who has demonstrated a personal environmental ethic through participation in non-profit environmental organizations or other activist or academic pursuits.
5. Assure top management participation. While an individual must be assigned specific responsibility for implementing environmental programs (*i.e.*, environmental manager), the CEO or other top executives must be actively engaged in the planning, implementation and evaluation of environmental initiatives.
6. Set goals. Establish explicit and realistic goals for reducing releases to the environment, waste generation, and raw materials consumption per unit of product produced.
7. Make a public commitment. Commit to attaining the goals you have established by participating in programs such as EPA's 33-50 program or Waste-Wise program. If you really want to stretch,

subscribe to the CERES Principles.

8. Seek corporate recognition. Identify and pursue awards presented by government, trade organizations, newspapers, or community organizations that recognize environmentally responsible corporations.
9. Participate in business organizations and policy forums. Stay abreast of rapidly changing technology, regulations, marketplace conditions and the expectations of our society by being involved in trade organizations, community groups, and advisory committees to government agencies.
10. Formulate a strategic plan. Create a plan specifying the actions that the company will take to meet its goals.
11. Comply with environmental laws. Be in compliance with all environmental laws all of the time, because a company will not be recognized for its outstanding pollution prevention efforts unless it is in compliance.
12. Educate the customer. Your customers are probably more concerned about the cost of your product or service than your pollution prevention successes, so let them know how the two are entwined.

Employee Utilization

The personal environmental ethic of the populace has changed. More individuals and families are recycling, looking to buy "green" products and, in general, are more aware of global environmental issues and problems. Frequently, the school-aged children in a family are the environmental activists.

Not surprisingly, more environmentally aware employees become frustrated and annoyed if they walk into their workplace and see careless handling of chemicals, and disregard for the conservation of resources such as energy and water, excessive waste, and inefficiency. Reaction to such conditions can adversely affect performance and pride in the company.

Correspondingly, when workers see that the company has committed both its attention and its resources to pollution prevention, they are eager to do their part when given permission, and the opportunity to do so.

Companies with outstanding environmental, health & safety, and quality assurance programs disburse decision making responsibility to all levels of the organization—from the president to the plating line operators.

It is important to educate workers about general environmental issues. Provide specific training on pollution prevention techniques. If expected to help with environmental management, employees need to develop the skills to do their job effectively.

These are some ideas that will help you secure the commitment of your fellow workers:

13. Ask for ideas. Production workers often have useful ideas for reducing waste and making a process more efficient, and will provide input when asked.
14. Educate workers. Educate employees about environmental issues, including the possible devastating effects of their actions on the environment and on the company.
15. Use teams and committees. If you have a well-functioning health and safety or quality assurance team, you may wish to use the group as a forum to share ideas, make decisions and implement projects—if not, create a "green team."
16. Create project teams. *Ad hoc* work groups can focus on a specific pollution prevention project to effect quick change if the sometimes bureaucratic formal team turns simple tasks into cumbersome ones.
17. Reward good work. Provide motivating financial incentives and recognition to employees, both individually and collectively, when they identify effective ways to reduce waste and meet goals.
18. Provide training. Train employees on pollution prevention and equip them with the skills to identify pollution prevention opportunities.
19. Encourage risk-taking. To the extent possible, promote a working environment that nurtures creative thinking, while reducing fear that an employee will be chastised if an idea doesn't work.
20. Provide resources. Be persistent to assure that top management participates and provides both

commitment and resources to encourage change.

21. Communicate well. Create mechanisms for information flow throughout the company, including bulletin boards, newsletters, electronic mail, and focused meetings.
22. Change gently. Make change subtly, because most people embrace change with caution, and employees are sometimes cynical because of previous company failings.
23. Keep records. Maintain a log of "green team" meetings, pollution prevention projects, successes, failures and noteworthy events that will serve as a record of accomplishments, as well as provide an institutional memory.
24. Share savings with employees. Distribute money that the company saves as a result of employee ideas and actions to those who were responsible for the savings.

Planning and Evaluation

Planning is essential to a successful pollution prevention program. Companies that have devoted time and resources to put together a comprehensive description of policy, goals, strategy, and assessment tools generally perform better environmentally than those that don't.

"Planning" differs from simply "having a plan." Planning is an active process—something that has a start but no end. Planning pollution prevention programs and projects is a dynamic and self-sustaining process. It is interwoven into the culture of the corporation.

A plan is a product of the planning. Pollution prevention plans document the corporation's philosophy, its goals and the method by which progress is measured. The plan states how information is communicated, and where responsibility lies. Some plans include inventories of hazardous materials, waste generation data, and describe pollution prevention projects and implementation schedules in great detail.

Plans mandated by government are often of little use to the company. However, the actions invoked by the mandate have often improved communication, prompted decision-making, and refocused company emphasis on prevention over control. Plans that have been written with the

singular input of an environmental manager, or solely by an outside consultant, typically collect dust.

Just as planning is an on-going process, a continuing process of program evaluation in environmental management will reduce waste generation and save money and lead to continuous improvements overall.

An audit is an effective measuring device. However, because the word "audit" conjures up images of the IRS rummaging through the corporate financial records, "pollution prevention opportunity assessment," or "assessment," is readily accepted as "kinder and gentler" terminology.

A pollution prevention opportunity assessment is not a one-time event. It is a continual search for ways that the company can stop waste from occurring and save money. The assessment generally does not seek to evaluate or improve the regulatory status of the company, but it often has that result.

EPA and state agencies have developed several comprehensive checklists and questionnaires to assist environmental managers in evaluating shop practices. Third-party auditors, such as government regulators and technical assistance personnel, use these and other similar assessment tools in an effort to target pollution prevention ideas. Consultants often perform assessments for their clients using similar tools.

Often these methods don't work well because the evaluator is usually far less knowledgeable about the operation than the evaluated.

Effective evaluation of pollution prevention opportunities and program effectiveness is best performed by a team of trained company employees. The team should represent a cross-section of company operations. Outside experts, such as suppliers and consultants, can also be valuable contributors to the team.

These actions will help you plan and evaluate your pollution prevention opportunities and programs:

25. Identify methods to encourage worker participation. Plan a strategy that will assure the "buy-in" of those who are cynical.
26. Establish planning and assessment teams. Bring together a broad representation of the company, including production workers, inspectors, maintenance workers,

financial personnel and management, for the purpose of writing and maintaining a written pollution prevention plan, and to regularly evaluate opportunities and progress.

27. Plan to communicate. Build into your plan the ways the planning team will communicate with management, production personnel, outside suppliers and consultants, and regulators.
28. Use facilitators. Utilize an expert to help facilitate planning sessions, such as someone on staff who is an experienced facilitator or an outside person trained in pollution prevention planning and training.
29. Choose a leader. Select an individual or individuals who will move the planning and assessment efforts along.
30. Train your team members. Assure that your planning and assessment team members are well-informed and skilled in pollution prevention theory, data collection, and the goals of the program.
31. Create a comprehensive plan. Planning elements may include process flow diagrams, materials accounting, cost analysis of waste treatment operations as attributed to specific processes, evaluations of options, goals, and timeliness.
32. Search and find. Conduct regular pollution prevention opportunity assessments in which members of the assessment team observe production processes and worker practices, and analyze written records of waste generation, raw material purchasing and the relevant documents.
33. Be thorough. Take the time to analyze each manufacturing process and understand why current production is the way it is.
34. Seek success. Choose to focus on a process that can be quickly analyzed so the team learns how to analyze for pollution prevention.
35. Use group brainstorming. Create ideas in a setting where all suggestions are considered potentially good ones.
36. Set pollution prevention goals. Establish your desired targets, including waste reduction goals, estimated cost savings, recognition and awards, and specific projects you would like to accomplish.

37. Showcase successes. Spread the word about the success of implemented projects to build credibility, support and enthusiasm for pollution prevention with your company.
38. Follow through. Take the best ideas and fully implement them in the most expeditious manner possible.
39. Find marketplace benchmarks. Find out how your competitors are doing and use this as motivation to gain a competitive edge.

Optimizing Costs

Most companies do not track costs very well. Few operations have an accounting system in place that fully and explicitly attributes costs and incorporates that information into the variety of business decisions.

Historically, business managers have viewed expenses related to environmental compliance as extraneous and often uncontrollable. They see that investments in, and the operation of, end-of-pipe technologies generally increase the cost of doing business, with little likelihood that savings or efficiencies may be realized.

Yet pollution prevention programs can lead to a reduction of operating costs by decreasing waste generation, lessening regulation-prompted activities, and lowering pollution-related liabilities. Capital expenditures on pollution prevention technologies and new products or processes often yield a surprisingly positive return on a company's investment.

Environmental projects compete with other company needs for resources. Small businesses, as well as large corporations, are constantly determining how to distribute these resources within the organization. Environmental priorities or better alternatives are often not pursued, because the cost of both existing and new options are difficult to evaluate. A more comprehensive analysis of costs and benefits helps business managers to discriminate with greater confidence between available options.

Accurate financial analyses, however, are difficult if cost data is absent, inaccessible or inaccurate. Financial management tools, such as total cost assessments (TCA) and activity-based costing (ABC), can

assist a company in identifying its real environmental management costs.

These accounting methods take into consideration all the costs associated with a particular environmental management activity or project. Tangible and most obvious expenditures, such as direct labor costs, waste disposal fees and chemical purchasing, are assimilated. Indirect or less tangible savings or costs, such as potential Superfund liability, or increased sales resulting from a "green" image, are also included in the financial analyses.

Businesses genuinely interested in improving their performance through pollution prevention need to optimize their costs. Here are some ways:

40. Modify the accounting system. Upgrade your computer processing capability to improve data management.
41. Contact your accountant. Most accountants use conventional accounting systems that work well to satisfy the IRS, banks and investors, but do little to define specific process or project costs.
42. Research literature. The U.S. EPA, the Northeast Waste Management Officials Association (NWMOA) and others have published training documents that can assist a company in developing cost accounting programs.
43. Draw process flow diagrams. For each production process in your plant, produce a detailed flow diagram to which costs can be specifically attributed.
44. Cost equipment purchase accurately. List all costs related to the purchase of new equipment, including the product, delivery, installation, taxes and start-up.
45. Save on tax exemptions and credits. Identify all applicable waivers of taxes on research and development activities, the purchase of pollution control and pollution prevention equipment and engineering and consulting services—most states have them.
46. Educate your banker. Keep your lender informed about your pollution prevention projects and cost accounting practices to encourage cooperation when financing is needed.
47. Characterize waste generation. Maintain a waste accounting system to track the types,

characteristics, and amounts of all solid wastes generated by your company.

48. Determine waste management costs. Assign the true cost of waste management, including the cost of waste disposal, transportation, taxes, supplies, training, insurance, handling labor, compliance, oversight and reporting labor, waste analyses, and mishaps.
49. Calculate future liability. Assess the cost that may be attributed to your company under Superfund as a result of past waste disposal practices.
50. Allocate costs to processes. Allocate the total costs of producing a product, including waste management, utilities, maintenance, and chemical purchases, to the activities responsible for generating the waste in the first place.
51. Account for time-value of money. Account using "net present value" for the value of the project savings over its lifetime, because pollution projects often have long payback periods.
52. Learn new accounting practices. Join EPA's Capital Budgetary and Managerial Accounting Workgroup that showcases pollution prevention projects.
53. Prioritize pollution prevention projects. Implement projects that have the greatest likelihood of saving the company the most money in the shortest time, especially if you are new with the company, are just getting a pollution prevention program going and want to prove your effectiveness.
54. Conduct a life cycle assessment. Assess the cradle-to-grave cost of one of your products or processes, including the inputs (the resources that go into a product or service) and outputs (the wastes and by-products that result from the product's manufacture, use and disposal).

Technology Utilization

Achieving zero emission, zero discharge, and zero hazardous waste, resulting in a reduction in regulation, is technologically achievable for most metal finishing operations. Not surprisingly, there are no "magic black boxes" housing sophisticated

wizardry that make this a simple and economically feasible task.

Since the passage of the first laws aimed at protecting the quality of surface waters, the metal finishing industry has relied on conventional end-of-pipe technology to remove pollutants from wastewaters being discharged to sewers or rivers and streams. This neutralization and precipitation style treatment has proven successful in reducing the uncontrolled mass loading of metals and other pollutants to receptors.

The chemical and labor costs of applying these treatment processes are great, however, and the management of the residual sludge has always been problematic.

Air scrubbers have also proven successful in reducing air emissions from chromium plating and other electroplating processes. Like their wastewater counterpart, however, scrubbers often generate by-products and may not help meet tomorrow's stringent air emission standards.

Changes in processes or procedures can reduce the reliance on end-of-pipe control technologies. Adding rinse tanks, converting from a cyanide zinc to an alkaline zinc plating solution, or replacing high-VOC paints with powder coatings are representative examples.

Both commonplace techniques and the availability of new technologies have combined to reduce the reliance on end-of-pipe controls. Some are "low-tech" and some are not. Fume suppressants and "ping-pong balls" reduce chromium fumes. Ion exchange, reverse osmosis, electrowinning, and various forms of evaporation technologies are commonly used to recover and recycle metals and cleaners in plating processes.

Despite advances in these technologies, companies are reluctant to make any changes that might affect their production processes, for fear of risking the quality of their surface coating. Customers are often rigid in specifying how a process should be performed, and large capital investments are beyond the reach of the financially strapped company.

While zero emission, zero discharge, zero waste, and reduced regulation are not as easy to achieve as some would have us believe, here are some ways that will help your company move in that direction:

55. Selectively use chemical suppliers. While most suppliers of chemicals are rewarded only by selling more, find a supplier representative who benefits from your using less chemicals or environmentally friendly ones.
56. Use the university. Most major state and private universities have established applied research capabilities for environmental technologies and are eager to help industry find new solutions to old problems.
57. Contact EPA information clearinghouses. EPA operates a number of clearinghouses for environmental information, including the Pollution Prevention Information Clearinghouse (PPIC), where you may obtain documents developed by EPA, state and other agencies, as well as private industry.
58. Compete for grants. Create partnerships with state government agencies, non-profit organizations and universities to obtain grants from the U.S. Department of Energy, the U.S. Department of Commerce, and EPA to develop and demonstrate advances in energy efficiency and clean production technologies.
59. Partner with equipment manufacturers. Manufacturers and distributors of pollution prevention-related technologies are eager to place their equipment in your shop and conduct a demonstration pilot project.
60. Lease, don't buy. Metal finishing companies, especially the small ones, have little access to funds for large capital investments, and suppliers are willing to work out attractive lease agreements.
61. Maintain equipment. Implement a strict preventive maintenance program for installed equipment in order to protect your investment and optimize effectiveness.
62. Learn from your colleagues. Search for companies within the metal finishing, or a similar industry, that have resolved the same problem you are now facing or that have evaluated a technology of interest to you—even your competition may be helpful.
63. Interface with technical organizations. When researching pollution prevention ideas, technical organizations and professional

societies, such as AESF, are excellent in fostering the technology and experience flow.

64. Query the government inspector. Environmental agency inspectors and engineers float from company to company and have the opportunity to see the best—and worst—technologies that are at work in the field.
65. Use consultants—selectively. Many engineering and environmental management consultants are technically sound, are knowledgeable about pollution prevention challenges and solutions, and can be helpful to your company, if they are used as a member of your pollution prevention team.
66. Utilize state assistance programs. More than 40 states have technical and financial assistance programs that provide both information and grants for pollution prevention projects.
67. Look at substitutes. Compare substitutes for chemicals and processes, such as hydrochloric acid, and cadmium and chromium plating, which may have become unquestioned commodities in the shop.
68. Assess energy costs. Request the help of your electric utility company to evaluate the energy demand for new technologies, because their use may affect your energy supply and bottom-line.
69. Buy used equipment. Search for the evaporators, ion-exchange units, membrane systems and other hardware that are starting to become available second-hand.
70. Talk to regulators. Seek approval from government regulators to install technologies that are incorporated into production processes or the treatment system, if such approval is required by law.
71. Educate regulatory personnel. Provide information on technological advances to state and federal regulatory agency engineers, because you are most likely more knowledgeable about pollution prevention technologies in your industry than they are.
72. Maintain confidentiality. While contrary to encouraging technology transfer, you may wish to keep certain proprietary information in strict confidence, and this desire must be clearly communi-

cated to suppliers, government agency personnel, and especially to your employees.

73. Make simple changes now. Identify the “low hanging fruit” and implement the common sense, low-cost changes that, for electroplaters, may include: Adding water flow restrictors, increasing dwell times, installing counterflow-current rinse tanks, and preventing cross contamination.

Program Integration

Pollution prevention can efficiently blend into existing quality assurance and health and safety programs. Doing this takes advantage of a management structure that may already be in place, and also avoids the stigma of “creating another new program.”

A successful pollution prevention program requires thoughtful planning, persistent implementation and continual evaluation—familiar concepts to general business management. Often companies struggle unnecessarily to create and maintain an effective environmental management program because they neglect to take advantage of well-established and effective company practices.

The people responsible for administering quality assurance and health and safety programs are often the same ones called upon to be a part of a “green team.” The smaller the company, the greater the likelihood that responsibilities will overlap.

Numerous metal finishing and manufacturing companies have embraced the concept of continuous quality improvement. Effective total quality management programs have evolved as a result of customer demands and good business sense. These companies are usually quick to comprehend and capitalize on the benefits of pollution prevention.

Health and safety committees are also commonplace in companies ready to implement a pollution prevention program. These committees exist as a mechanism to improve the workplace environment, lower workers' compensation insurance costs, and, in many states, to satisfy regulatory requirements.

Quality assurance and health and safety plans, teams, communication networks, incentive programs and evaluation tools can easily be ex-

panded to include pollution prevention. Similarly, the best of these existing programs can be extracted to form a basis of a segregated pollution prevention initiative, if that is the will of the corporation.

These hints will help you improve quality assurance, health and safety, and pollution prevention:

74. Become familiar with global environmental standards. Learn about ISO 9000, ISO 14000, the British Standards Institution Program (BSI 7750), and the European Community's eco-management and audit schemes, and compare your operation with these standards.
75. Survey the field. Evaluate existing quality assurance and health and safety programs in terms of the resources required for implementation.
76. Locate a champion. Find an employee who wants to see pollution prevention implemented and sees the connection between quality and environmental management.
77. Proceed cautiously. Efforts to expand existing programs could be viewed as invading other people's turf, or loading on too many responsibilities.
78. Train the team. Pull successes from your own company's quality, health and safety, and pollution prevention efforts to show the link between strategies and the future potential benefits.
79. Look for holes. Find areas where current practices are not consistent with program goals and how these "holes" result in waste and pollution.
80. Patch the holes. Create new policies, directives and training to extend the existing programs to these uncovered areas.
81. Conduct co-audits. Have the lead pollution prevention person assess pollution prevention opportunities during walkthrough inspections for quality, and health and safety.
82. Talk their "talk." Familiarize people who have been exclusively focused on quality or safety with environmental regulations and terminology, yet use a lot of their terminology until they become more familiar with "enviro-talk."
83. Modify the manual. Expand the scope of quality and health and

safety manuals to include pollution prevention.

84. Focus on common causes. Build cooperation and early success by choosing projects that clearly show both a quality or safety benefit and a pollution reduction.
85. Sell the cost savings. Improve the support of top management by citing the reductions in number of staff meetings and time spent away from production if programs were integrated.
86. Transfer the expectation to contractors. Tell your vendors and contractors that pollution prevention is part of the quality program and that the company's expectations of vendors might be changing.
87. Pollution defects. Treat permit limitations exceedances as product defects, and follow all the quality procedures you would for any other type of a quality defect.
88. Design for pollution prevention. Design and specify products that meet both quality and non-polluting criteria.

Public Policy Advocacy

Today's environmental regulations and the manner in which they are administered often stymie, rather than enhance, change that results in improved environmental management.

Command and control regulations have led to a remarkable reduction in emissions to the environment from industrial sources. The Clean Water Act, the Clean Air Act, RCRA and state laws and local ordinances have constrained much of the blatant discharge of pollutants to surface waters, the air, the land and groundwater. Nationwide, rivers and streams are cleaner and support an expansion of use; air quality has improved; and groundwater is less threatened by land disposal of waste chemicals and leaking underground storage tanks.

The reduction in pollution during the past 20 years, however, represents a short-term gain. Costly command and control regulations have taken a toll on industry without producing a corresponding long-term benefit to the environment.

The metal finishing industry has suffered as a result of disjointed, rapidly changing, and often arbitrary environmental standards. Industry often complains about the frustration

and uncertainty of trying to hit a moving target.

Business professionals, government officials, and environmentalists often concur that our present policies are not what they should be. Industry needs a predictable and fair regulatory system to encourage responsible corporate behavior by rewarding the good and appropriately punishing the bad. Here are some ways you can make this happen:

89. Encourage reasonable market-based environmental policies. Support policies in which the real cost of pollution is assigned to, and controlled by, the entity most directly responsible for generating it, so that any increase in pollution leads to higher costs, and any decrease leads to lower costs.
90. Know your elected public officials. Contact your town hall to obtain the names, addresses, phone numbers, and staff assignments of your municipal and county officials, state representative and senator, and congressional representative.
91. Invite policy-makers to your plant. Have public officials visit your plant to see your operation and to understand the importance of metal finishing to society.
92. Make useful suggestions. Prepare comments that are well-thought-out, make sense, are "doable," and that focus on substantive suggestions.
93. Promote education in government. Join AESF and NAMF or MFSA to support advocacy activities as Congress debates environmental laws, such as Superfund and the Clean Water Act.
94. Support your state and local trade and business organizations. Join and be active in associations that promote your interests at the regional, state and local levels.
95. Discourage unscientific environmental policy. Speak out against proposed environmental laws and programs that reflect political whim, rather than scientific foundation and purpose.
96. Participate in environmental policy-making. Watch for opportunities to work with EPA or state agencies on collaborative projects, such as EPA's Common Sense Initiative.

97. Read proposed regulations. Obtain and evaluate environmental regulations that affect your company. Don't always leave it up to your lobbyist, who doesn't know your company as well as you do.
98. Educate the children. Provide science-based information to your schools, scout troops and churches—the power of letters from a fourth grade classroom to a legislator is remarkable.
99. Put your opinion in writing. Write letters to your elected public officials; send opinion letters to the local paper; volunteer to write articles for trade journals.
100. Give speeches. Offer to lecture at schools, universities, and to community organizations, such as the Lions Club or Rotary.

Change Requires Effort

Changing habits and behavior is difficult, especially if one is satisfied with past efforts. Changing the manner in which an institution operates, whether it be a government agency or a small business, is not a minor undertaking. Many human, institutional and economic obstacles often prevent logical and constructive actions from happening.

The action steps described here are not novel, or unique to the metal finishing industry. They are all, in some manner or degree, being successfully implemented in industrial operations throughout the country. While some companies have comprehensive, well-designed and formalized programs, others are successfully implementing pollution prevention simply by acting on a good idea that results in a positive change. Without a doubt, companies that are unable or unwilling to continually improve their environmental management face a dismal future.

Without this last action step, however, the ultimate benefits of implementing pollution prevention will not be realized.

101. Be patient and persistent. All change takes time, dedication, and effort. ○

About the Author

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